THE DIABETES EDUCATOR ROLE IN ONTARIO

THE DIABETES EDUCATOR ROLE IN ONTARIO: A PROVINCIAL PERSPECTIVE

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**Abstract**

Background: As the diabetes (DM) epidemic in Canada continues to grow, the need to provide diabetes self-management education (DSME) becomes increasingly important. Research has shown that DSME can improve both physiological and behavioural outcomes in individuals with DM. Diabetes educators (DE) play an essential role in providing DSME to individuals with DM. Although considered an important role in the care of individuals with DM, the DE role is not well described in Ontario. Building a province-wide description of DEs’ role would outline the role of DE in Ontario is enacted, and suggest possible areas for improvement.

The specific objectives of this study are:

a) To describe the demographic characteristics of DEs in Ontario;

b) To identify the *structures*, *processes*, and *outcomes* associated with the role of DEs;

c) To identify the facilitators and barriers to providing DSME in Ontario;

d) To identify the association between key characteristics of DEs (profession, education, certification, practice-setting, and DM-specific training) and the *structures*, *processes* and *outcomes* of this role.

Methods: This cross-sectional study used an online questionnaire, the Diabetes Educator Questionnaire (DEQ). The DEQ was developed using the *International Standards for Diabetes Education* and Donabedian’s framework to examine the *structures*, *processes* and *outcomes* associated with the role of DEs. The study consisted of three sequential phases: (1) pre-testing the questionnaire in a tertiary care diabetes program, (2) pilot testing the questionnaire to a single Diabetes Educator Section (DES) chapter of the Canadian Diabetes Association (CDA), and (3) administering the DEQ to the remaining DES chapters across Ontario. The online questionnaire was created using LIME survey, an open source survey program housed at McMaster University. Data were downloaded, cleaned, and analyzed using statistical and geographical mapping software.

Results: The DEQ demonstrated both face and content validity. A total of 178 out of an estimated 600 DEs across Ontario responded to the DEQ, for an overall response rate of 30%. The respondents consisted of 61 registered nurses, 94 registered dietitians, 18 pharmacists, and 4 nurse practitioners, and 1 undescribed. The majority (85%) of respondents were CDEs. Insufficient time, and organizational/management support were the two most common barriers to implementation of the role of the DE. Significant differences (p value greater than 0.05) in how DSME was provided and the use of outcomes were observed for profession, level of education, and practice setting.

Limitations: With a low response rate, conclusions cannot be drawn from this study. Being an anonymous study, intra-rater reliability could not be performed.

Conclusions: This study shows that the DEQ serves as a feasible tool to explore the role of DEs in Ontario, however, improved recruitment strategies are necessary before further research is performed. The study provides a foundational description of DEs across Ontario, generating possible hypotheses for future research.

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**List of Abbreviations**

AADE: American Association of Diabetes Educators

CCDSS: Canadian Chronic Disease Surveillance System

CCHS: Canadian Community Health Survey

CCM: Chronic Care Model

CDA: Canadian Diabetes Association

CDE: Certified Diabetes Educator

CDECB: Certified Diabetes Educator Certification Board

DE: Diabetes Educator

DEP: Diabetes Education Program

DES: Diabetes Educator Section

DKA: Diabetes Ketoacidosis

DM: Diabetes Mellitus

DSM Diabetes Self-Management

DSME Diabetes Self-Management Education

EMR: Electronic Medical Record

IDF: International Diabetes Federation

RD: Registered Dietitian

RN: Registered Nurse

T2DM: Type 2 Diabetes Mellitus

T1DM: Type 1 Diabetes Mellitus

WHO: World Health Organization

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**Declaration of Academic Achievement**

**Chapter 1:** **Introduction**

**1.1** **Background and Purpose**

With the increasing incidence and prevalence of diabetes mellitus (DM) in Canada and internationally, the importance of providing diabetes self-management education (DSME) has only increased. DSME builds the monitoring, self-care, and problem-solving skills of individuals with DM, making them active participants in the management of their disease (Canadian Diabetes Association Clinical Practice Guidelines Expert Committee [CDACPG], 2013). Diabetes educators (DEs), as healthcare professionals with specialty knowledge of DM, are foundational to ensuring that appropriate DSME is provided.

Unlike other countries, such as the United States, United Kingdom, and Australia, the role of DEs in Ontario, as well as in Canada, is not well described in the literature (see *Appendix A* for literature describing DEs in various countries, & *Appendix* *B* for a comparison of DE between countries). Although questionnaires have been developed to study the role of DEs in other countries, such as the United States, United Kingdom, and Australia, none were found that investigated the role of DEs in Ontario, or the Canadian healthcare system as a whole (see *Appendix A*).

Questionnaires assist healthcare systems in defining the role DEs by providing current descriptive data from DEs practicing within their healthcare system. The data collected from DEs can provide direction to possible avenues to improve the provision of DSME in their respective countries, as well as identify current gaps in the provision of the DE role. Thus, the use of a questionnaire to describe the DEs role in Ontario would outline the current landscape of DSME across Ontario, and identify areas to build capacity in the provision of DSME in Ontario.

The purpose of this study was threefold: (1) to develop the Diabetes Educator Questionnaire (DEQ), (2) to pilot test the questionnaire, and (3) to explore components of the role of DEs in providing DSME in Ontario. Such knowledge may inform the development of strategies to improve the access, provision, and quality of DSME, as well as clarify the role and identity of DEs in Ontario.

**1.1.1** **Condition Background**

DM is broadly defined metabolically as intolerance to glucose. This intolerance manifests itself as hyperglycemia, and is caused by the body’s inability to secrete insulin, and/or the inability of insulin to act in the body. DM is a chronic condition, where prolonged hyperglycemia is associated with many serious complications, which include depression, neuropathy, nephropathy, cardiovascular diseases, retinopathy, and others. According to the Canadian Diabetes Association (CDA), a diagnosis of DM occurs with a fasting plasma glucose of ≥7.0 mmol/L, A1C≥ 6.5%, plasma glucose ≥11.1 mmol/L + symptoms of DM, and/or ≥11.1 mmol/L on a 75-gram 2-hour plasma glucose in an oral glucose tolerance test (CDACPG, 2013). DM can be further classified into three groups: Type 1 Diabetes Mellitus (T1DM), Type 2 Diabetes Mellitus (T2DM), and Gestational Diabetes Mellitus (GDM).

*Type 1 Diabetes Mellitus*

T1DM includes all types of DM, where there is destruction of beta cells in the pancreas. Beta cells are responsible for the production and secretion of the hormone insulin, which acts in the body to stimulate the removal of excess glucose in the blood. T1DM is an autoimmune disease where the immune system attacks the beta cells of the pancreas, and inhibits their activity. Thus, the body can no longer control blood glucose levels, and requires an external source of insulin. T1DM requires individuals to take regular injections of insulin and maintain a highly controlled diet, and physical activity regimen. Although the exact cause of T1DM is not completely clear, typically it is diagnosed early in life, between childhood and adolescence (Jones, Brashers, & Huether, 2010; CDACPG, 2008). Approximately 10% of individuals with DM worldwide are classified as having T1DM (International Diabetes Federation [IDF], 2012). The IDF calculated this estimate using data from international peer reviewed literature, reports of national health statistics, and other international organizations such as, the World Health Organization (WHO) (IDF, 2013). As outlined by the CDACPG, currently there is no method to prevent the onset of T1DM (2013).

*Type 2 Diabetes Mellitus*

Unlike T1DM, where there is a lack of production and secretion of insulin, T2DM occurs when the production of insulin by the pancreas is insufficient to meet the body’s need, and/or tissues of the body become resistant to the hormone insulin and consequently cannot act appropriately to maintain physiological blood glucose control. According to the IDF, T2DM accounts for approximately 90% of the individuals with DM worldwide (2012). The prevention of T2DM has been the subject of many clinical and intervention studies, which aim to prevent or delay the progression of impaired glucose to a clinical diagnosis of DM (CDACPG, 2013; Sherifali & McMaster Evidence Review and Synthesis Center, 2012). Reviewing meta-analyzed data of randomized controlled trials, both the CDACPG expert committee (2013) and Sherifali & McMaster Evidence Review and Synthesis Center (2012) found that lifestyle modifications, and also use of some oral anti-hyperglycemia agents were beneficial in the prevention of T2DM. Some of these strategies are discussed later in the chapter.

*Gestational Diabetes Mellitus (GDM)*

As the name suggests, GDM is characterized by elevated blood glucose levels (hyperglycemia) occurring during pregnancy. Leading risk factors associated with GDM include macrosomia, member of a high risk racial population (e.g., Aboriginal, Hispanic, South Asian), pregnancy in older age (35 years and older), and obesity (BMI ≥ 30). At diagnosis, GDM requires dietary and physical activity modification, and/or medication management to mitigate the extremes in blood glucose concentrations. Although GDM usually dissipates after pregnancy, it predisposes both the mother and child to developing T2DM later in life (CDACPG, 2013).

*Other Types of Diabetes Mellitus*

There are other types of DM, all of which are rare and stem from various sources, including genetic conditions, other diseases, and use of certain medications. Regardless of the source, the body’s ability to manage blood-glucose level is impaired, leading to hyperglycemia.

*Prediabetes:*

A range of fasting blood glucose of 6.1–6.9mmol/L and postprandial glucose values of 7.8-11.0mmol/L indicate that a person has prediabetes, or is at high risk of developing DM, DM-related complications, and other cardiovascular diseases (CDACPG, 2013). These individuals are encouraged to maintain a healthy lifestyle to help prevent DM. Recommendations for a healthy lifestyle will be described in more detail below (see *Section 1.4*), and are also summarized in the CDACPG (2013).

**1.2** **Prevalence and Burden of Diabetes**

**1.2.1 Diabetes** **Epidemiology**

The increase in DM prevalence in Canada and globally is considered to be of epidemic proportions. According to the Public Health Agency of Canada (PHAC, 2011), in 2008/2009 there were 2.4 million (6.8%) Canadians living with all types of DM (except prediabetes). The PHAC summarizes cross-sectional data from Canadian Chronic Disease Surveillance System (CCDSS), which collects population-based administrative, health services, health survey, health outcomes, and vital statistics from across Canada (2011). Using data from the CCDSS, the age standardized prevalence of DM in Ontario alone was 6.0%, which was the third highest among all Canadian provinces (PHAC, 2011). Recent measures of DM prevalence in Ontario have exceeded global predictions (Lipscombe & Hux, 2007). There has been a 70% increase in the prevalence of DM across Canada in the 10 years prior to the 2008/2009 data (PHAC, 2011). In the year 2008/2009, a staggering 203,018 individuals were newly diagnosed with DM throughout Canada (PHAC, 2011). Based on current calculations of DM prevalence and incidence, over the next six years the number of individuals with DM in Canada is predicted to reach 3.7-3.8 million (PHAC, 2011).

Based on the international health data collected by the IDF, every country in the world is experiencing growth in numbers of individuals with T2DM (IDF, 2012). Canada ranks third among North American and Caribbean countries in terms of total number of individuals with DM. Global estimates indicate that there are 371 million individuals worldwide living with DM (IDF, 2012). The majority (80%) of those living with DM globally live in lower to middle income countries such as India, the Ukraine, and Indonesia. Approximately 50% of individuals living with DM world-wide are also undiagnosed (IDF, 2012). It is projected that by the year 2030, the total population living with diagnosed DM will reach 552 million (9.9% of the world population). These projections do not take into account the proportion of undiagnosed individuals, thus this is likely a considerable underestimation of the true prevalence.

Using the Canadian, population-based observational findings from CCDSS, experts identified that the prevalence of DM increases with age (2011). The highest rates of DM are seen among individuals aged 75-79 years, where greater than one in four individuals is living with the disease (PHAC, 2011). Since a growing proportion of the population in Canada is above 65 years of age, the overall prevalence is expected to continue to rise. Another alarming statistic is the increased proportion of DM in younger age groups (35-45 years). One contributor to the increases in this age group may be higher rates of obesity in younger population groups. Obesity and excess weight are closely associated with DM.

**1.2.2** **Complications of Diabetes**

DM is a serious and potentially life-threatening disease that creates a huge burden on individuals living with the disease, family members, the healthcare system, and society as well. This is often related to the development of DM-related complications. These complications typically arise as a result of poor management of DM. Short-term DM-related complications include diabetes ketoacidosis (DKA), hyperglycemic hyperosmolar non-ketotic syndrome (HHNS), loss of consciousness and/or falls (due to hypoglycemia), impaired wound healing, increased risk for infections, and even death (PHAC, 2011). Both high (hyperglycemia) and low (hypoglycemia) blood glucose levels can result in multiple short-term complications. Immediate management of blood-glucose extremes is necessary to prevent the onset of these complications.

Long-term DM-related complications are closely associated with chronic hyperglycemia and an altered metabolic state such as ketoacidosis. Damage occurs to the vascular tissues of the body at both the micro-vascular and macro-vascular levels due to hyperglycemia for extended periods of time. Some micro-vascular complications include retinopathy, nephropathy, and neuropathy. With prolonged hyperglycemia, the capillaries and other micro-vessels of the retina, kidney, and nerve fibres are at risk of injury. Over time, these injuries can lead to permanent damage such as blindness, kidney failure, and non-traumatic limb amputations. Macro-vascular complications of DM can include cardiovascular diseases, such as coronary artery disease (CAD), stroke, and peripheral arterial disease (PAD). The presence of DM greatly increases an individual’s probability for all these complications. Approximately 80% of people with DM will die due to heart disease or stroke (CDA, 2012c). Complications due to DM are the predominant predictor of mortality (PHAC, 2011).

Although the majority of data regarding DM-related complications focus on individuals who are already diagnosed with DM, there is a large population of individuals in Canada who live with DM, but have not yet been diagnosed. It is projected that 20% of people with DM in Canada have not yet been diagnosed with DM (PHAC, 2011). This finding is considerably lower than the estimate world-wide mentioned previously. Because this projection of 20% is based on a study with a small sample size (Canadian Health Measurement Survey), the actual prevalence of undiagnosed DM in Canada might be greater, especially when considering the projections estimated by the IDF using international observational health data (PHAC, 2011; IDF, 2012). The considerably lower estimate of undiagnosed DM in observed in Canada, could possibly demonstrate the availability of effective screening techniques in Canada, as a high income country in comparison to other middle to lower income countries. Disparities between high income countries and middle to lower income countries in the screening of DM are an issue supported by the World Health Organization, in a previous consensus report (WHO, 2003).

Although projections of undiagnosed DM may vary, the concern to healthcare systems regarding undiagnosed DM is that in the absence of a diagnosis, individuals do not receive appropriate management of their disease (PHAC, 2011; WHO, 2003). It is therefore not surprising that in Canada, complications of DM are more commonly found among undiagnosed individuals (PHAC, 2011). Findings from an observational study (N= 2,792 ), using a population representative sample, demonstrated that individuals with undiagnosed DM had higher proportions of obesity, higher blood pressure, and poorer lipid profiles, compared to individuals with an existing diagnosis of DM (Young & Mustard, 2001). Similarly, observational data from Canada and the United States indicates that at diagnosis, the prevalence of established microvascular complications is high (Spijkerman et al, 2003; PHAC, 2011). These microvascular complications can include cardiovascular disease, neuropathy, nephropathy, retinopathy, and others (Spijkerman et al, 2003; PHAC, 2011). The high prevalence of microvascular complications at diagnosis indicate the “hidden” burden of DM, and have considerable impacts to both the screening and management of DM in Ontario (Young & Mustard, 2001).

Another disease associated with DM is depression. A 2006 high quality meta-analysis (n= 51 331) of controlled studies, identified that individuals with T2DM are 1.6 times (95% CI 1.2, 2.0) more likely to experience clinical depression, compared to individuals without T2DM (Ali, Stone, Peters, Davies, & Khunti, 2006). The results of another systematic review of individuals with T1DM, also identified an increased prevalence of depression among individuals with T1DM; however, the review identified that considerable variation in findings existed between studies (Barnard, Skinner, & Peveler, 2006). It is not completely clear how these two illness interact; however, in a cross-sectional study (n=4,463) of individuals with DM, clinical depression was associated with lower levels of self-management and self-care tasks (Lin et al, 2004). Similarly, a recent lower quality systematic review of 52 observational and clinical trials found that depression, and failure to cope are also closely associated with poor problem-solving skills (Hill-Briggs & Gemmell, 2007). As depression appears to be associated with lower levels of self-care, problem-solving, and other strategies to manage DM, it is not surprising that depression in DM is also associated with poorer health outcomes (Pouwer, Nefs, & Nouwen, 2013).

Using cross-sectional data from a sample of over 200,000 individuals in Canada, a recent study demonstrated that DM affects not only physical health, but also an individual’s quality of life (Loukine, Waters, Choi, & Ellison, 2012). In fact, in the Canadian Community Health Survey (CCHS), almost one-half (40%) of individuals with DM rated their health as fair or poor (PHAC, 2011). The CCHS is an annual cross-sectional survey of individuals in Canada 12 years and older and provides a representative indication of health statistics across Canada (Statistics Canada, 2013). As DM is a prevalent disease in Canada, these data enables highly accurate description of individuals with DM to be obtained. Living with DM, regardless of age, often requires major lifestyle changes, and added stress. Using a cross-sectional methodology (N=2057), the DAWN2 study also identified that DM has negative impacts on the lives of family members (Kovacs et al, 2013). These impacts include increased burden, stress, fear, and frustration (Kovacs et al, 2013).

To further compound the burden of DM, the WHO has reported that individuals living with DM are at increased risk for other chronic diseases, such as stroke, heart disease, chronic respiratory diseases, and others (2005). Using observational data from the CCHS, the PHAC estimates that 36.5% of Canadians with DM have two or more co-morbid conditions in addition to DM (2011). The WHO identified that DM shares many common risk factors with other chronic diseases (2005). These risk factors include smoking, poor diet, and physical inactivity; all of which are modifiable (WHO, 2005).

**1.2.3 Diabetes in Older Adults**

A rapidly growing area of concern for DEs is DM among older adults in Canada. Not only is the highest prevalence of DM found among older adults (25.5% prevalence among older adults 75-79 years of age), but also the physiology and contextual factors associated with DM in older adults are completely unique (CDACPG, 2008; Sinclair et al, 2012; Suhl & Bonsignore, 2006; Meneilly, 2011; PHAC, 2011). Similarly, older adults with DM often have comorbid chronic conditions that also require management and support, in addition to their DM. Cognitive functioning is linked to DM outcomes and not only impacts patients’ self-management, but also their personal safety, particularly if living alone (Sinclair et al, 2012; Meneilly, 2011). With these unique challenges, the care of older adults requires special individualized care (CDACPG, 2013; Suhl & Bonsignore, 2006).

Unfortunately, there is limited literature on DM care in this population, making treatment options difficult to determine (Sinclair et al, 2012). With such high levels of variation among patients, DM care needs to be individualized, exploring interactions between the patient’s DM and other co-morbidities, medications, and cognitive states to ensure that appropriate care is provided (Suhl & Bonsignore, 2006).

**1.2.4** **Costs of Diabetes**

In addition to the burden on an individual’s health, there are also many financial costs associated with DM. The CDA estimates that individuals with DM are subject to health care costs two to three times more than those without DM (2012c). This translates into an annual direct cost of $1,000-15,000 per person per year. Some of the more major contributors to these increased costs are related to medication prescriptions, as well as testing, and other medical supplies. This cost estimate does not incorporate indirect costs, which include loss of work, disability, and the costs of DM to family members. These indirect costs are more difficult to estimate (PHAC, 2011).

In 2000, DM cost Canadians an estimated $1.7 billion (CDA, 2012c). The Canadian healthcare system bears a considerable amount of the direct and indirect costs of DM. In Ontario alone, DM costs a total of $4.9 billion a year (Ontario Ministry of Health and Long-term Care, 2012). Nationally, it is estimated that by the year 2020 the cost of DM on the healthcare system will reach nearly $17 billion per year (Ontario Ministry of Health and Long-term Care, 2012). The huge burden that DM places on the healthcare system is due to the chronic nature of DM, DM-related complications, and the need for complex care, management, education, as well as medical supplies. All of these services are very costly to provide (Li, Zhang, Barker, Chowdhury, & Zhang, 2010; American Diabetes Association [ADA], 2008; Tharkar, Devarajan, Kumpatla, & Viswanathan, 2010). Some of the main sources of these costs include increased hospitalization, physician visits, medication, and other costs which are higher among individuals with DM compared to the rest of the population (PHAC, 2011).

The costs related to DM are not unique to Canada. The IDF estimates that DM accounts for 11% of health care spending around the world (2012). This translates into a total of $465 billion (US dollars) in the year 2011 (IDF, 2012). In most high income countries, like Canada, which account for 80% of the global healthcare spending associated with DM, many DM services are provided publically. However, in low and middle-income countries, individuals living with the DM have to pay a larger proportion of the care from their own pocket (IDF 2012).

**1.3** **Care and Management of Diabetes**

Diabetes is both a serious and costly disease and consequently requires extensive care and management to maintain wellness, prevent complications, and reduce healthcare costs. It is well documented in randomized controlled trials, and other clinical studies, that adequate management and care of DM has considerable benefit to not only delay, but also prevent long-term complications of T1DM and T2DM (Ohkubo et al, 1995; UKPDS, 1998; UKPDS 38, 1998; Nathan et al, 2005; Gubitosi-Klug, & DCCT/EDIC Research Group, 2014). Currently in Canada, evidence-based recommendations of optimal care for DM incorporate professional support around the person performing self-management (CDACPG, 2013). These recommendations, outlined by the CDACPG, were developed by a panel of experts in each subject area, using the highest level of literature available. Health data bases are systematically searched and included literature is appraised using the *Appraisal of Guidelines for Research and Evaluation* (AGREE) instrument. Each recommendation listed in the CDACPG has an attached grading of the literature, from high level evidence (Meta-analysis), to lower level evidence (observational studies, or non-randomized trials).

Thus, recommendations made by the CDACPG provide an evidence-based guide to the provision of DM care in Canada.

As DM is a chronic disease with no permanent cure, self-management of DM is a lifelong task. Thus, at its core, managing DM as well as delaying and preventing DM-related complications and other comorbid health conditions, requires the individual to take ownership of their DM care. The healthcare team serves to educate, support, coach, monitor, adjust medication, and/or perform other strategies to promote the health and self-management of the individual (CDACPG, 2013). Self-management requires the individual to not only perform tasks and develop skills related to the management of their condition, but also to cope and problem-solve when issues arise (Lorig & Holman, 2003).

As described by the CDA (2011), in *Diabetes: Canada at the Tipping Point Charting a New Path*, the Canadian healthcare system is currently at a crucial time in the management and care of DM. As described in this report, the current care and management of DM in Canada is faced with a rapidly growing population with DM. This growing prevalence is attributable to individuals living longer with DM. With individuals living longer, DM services, such as DSME, will be used on a longer term basis by these individuals. Consequently, there is a need to ensure that current DM services can adequately meet the needs of this growing population.

**1.4 Diabetes** **Self-Management**

The term ‘self-management’ has become a mainstay term in DM care. Specifically, diabetes self-management (DSM) is defined as “the actions and choices, employing a range of skills, knowledge and coping strategies that are undertaken by people with DM in response to their condition” (IDF, 2009, p.32). Thus, poor actions and choices detrimental to management of DM are also a form of self-management. To promote healthy DSM, it is essential that these behaviours, actions, and choices are beneficial to the health of individual (Lorig & Holman, 2003). Effective DSM includes many positive actions and choices, which are to be sustained over a lifespan. DSM behaviours can also differ in their level of difficulty and complexity. The CDA, using several systematic reviews, identified five healthy DSM behaviours, which include diet, self-monitoring blood glucose, medications, physical activity, and smoking cessation (CDACPG, 2008). The American Association of Diabetes Educators (AADE) has also developed a self-care behaviour framework which consists of seven self-care behaviours, which includes healthy eating, being active, monitoring, taking medications, problem-solving, healthy coping, and reducing risks (AADE, 2012; AADE, 2011a).

The AADE7TM is based on the findings of seven systematic reviews and has been used by the AADE as the basis for the delivery and evaluation of DSME (AADE, 2011a; AADE, 2009). These systematic reviews searched many large databases of published literature such as PubMed, CINAHL, and Cochrane Database of Systematic Reviews for both observational and clinical trials, however there is no indication of the performance of a grey literature search (Boren, 2007). The studies used modified QUOROM checklists, to appraise the existing literature. Although limited conclusions could be made due to the heterogeneity of the available literature, these systematic reviews provide a foundational literature base regarding DSME (Boren, 2007; Boren, Gunlock, Schaefer, & Albright, 2007; Fisher, Thorpe, Devellis, & Devellis, 2007; Kavookjian, Elswick, & Whetsel, 2007; Hills-Briggs & Gemmell, 2007; McAndrew, Schneider, Burns, & Leventhal, 2007; Odegard, & Capoccia, 2007; Povey, & Clark-Carter, 2007). By providing an evidence-based, systematic review of the literature on DSM, the AADE7TM framework will be used further in this study to explore the scope of DSME provided by DEs. Although the CDA and AADE frameworks differ in the types of DSM behaviours, both suggest that DSM is a broad, life-encompassing practice that ultimately needs to be tailored to the individual’s needs, preferences, and abilities. Below is a description of the self-care behaviours outlined by the AADE7TM.

1. **Healthy Eating**

Since DM is characterized by an inability of the body to maintain blood-glucose levels, the ingestion of glucose through food consumption plays a crucial role in this balance. Consequently, healthy eating is an essential behaviour in DSM. Several randomized controlled trials and meta-analyses have demonstrated that nutrition therapy alone can reduce an individual’s glycosylated hemoglobin (A1C), a clinical marker of DM management with a target of 7%, by 1-2% (CDACPG, 2013). Healthy eating also can reduce lipid levels, body weight, and blood pressure, all of which are risk factors for cardiovascular disease and the development of DM-related complications (AADE, 2009; Povey, & Clark-Carter, 2007). Healthy eating requires individuals to both be aware of foods with high levels of glucose, and to choose appropriate foods to fit their condition(s) (AADE, 2011a). In particular, the consumption of carbohydrates (foods with high amounts of available glucose) needs to be controlled, to ensure a health amount of carbohydrates is consumes at each meal.

1. **Being Active**

Physical activity is another critical self-management behaviour that individuals with DM (T1DM & T2DM) should perform. Increased physical activity cannot only improve blood glucose levels and decrease blood lipid levels, but reduces the risk for cardiovascular disease. A systematic review found positive health outcomes from increased physical activity in the short-term; however, there is limited literature demonstrating the effectiveness of physical activity on the long-term outcomes of DM (Kavookjian, Elswick, & Whetsel, 2007). The CDA recommends that all individuals with DM should engage in a minimum of 150 minutes of aerobic exercise spread over three days of the week, and should perform resistance exercises two to three times per week (CDACPG, 2013). Although physical activity is encouraged for individuals with DM, there are also some cautions. Prolonged exercise can increase an individual’s risk for hypoglycemia, thus, choosing an appropriate time and duration of exercise is important. Similarly, many individuals with DM also have other complications, which may put them at risk during exercise. These include retinopathy, neuropathy, cardiovascular disease (CVD), or being at risk of CVD (CDACPG, 2008).

1. **Monitoring**

DSM requires that individuals are aware of the current condition of their body (Funnel, et al, 2012). Individuals with DM need to regularly and actively engage in self-monitoring behaviours in order to determine the appropriate behaviour to perform and also to prevent the onset of complications (AADE, 2009). Monitoring behaviours can include self-monitoring blood glucose, blood pressure, foot checks, weight, testing for ketones, A1C, and others. For individuals taking insulin, self-monitoring blood glucose is particularly important and it is recommended to be performed at least three times a day (CDACPG, 2008). A systematic review of 18 observational studies and 11 randomized controlled trials found that increased levels of self-monitoring improved glucose control; however, little data was found to indicate its improvements on individuals’ A1C values (McAndrew, Schneider, Burns, & Leventhal, 2007). Self-monitoring is a highly individualized process*,* which is dependent on the needs and circumstances of the individual living with the disease (CDACPG, 2013).

1. **Taking Medications**

In both T1DM and T2DM, an appropriate medication regimen is an important aspect of DM management. All individuals with T1DM and T2MD, excluding those using exclusively lifestyle interventions to manage their condition, require ongoing adherence to a medication regimen. These regimens can differ in complexity, from taking a daily oral medication, to managing a Continuous Subcutaneous Insulin Infusion (CSII, also known as insulin pump therapy). A recent systematic review identified that there are limited controlled trials or interventions to improve medication adherence in DM, however, the review identified that complexity in medication regime is a common barrier to medication adherence (Odegard, & Capoccia, 2007). It is very important that individuals on each regimen are able to understand the purpose of their medications, and, if capable, to accommodate the complexities of their regimen with the changes and fluctuations in their daily life (AADE, 2009). The complexity of a medication regime is often increased, in a population through the use of additional medications for other chronic conditions, or through managing the side effects of the various medications. Another important component of *Taking Medication* behaviour is medication adherence and compliance. A 2004 systematic review of 23 retrospective and prospective studies estimated that adherence to both oral anti-hyperglycemic agents and insulin regimes can range from 36% to 93%, based on data from prescription refills, electronic monitoring, and insulin trials (Cramer, 2004). Thus, in addition to managing and adjusting medications, adhering to a medication regime is essential to build this behaviour.

1. **Problem-Solving**

The ability to problem-solve is an essential aspect of self-management. Problem-solving includes identifying the existing problem, choosing the most appropriate solution, and evaluating whether the problem was effectively resolved (Agema & Sherfali, 2012; Hill-Briggs & Gemmell, 2007). In a recent systematic review, several observational studies identified that poor self-management is associated with poor problem-solving skills (Hill-Briggs & Gemmell, 2007). Conversely, several studies demonstrated that building strong problem-solving skills not only improved DM outcomes, but also improved the performance of other self-care behaviours such as those listed in the AADE7 (Hill-Briggs & Gemmell, 2007). Problem-solving is particularly critical during times of illness, stress, life changes, managing multiple comorbidities, and altered physiological states, to ensure that self-management can be maintained.

1. **Healthy Coping**

Individuals living with DM face not only the demands of life, but also those of their condition. Thus, healthy coping is critical to maintaining one’s psychosocial health in the face of all these challenges. There appears to be a bi-directional relationship between self-management and psychological factors (Fisher, Thorpe, Devellis, & Devellis, 2007). In cases of poor coping behaviours, an individual may perceive their problems and challenges as insurmountable, and consequently not have the motivation to perform the appropriate self-care behaviours (AADE, 2012; AADE, 2011a; AADE, 2009). Many cognitive-behavioural therapies, which the CDA recommend, help prevent psychological distress and promote healthy coping (CDACPG, 2008).

1. **Reducing Risks**

As mentioned previously, DM is associated with an increased risk for cardiovascular disease and other DM-related complications. Thus, it is imperative that a person with DM actively take steps to minimize these risks. Although many of the behaviours listed above contribute to this aim, there are additional behaviours to add to this category. These include smoking cessation, eye exams, foot inspections, vaccinations, and other prevention strategies (AADE, 2012; AADE, 2011a; AADE, 2009). A systematic review of 39 studies found few interventions that provided positive risk reduction outcomes related to DM (Boren, Gunlock, Schaefer, & Albright, 2007). This review emphasizes the need for a greater emphasis on risk reduction behaviours in individuals with DM.

**1.4.1** **Barriers to Diabetes Self-Management**

There are multiple barriers to DSM. Even if individuals with DSM were given all tools and effectively educated on DSM, there are many obstacles to implementing and sustaining these behaviours over time. Both a systematic review of 80 studies, and a recent literature review, identified that barriers to the individual’s DSM can include adherence, individuals’ attitudes/beliefs, knowledge, culture, language, health literacy, social supports, finances, comorbidities, and many more (Nam, Chesla, Stotts, Kroon, & Janson, 2011; Ahola & Groop, 2013). Barriers can either be intrinsic (e.g., attitudes and beliefs) or extrinsic (e.g., finances and social supports). Barriers to building DSM can also be attributed to the healthcare provider. Some possible barriers to the provider include differing attitudes/beliefs, knowledge, and interactions/communication with patients (Nam, Chesla, Stotts, Kroon, & Janson, 2011). Also at a systems level, there are considerable barriers to DSM, some of which include shortages of healthcare providers’ time, resources, and integration of evidence-based literature (Nam, Chesla, Stotts, Kroon, & Janson, 2011). One of the challenges for DE in providing DSME is to help develop strategies to overcome and/or minimize these barriers, and support this over time.

**1.5** **Rationale for Diabetes Self-Management Education**

As the AADE7TM clearly suggest, DSM requires the individual to perform and sustain extensive self-care behaviours on a continual basis (AADE, 2012; AADE, 2011a). These behaviours cannot be mastered without extensive assistance, support, and most importantly education. Education is essential for individuals to gain and achieve effective self-management behaviours and skills. As defined by the International Diabetes Federation (IDF, 2009), DSME is

…*a process by which people with diabetes, their family, and/or significant social contacts are engaged as active participants in the acquisition of the knowledge and practical, problem-solving and coping skills needed to achieve optimal health outcomes*. (p.32).

Thus, DSME is provided to the individual and all significant others, and focusses both on knowledge, behaviour modification, and skill acquisition. In accordance with the Chronic Care Model (CCM), which the Canadian healthcare system has adopted, DSME serves to support self-management (CDACPG, 2013). There is also considerable literature to support the importance of building individuals’ DSM skills through education and the benefit DSME has on physiological outcomes (Minet, Moller, Vach, Wagner, & Henriksen, 2010; Gary, Genkinger, Guallar, Peyrot, & Brancati, 2003; Cochran & Conn, 2008; Look AHEAD Research Group & Wing, 2010; Boren, Gunlock, Schaefer & Albright, 2007; Hornsten, Stenlund, Lundman & Sandstrom, 2008; Fan & Sidani, 2009; Norris, Lau, Smith, Schmid & Engelgau, 2002; Ellis, Speroff, Dittus, Brown, Pichert & Elasy, 2004 ). Thus, DSME plays an essential role in the management of DM, by building and supporting beneficial self-management behaviours in the individual.

The CDA emphasizes that teaching individuals to manage their DM may be performed at an individual or group level, and includes cognitive behavioural interventions to both empower and support problem-solving skills of the person with the disease (CDACPG, 2013). Empowering individuals to participate in decision-making related to their own care is very important to the enactment of self-care behaviours. To further delineate the process of DSME, the CDA suggests that individuals with DM consist of three different levels of learners: *survival/basic, intermediate*, and *advanced* levels (CDACPG, 2008).

The *survival/basic* level characterizes individuals who understand and are able to perform self-care activities, primarily to minimize acute complications, namely hypoglycemia and hyperglycemia. Although, the risk for long-term complications is not reduced, some individuals may either choose to remain at this level due to quality of life, or only be capable of achieving this level of involvement in their self-care. At the *intermediate* level, individuals understand and are capable of performing some control over their self-care activities, as recommended by their healthcare provider, and consequently are able to reduce the risk for short-term and long-term complications. At the *advanced* level, individuals play an active role in the maintenance and management of optimal self-care and are able to full incorporate DSM behaviours into their daily activities (CDACPG, 2008). As these three levels emphasize, DSM is a highly individualized process, and greatly depends on the needs, abilities, and choices of the individual living with the disease.

**1.6** **Literature on the Role of the Diabetes Educator in Ontario.**

As the CDA suggests, the delivery of DSME is part of the role of the healthcare team (CDACPG, 2013). Although the CDA is not explicit as to which professionals are to provide DSME, it does state that is best provided by an interdisciplinary team of healthcare professionals in a patient-centered manner (CDACPG, 2013). This recommendation is supported by the evidence of non-randomized, and cohort studies (CDACPG, 2013). Since effective DSME is highly individualized and multifaceted, there is a need for healthcare professionals who have specialized knowledge of DSME (Duncan et al, 2011). The role of a DE in Canada identifies healthcare professionals with such expertise (Canadian Diabetes Educator Certification Board [CDECB], 2012). Unfortunately, the research literature describing and validating the role of DEs in Canada is very limited. Below is listed some of the relevant literature that provides a rationale for the role of DEs.

In a small (n=46) Canadian prospective randomized trial, a significant drop in A1C (0.078 vs. 0.096; p<0.01) was seen in the group that had regular communication with a DM nurse educator regarding insulin adjustments (Thompson et al, 1999). With a limited sample size and considerable time since this study was performed, limited conclusions can be taken from this study.

There is also limited evidence from a systematic review of six trials for the effectiveness of DM specialist nurses in improving short-term patient outcomes (Loveman, Royle & Waugh, 2009). Although several studies found the use of DM specialist nurses reduced A1C values and episodes of hypoglycemia, the review found considerable heterogeneity between studies and consequently a meta-analysis was not performed. Furthermore, the long-term outcomes of this study were not conclusive, because studies were not comparable. This exclusively nursing role does include the provision of DSME, but also other components to DM care (Loveman, Royle & Waugh, 2009). There is less evidence for the multi-disciplinary role of DEs, as seen in Canada (Boren et al, 2007). As a result, the role of other DE professionals in providing DSME is unclear. These studies examine nurse DEs specifically, and focussed predominantly on glycemic control, thus these studies provide limited evidence to support the multi-professional role of DE in Ontario, as well as the broad scope of DSME within which DEs provide care. As these studies indicate, the existing research describing the DE role is outdated, and limited to describing the role of DM specialist nurses, which is not representative of the multidisciplinary role of DEs seen in Ontario (Houweling et al, 2009; Thompson, Kozak, & Sheps, 1999).

Although there is limited research demonstrating the effectiveness of the DE role, there is evidence to support the effectiveness of various DSME tools and strategies that can be used by DEs. Several systematic reviews support the short-term effectiveness of DSME in improving glycemic control (A1C), as well as other physiological outcomes (e.g., blood pressure, body weight, etc.), and reduce costs to patients with T1DM and T2DM (IDF, 2009; Boren, Gunlock, Schaefer, et al, 2007; Steed, Cooke, Newman, 2003; Loveman et al, 2003; Duke, Colagiuri, Colagiuri, 2009). However, due to the heterogeneity between studies on the type of DSME provided, these reviews were not able to conduct meta-analysis. Furthermore, these reviews outline the need for larger randomized controlled trials of longer duration, to strengthen these findings.

A recent meta-analysis outlined that DSME programs which were effective at improving patient outcomes focus on behavioural change and empowerment of the individuals with DM (IDF, 2009; Fan & Sidani, 2009). There is also a trend toward more mixed methods of providing DSME which includes combinations of group sessions, one-on-one conversations, and online communication, rather than solely didactic teaching. Traditionally, DSME was provided in a didactic manner; however, current methods of providing DSME are primarily theory-based and focus on the empowerment of the individual (IDF, 2009). Several systematic reviews and a meta-analysis of observational and controlled trials demonstrates that these more diverse forms of DSME can be effective in improving knowledge, self-care behaviours, and clinical outcomes, such as glycated haemoglobin (Fan & Sidani, 2009; Steed, Cooke & Newman, 2003; Loveman et al, 2003; Duke et al, 2009; Dove, Morrison, Reimer & Wice, 2009; Deakin, McShane, Cade & Williams, 2009). With considerable variability between studies, the validation of each individual form of DSME is limited. A systematic review, and a randomized controlled trial (N=50) also indicated that interventions which include telephone, or continued face-to-face follow-ups, improve patient outcomes (Boren et al, 2007; Panagiotopoulos, Preston, Stewart, Metzger & Chanoine, 2003). Two large systematic reviews also demonstrated that effective DSME is provided by a team of DEs in a culturally appropriate manner (Loveman, Frampton & Clegg, 2008; Hawthorne, Robles, Cannings-John & Edwards, 2008). Overall, the literature suggests that although there is evidence of the effectiveness of different of DSME are widely studied, there is limited literature that examines the role of the DE in carrying out these tools and strategies.

A cross-sectional study was recently conducted in Ontario to create an inventory of diabetes education programs (DEP) across Ontario (Amirthavasar, Dudar, Gandhi, Phillips, & Sherifali, 2012). This study used a self-reported questionnaire to describe the DM services that are being conducted across the province. The questionnaire collected the following information on each DEP: program setting, referral process, resources, use of technology, and strengths and challenges of each program (Amirthavasar et al, 2012). A total of 107 DEPs, from nine of the fourteen DM regional coordinating centres across Ontario responded to the questionnaire. These questionnaires were completed by program managers, rather than DE, and were designed to create an inventory of DM services available in each local DEP, not the specific roles of the DEs in providing these services. Similarly, the study only accounted for DE services provided by the Ministry of Health and Long-term Care as part of the regional coordination centers. DEs practicing outside of a DEP, for example, in a pharmacy, or physician office would consequently, not be included in this study. The inventory provided an organizational level description of DE services offered in Ontario and, therefore, contributes to a description of DEs role by describing the context in which some DEs practice. Psychometric testing of the questionnaire was not described.

**1.7 Population of Diabetes Educators in Ontario**

A current estimate of the total population of DEs in Ontario is difficult to establish. However, the CDA estimates that there are a total of 2,500 educators who are members of the Diabetes Educator Section (DES) of the CDA (2012). As membership with the DES is not a requirement to practice as a DE, it is likely that this is an underestimate of the true prevalence of DEs across Ontario.

There are essentially two types of DEs in Ontario; certified and non-certified DEs. The CDECB provides certification designation to healthcare professionals who write this examination, or renew their designation every five years (2012). Certification is completed on a voluntary basis and is not required by law. To write this examination, a healthcare professional must be a member of a licensed profession which may include registered nurses (RN), registered dietitians (RD) and pharmacist, and have completed 800 hours of DSME. No specific training or recertification courses are required; however, every five years one must submit a portfolio of professional development activities with sufficient credits, or rewrite the examination in order to renew and maintain their certification (CDECB, 2012). While certification does not add to their scope of practice, it provides an indication of certified healthcare professionals’ enhanced knowledge and training in DM care, as compared to non-certified healthcare professionals (CDECB, 2012).

Certified DEs (CDE) in Canada differ considerably from DEs internationally (see *Appendix B*). In countries, such as the United Kingdom, and Australia, credentialed DEs are required to have graduate level training in DSME. In Ontario, education requirements for certification are dependent on the requirements of each DE’s profession. The United States has differentiated two specialized roles of DEs, namely, CDEs and Board Certified Advanced Diabetes Manager (BC-ADM). Both types of DEs perform differing levels of DSME. In Ontario, the only credentialed DEs are CDEs, thus the role of DEs in Ontario differs considerably from those of DEs internationally.

In contrast, non-certified DEs are a relatively unknown group of healthcare professionals. They are thought to be comprised of various healthcare professionals including RNs, RDs, physicians, pharmacists, kinesiologists, podiatrists, psychologists, chiropractors, etc. Training and activities of non-certified DEs are equally unknown.

Currently, the ability to define the role of DEs across Ontario is difficult given the paucity of literature available. Similarly, without any comprehensive databases that might be developed, if registering and licensing bodies for DEs existed, it is also difficult to describe the total population of DEs in Ontario. Without reliable data on the population of DEs in Ontario, it is difficult to facilitate the development of this role within the current Ontario healthcare setting.

**1.8 Literature Search**

As there is a paucity of literature on the role of DEs in Ontario, and creation of a database of DEs is not possible, the most ideal method to describe the role of DEs across Ontario would be to conduct a new study. To begin the process of conducting a study to describe the role of DEs in Ontario, a literature search was performed. The intent of this search was to identify all research studies describing the role of DEs in Ontario. The search focussed predominantly on studies that used a cross-sectional design. This design enables a large amount of observational data to be collected in a relatively short period of time, as compared to a controlled trial (Kelsey, Whittemore, Evans, & Thompson, 1996). Thus, a cross-sectional study would likely provide a broad description of DEs in Ontario. For a further discussion of the value of cross-sectional studies, see *Section 1.9* of this chapter. The initial search strategy utilized databases, such as CINAHL, PubMed, and Embase. Some of the search terms used included “diabetes educator, certified diabetes educator, questionnaire, Canada, and/or Ontario”.

This preliminary literature search only identified one cross-sectional study of DEs in Ontario. This study was an internal survey of DES membership of the CDA (2009b). The purpose of this survey appeared to primarily be an evaluation of the DES professional section membership, and thus has limited applicability to the purposes of this study. In addition, a number of cross-sectional studies, using questionnaires to describe the role of DEs in the United States and Australia were found (Martin, 2011; Martin et al, 2008; Peeples & Austin, 2007; Funnell et al, 2007; Barlow, Crean, Heizler, Mulcahy, Springer, 2005; Zrebiec, 2009; Zrebiec, 2005; Zrebiec, 2001; Dunning, 2006; see *Appendix A*). Although these studies investigated relevant concepts, such as outcomes, practices, demographics, and others aspects of the role of DEs, the context surrounding the provision of DSME, and the structure of healthcare systems in these countries were considerably different from Canada’s. In the United States healthcare is privately funded, whereas in Canada it is publically funded. The Australian healthcare system includes both private and public funding. Thus, each healthcare system operates using a differing model of care. Similarly, the scope of practice of DEs in the United States and Australia differs from DEs in Canada, and consequently would influence their role (see *Appendix B*). Thus, use of these studies and their findings may not be applicable to the Ontario context.

The literature search extended to grey literature such as clinical practice guidelines, and national/organizational position statements of relevant organizations involved in DSME. Some of these organizations included the CDA, CDECB, AADE, and the IDF. Professionals with expert knowledge related to the role of DE in Canada also were contacted, as part of the grey literature search. These search strategies found no relevant cross-sectional studies, and consequently no questionnaires. Experts in the role of DEs echoed the existence of this gap in the literature regarding the role of DEs in Canada. In short, this search demonstrated that although a highly utilized role in the healthcare system, DEs are not well described within the Canadian context.

**1.9 Ideal Cross-Sectional Study**

As there currently does not appear to be a study performed in Ontario describing the role of DEs, there are several concepts that an ideal study to describe the role of DEs in Ontario should subscribe. To obtain a broad description of DEs in Ontario, a cross-sectional design would be the most ideal study design. First of all, the use of a cross-sectional design provides an inexpensive and rapid method to gather considerable data on DEs across Ontario at one point in time (Newman, Browner, Cummings, & Hulley, 2007). This convenience does have a major limitation, namely an increased difficulty of establishing causal relationships. As there currently is an absence of even a foundational description of DEs in Ontario, a cross-sectional study design would provide an initial strategy to define and describe the landscape of DEs in a relatively quick and efficient manner. The finding of clinically meaningful associations would suggest initiating successive studies to explore possible causal relationships using more expensive long term studies.

In conjunction with the use of a cross-sectional design, there are also several standards for the development and psychometric testing of a research tool, such as a questionnaire, that an ideal study would include. As described by Streiner and Norman, these standards are divided into three aspects, namely, *test development*, *reliability*, and *validity* (2008).

**1.9.1 Test Development**

First of all, the development of a questionnaire needs to begin with a clearly stated purpose and objective (Streiner & Norman, 2008). This includes a definition of the items under investigation; in the case of this study these terms would include DSME, and DE. The sampling of the study must be representative of the target population. For example, if using a study to describe DEs in Ontario, participants would need to be representative of the total population of DEs across Ontario. The reason for representativeness is to ensure external validity of the study, and enable inferences to be made from the findings of the study participants to the total population of DEs across Ontario. A specified sampling frame would also provide an indication of the representativeness of the sample. In order to be representative of DEs in Ontario, the sampling frame would need to ensure that all DEs would have equal access to the study. Some possible sampling frames to study DEs could be through the DES chapters, Diabetes Regional Coordination Centers, College of Nurses of Ontario, Registered Nurses Association of Ontario, College of Dietitians of Ontario, Ontario College of Pharmacists, and the College of Kinesiologists of Ontario.

Another standard in the development of a questionnaire is the review of items in the questionnaire by a panel of experts (Streiner & Norman, 2008). A review can help ensure the understandability of the items in the questionnaire. For example, the use of jargon or words with double meanings may influence the respondents’ interpretation of the question. A review by a panel of experts or sample respondents may help identify and eliminate these sources of bias in the questionnaire.

The inclusion and exclusion of items in the questionnaire needs to adhere to a specified rationale (Streiner & Norman, 2008). This rationale can either be driven by theory, a panel of experts, or even empirical relationships. Similarly, there needs to be evidence that the questionnaire covers the content area appropriately. For example, if exploring the role of DEs in Ontario, a questionnaire would need to be comprehensive, exploring all the components of this role, in order to provide a complete description of the sample. Review by a panel of experts would help build the validity of each item in the questionnaire, as well as the questionnaire as a whole, ensuring it appropriately addresses all aspects of the role.

To help with the process of questionnaire development, a pretest and/or pilot study would be beneficial to obtain an indication of understandability, feasibility, efficiency, and cost of the cross-sectional study (Grady & Hulley, 2008). A pretest is typically performed by research staff, and is used to determine the readability and face validity (see *Section 1.9.3* for definition of face validity) of the questionnaire. In contrast, a pilot study uses a sample population and recruitment strategy that are similar to the target population. A pilot test would provide a clearer indication of recruitment and feasibility for a full study, compared to a pretest. Both pretests and pilot test would help indicate the feasibility of the questionnaire, and provide an indication of the understandability and potential pitfalls in the implementation of the study.

**1.9.2 Reliability**

As defined by Streiner & Norman (2008), reliability “is a measure of the proportion of the variability in scores which was due to true differences between individuals” (p. 6). There are several measures of reliability, which include test-retest reliability, inter and intra-rater reliability, and tests of homogeneity (Fink, 1995). These measures provide an indication of the stability and internal consistency of the questionnaire. For example, test-retest reliability is measure of the similarity of responses, if a respondent completed the questionnaire over an interval of time (Fink, 1995). Similar responses to the questionnaire over time would demonstrate the stability of the questionnaire. Internal consistency is a measure of how consistent a respondent would answer the questionnaire, for example, a respondent who identified themselves in as a RD should also indicate that they educated individuals on topics related to diet. This would be an indication of internal consistency in the questionnaire.

A statistical measure, such as the Pearson correlation (*r* value) could be used to determine an acceptable level of reliability. An *r* value, between 0.8 - 0.9, would be expected for sufficient test-retest reliability. Streiner and Norman suggest that these measures should be performed and expressed in a study to provide an indication of the reliability of the questionnaire (2008).

**1.9.3 Validity**

Another indicator of an ideal questionnaire is validity. Validity as defined by Fink (1995) is the “degree to which a survey instrument assesses what it purports to measure” (p. 49). There are four main forms of validity, namely, content, face, criterion, and construct validity (Fink, 1995). Content validity, as briefly previously, is a measure of how well the questionnaire covers the content under investigation (Fink, 1995). Content validity is often determined using the findings of previous research or theory. In contrast, face validity is a measure of how well a questionnaire appears to explore the intended topic area without looking specifically at research and theory. Criterion validity is a measure of how well items in the questionnaire correlate with the “gold standard” (Streiner & Norman, 2008). In this study, the literature search identified that any such questionnaire currently does not exist, thus this form of validity is difficult to achieve. The last form of validity is construct validity, which is a measure of how well a questionnaire adheres to the constructs of a theory (Fink, 1995). For example, if a theory existed which identified attributes of the role of DEs, the items in the questionnaire would need to adhere to the theory to ensure construct validity. Streiner and Norman suggest that strategies to build these four forms of validity should be expressed in the study, as well as a rationale for their use (2008).

**1.9.4 Response Rate**

Part of performing an ideal cross-sectional study is obtaining a sufficient response rate. In a cross-sectional study, the response rate is the percentage of the target populations that responds to the study. For cross-sectional studies an acceptable response rate is generally considered to be 80% or higher (Fincham, 2008). A lower response rate has implications for the interpretation of study findings, limiting the ability to draw conclusions from the findings as they may not be representative of the target population. With a response rate of 80% or higher, the study samples the majority of the target population. Several strategies can be employed to boost a response rate. The *Dillman Total Design Survey Method*, also known as the Dillman approach, is one such strategy (Hoddinott & Bass, 1986). This method involves an initial invitation to participate in the study, followed by two reminders, two individuals who had not responded to the questionnaire (Hoddinott & Bass, 1986). Although this method was initially created paper-based questionnaires, recent studies also have modified this approach for web-based questionnaires (Schleyer & Forrest, 2000). By employing these strategies to improve response rate, a more representative sample may possibly be achieved.

**1.10 Organizations Associated with Diabetes Educators**

While there is no professional regulatory body for DEs in Canada, one of the primary means that DEs can obtain professional support for their role is through the DES of the CDA (CDA, 2012). The mission of this organization is to provide DEs with the knowledge of *prevention, early identification, and optimal management* (CDA, 2012). This is done through *professional education, accessible support and consultation, advocacy and research* (CDA, 2012). Professional membership in the DES is completely voluntary, available to all health professionals (e.g., CDE & non-CDE), and only requires a membership fee. The DES is divided into chapters, which span the country. As part of this organization, educators have access to current Canadian research in DE (e.g., *Canadian Journal of Diabetes*, *Diabetes Communicator* and *Diabetes Dialogue*), professional conferences on DM, special interest groups, and other networking and support opportunities (CDA, 2012). By participating in DES activities, educators can gain credits in professional development as part of the maintenance of CDE certification. With an estimated 2,500 members across Canada, it is evident the DES has a pivotal role in assisting DEs in Canada (Knip, 2011).

Although the DES is the primary support for DEs in Canada, one of the leading organizations committed to improving DSME across the world is the IDF. The IDF is a multi-national organization with a membership of over 200 DM associations across the

world (2012). The mission of the IDF is to “promote diabetes care, prevention, and a cure worldwide” (2012).

The IDF has created the *International Standards for Diabetes Education*, to demonstrate an evidence-based framework of DSME provision and a benchmark for how DSME should be espoused (2009).

These standards are divided into three sections, namely; *Structure*, *Process*, and O*utcome* standards. *Structure* standards outline the essential components of a DSME service, for example, the professionals involved in care, and resources necessary to provide DSME. *Process* standards outline how DSME is provided and enacted, for example, components of initial assessments, topics included in DSME. Lastly, *Outcome* standards outline what criteria should be used to evaluate the provision of DSME, for example, measuring behavioural change, or knowledge acquisition. These three sections are taken from Donabedian’s quality framework and will guide the conceptualization of the questionnaire content, and ongoing analysis of this study (Donabedian, 2003).

**1.11 The Donabedian Framework**

The Donabedian framework was created as a means of evaluating the quality of health care, and includes three main components: (1) *Structure*; which refers to the framework in which care is provided (i.e., characteristics of personnel, physical structure of service, etc.), (2) *Process*; which refers to the actions performed by healthcare personnel, and (3) O*utcomes*; which refers to the changes in the individual that are a result of health care (Donabedian, 2003). This framework was created to enable both the evaluation of health care services, as well as creation of standards of health care. In addition to the IDF, the American Association of DEs (AADE) and the CDA have also adopted this framework in their standards and position statements (Funnel et al, 2012; CDA, 2009). Thus, this framework provides a highly applicable foundation to any assessment of DEs in Ontario.

**1.12 Summary**

In short, with the growing epidemic of DM in Ontario, the need for DSME also grows. Consequently, the importance of DEs in the healthcare system is ever increasing. As the literature search described, there is some evidence, albeit outdated, to support aspects of the role of DEs in Ontario. However, there currently were no studies found describing the role of DEs in Ontario. This gap in the literature emphasizes the need to develop a study to investigate this role.

To ensure that this study strives for optimal methodological rigour, some attributes of an ideal cross-sectional study of DEs in Ontario were discussed. A description of organizations, and frameworks related to the role of DEs in Ontario also were discussed to ensure that a research study may be tailored to the landscape of DEs in Ontario. Thus, having both explored the need for a description of DEs in Ontario, and the tools to assist in studying this population, an investigation of DEs in Ontario is warranted and timely (CDA, 2012).

**Chapter 2:** **Study** **Methodology**

**2.1** **Introduction**

This chapter outlines the steps taken to develop the DEQ, the psychometric testing of the questionnaire, and administration of the questionnaire to DEs across Ontario. The development, psychometric testing, and deployment of the DEQ were performed to answer the research questions listed in *Section 2.2*. The methodological framework for developing measurement scales described by Streiner and Norman was used in the development and psychometric testing of the DEQ (2008). As such, there were four main phases to the proposed research. Phase 1 involved the development of an instrument to examine the role of DEs, and included item generation, item presentation, and item selection. Phase 2 involved instrument evaluation; that is pilot testing of this newly developed questionnaire by DEs in a single DE clinic to establish its content/face validity (see *Section 2.6* & *Appendix C*). Phase 3 involved administering the DEQ to DEs in a regional DES chapter of the CDA. Phase 4 involved administering the DEQ to DEs in the remaining DES Chapters across Ontario.

**2.2 Research** **Questions**

1. What are the demographic and *Structural* characteristics of DEs in Ontario (age, profession, education, etc.)?
2. What *Processes* do DEs use in providing DSME?
3. What *Outcomes* do DEs use to measure the effectiveness of DSME?
4. What are the barriers and facilitators to implementing the role of DE?
5. What aspects of the DE role (profession, education, certification, practice-setting, and diabetes training) are associated with the *Structure*, *Process*, and *Outcomes* involved in the role of DEs?

**2.3 Research** **Design**

The research questions were addressed using a cross-sectional study design. This type of design collects point prevalence data on both outcomes and determinants at one point in time (Hulley, Cummings, Browner, Grady & Newman, 2007). Since the objective of this study was to describe the role of DEs, and the factors associated with implementation of this role, a cross-sectional design was chosen to be most appropriate. Cross-sectional designs are less costly and less time consuming than clinical trials (Hulley et al, 2007). Unlike randomized trials, the major limitation of a cross-sectional design is that this design cannot determine causal relationships, only associations (Hulley et al, 2007).

**2.4** **Overview of Study Phases**

**a) Phase 1**

This initial phase was dedicated to the development of the DEQ. The *International Standards for Diabetes Education* and Donabedian Framework, best practice guidelines and empirical literature related to the role of DEs was used to identify initial items for the questionnaire. A pretest of the originally drafted questionnaire was conducted with several experts and professionals from various roles. This helped to establish the face and content validity of the questionnaire.

**b) Phase 2**

A pilot study was conducted among several DEs of differing professions and levels of education from the Diabetes Care and Research Program (DCRP) at Hamilton Health Sciences. The purpose of this pilot study was to determine the feasibility of the questionnaire, comprehension, survey technology, timing to completion, ease of completion, and further refine the face validity (as necessary). The researcher observed respondents completing the online questionnaire, and discuss any challenges they faced in completing of the questionnaire. Findings from the pilot study were used to revise the questionnaire and to improve the implementation of the questionnaire in Phases 3 and 4.

**c) Phase 3**

A larger pilot study of the Grand River DES chapter was conducted. The purpose of this phase was to determine the feasibility of the questionnaire when completed independently, online, and on a larger scale. In addition, the feasibility of data collection, analysis, and management procedures were determined, to ensure proficiency of the software when used in future large scale deployment. Respondents completed the questionnaire independently. Given the total number of members present in the Chapter, a response rate was determined to inform Phase 4. Any potential issues in Phases 1 and 2 were addressed prior to the completion of Phase 3.

**d) Phase 4**

The final phase of this study involved sending the questionnaire to all remaining DES chapters in Ontario. The questionnaire was sent via email and completed independently. Data from Phase 4 was collected, compiled with data from Phase 3, and further statistical analysis was performed.

**2.5 Phase** **1: Questionnaire Development**

Upon completing a literature search, with no relevant questionnaires identified, a draft questionnaire was developed. To manage the anticipated time constraints that busy health professionals experience, the questionnaire length (32 questions) and resulting time for completion were minimized by including only the key content required to answer the study questions and by structuring the questionnaire with formatting that minimized the length of time per item. The questionnaire included minimal text, and enabled the respondents to complete the questionnaire in approximately 15 minutes. As seen in section 2.5.2, several literature sources were incorporated in the development of the questionnaire to build its content validity. Through Phases 2-4 of this study, the questionnaire was reviewed, adapted, and improved to further ensure its face validity.

**2.5.1** **Sources of Items in Questionnaire**

The development of a new questionnaire began with a search of DE literature for the purpose of determining relevant and essential content areas of the questionnaire. These content areas were used to identify the initial items for the questionnaire that captured the role of DEs. Several sources were used to identify the initial items for the questionnaire (see Section 2.6.3). These included current literature describing the role of DEs; (see *Appendix A*), *Canadian Diabetes Association Clinical Practice Guidelines (2013),* *Canadian Diabetes Educator Certification Board Examination Handbook 2012*, *American Association of Diabetes Educators* (2011a, 2011b), and the *International Standards for Diabetes Education* (2009). Questions in this initial questionnaire were devised using strategies outlined by Streiner and Norman (2008).

The *International Standards for Diabetes Education* were chosen to function as the overarching framework of this questionnaire (IDF, 2009). They provided an ideal framework for several reasons. First, these standards provided a highly developed, internationally recognized framework stipulating what DSME entails to enhance the questionnaire’s content validity. Second, these standards are an internationally recognized benchmark in the provision of DSME. They are not limited to a specific geographical context, and therefore, are applicable to Ontario as well as other provinces and countries across the globe. Third, these standards are evidence-based and are based on current research on the provision of DSME (IDF, 2009). Lastly, these standards are congruent with the Donabedian framework, which is commonly used in healthcare systems to assess and analyze health care delivery and quality (Donabedian, 2003). The similarities between these two frameworks are depicted in *Appendix D*. It is important to note that the purpose of this study is not to assess the quality, or role execution of DEs, but rather to describe the delivery of the role itself. The items for the questionnaire were derived from the following sources.

1. ***CDA Clinical Practice Guidelines***

These evidence-based guidelines were developed by the CDA, which is the leading authority on DM care in Canada, and consequently provide a strong evidence-based Canadian perspective of DSME (CDACPG, 2013). The guidelines outline a number of elements that comprise self-management education, as well as a suggested process of teaching patients. .

1. ***Canadian Diabetes Educator Certification Board***

Certification for DEs in Canada is offered only through the CDECB. The CDECB provides an outline of the requirements necessary to gain and maintain accreditation (CDACPG, 2013). This information provided insight into criteria for certified DEs, and helped inform questions regarding training and certification. It also provided insight into possible differences in the role, activities, practices, and training of certified versus non-certified DEs in Ontario.

1. ***American Association of Diabetes Educators***

The AADE is an American organization dedicated primarily to assisting DEs in providing DSME. Some of the tools developed by the AADE include *DSME Outcomes Continuum*, and *AADE7TM Self-care behaviours* (AADE, 2011a; AADE, 2011b; AADE, 2012; AADE, 2009; Mulcahy, Maryniuk, Peeples, Peyrot, Tomky, Weaver & Yarborough, 2003). These tools have been developed through research and have been previously validated (AADE, 2011a; AADE, 2011b; AADE, 2012; AADE, 2009; Mulcahy et al, 2003). Use of these two tools in the questionnaire will help promote both content and face validity regarding DSME outcomes and self-care behaviours to address in DSME.

1. ***Current DE Questionnaires***

Given the large amount of literature that describes DEs internationally (see *Appendix A*), these questionnaires serve as a good starting point regarding the types of data to collect, and the areas of DEs’ role to investigate. In particular, this literature helped to determine types of demographic variables to collect. These questionnaires also provided insight into length of the questionnaire and the number of questions to ask (Peeples & Austin, 2007). Several of these questionnaires used the Donabedian framework, which provided further validation for the use of this framework in our questionnaire (Peeples & Austin, 2007; Martin, 2011; Martin et al, 2008). These international studies, though informative to this study with regards to questionnaire format, provided limited applicability to the Canadian context.

**2.5.2** **The Diabetes Educator Questionnaire**

The DEQ(see *Appendix C*) consisted of 32 open- and close-ended questions, divided into the following four sections:

1. **Demographics (16 Questions)**

This section of the questionnaire included questions related to: (1) the demographic characteristics of the DEs a) age; b) postal code (first three digits only); c) sex; d) level of education; e) professional status; f) experience(years); g) employment status; h) CDE certification; and i) DM specific training), (2) their practice setting and patient population (type of DM, age, ethnicity, and language), and (3) the time spent on various clinical and professional activities related to the role of DEs.

1. **Diabetes Self-Management Education (DSME) (8 Questions)**

This section of the questionnaire included questions related to the specific DSME activities DEs performed as part of their role. In accordance with the framework outlined by the *Process* standards of the IDF (2009), these questions explored the activities DEs perform in the enactment of DSME (see *Appendix D*). Thus, these questions collected data related to: a) components of a DSME initial assessment; b) method of education delivery; c) use of teaching-learning models; d) presence of a DSME curriculum; e) components of DSME provided; f) the use/types of cognitive-behavioural strategies; and g) discussion of the 7 AADE™ self-care behaviours with patients (AADE, 2011b). The AADE7TM self-care behaviours, is a framework created by the American Association of DEs that outlines self-care behaviours that need to be identified by DEs (AADE, 2011a; AADE, 2009). This framework was founded on expert consensus and research, providing a well-established list of DM self-care behaviours that can be adopted for the purposes of this questionnaire (AADE, 2011a; AADE, 2009). The components of DSME included in the questions of this section were adopted from the curriculum of the IDF, found among the *Structure* standards (s*.7*.) as outlined in *Appendix D*.

1. **Measuring Diabetes Self-Management Education (4 Questions)**

This section of the questionnaire assessed how DEs’ measured the effectiveness of DSME. In accordance with the *Outcome* standards of the IDF (see *Appendix D*), the assessment of outcomes was divided into three categories; patient’s knowledge, patient’s application of knowledge, and clinical outcomes (IDF, 2009). These questions included: a) evaluative measures used to assess patient knowledge; b) evaluative measures used to assess patient’s behavioural change; c) clinical measures utilized; and d) relative importance of the types of outcomes (e.g., clinical outcomes, patient knowledge outcomes, *Process* outcomes.). The options for each question were essentially a summary of the indicators from the *Outcome* standards of the IDF (see *Appendix D*). For example, the questionnaire options for measures of individual’s knowledge were adapted from the indicators specified in the IDF *Outcome* standard on knowledge (O.1.) (see *Appendix D*). Respondents also had the option to select and identify “other” outcomes, if their measures are not specified. For the last question in this section (re: relative importance of the types of outcomes), the list of outcomes described are adopted from the AADE who identify that outcomes of DSME occur on a continuum (AADE, 2011b; Mulcahy et al, 2003). The framework outlined the types of outcomes used in the provision of DSME, starting with immediate outcomes and ending with long-term outcomes (AADE, 2011b; Mulcahy et al, 2003).

1. **Facilitators and Barriers to Practice (4 Questions)**

This section of the questionnaire assessed DEs’ perceptions of the factors that enabled the provision of DSME (facilitators), and the factors that hindered DSME (barriers). Respondents were asked to identify facilitators and barriers, as well as identify the single most influential facilitator and barrier. Although these questions do not explicitly follow the IDF framework, they provided an opportunity for DEs to indicate additional components of their role, namely, the *Structure*, *Process*, or *Outcomes* that promote or inhibit the education that they provide.

**2.5.3** **Face and Content Validity of the Diabetes Educator Questionnaire**

Upon completion of the initial draft of the questionnaire, a pretest was conducted. The purpose of this pretest was to assess both the face and content validity of the questionnaire. *Face validity* is examining the content at a superficial level, to determine whether the questionnaire content appears to be appropriate for the investigation (Streiner & Norman, 2008). For example, does the questionnaire appear to measure demographic data of DEs? Similarly, *content validity*, is a measure of how well the questionnaire covers the relevant content areas under investigation (Streiner & Norman, 2008). For example, does the questionnaire encompass all aspects of the role of the DE?

As mentioned previously, face and content validity are typically ascertained by experts in the field. For this reason, the pretest was completed by a panel of five DEs representing diverse professionals, namely: RNs, RDs, and pharmacists, and clinical settings: pharmacy, community, and hospital settings. These professionals identified unnecessary questions, unclear wording, and suggested options to improve the comprehensiveness, comprehensibility, and content validity of the questionnaire. Their comments were tabulated and incorporated into an updated draft of the questionnaire. No significant changes were made to the questionnaire structure. The majority of revisions involved clarifying questions, and improving the comprehensiveness of multiple choice questions.

**2.6** **Phase 2: Questionnaire Evaluation and Pilot Testing**

**2.6.1** **Study Sample**

Respondents at this phase were recruited from the DCRP at Hamilton Health Sciences on December 19, 2012. DEs employed at the DCRP program and able to access a computer were eligible for inclusion in this phase of the study. The DCRP is a tertiary care outpatient DM clinic that provides education and management to adults with complex DM, including those with multiple comorbidities, T1DM, and/or on an insulin pump. The DCRP has a total of 16 DEs, and includes RNs, RDs, nurse practitioners, kinesiologists, and a psychiatrist. Hamilton Health Sciences is affiliated with McMaster University, and the program staff are actively involved in research. Maximum variation between respondents’ type of profession, education, experience, practice setting was attempted during recruitment. The purpose of this variation was to assess the extent of face validity of the questionnaire, by ensuring that it was comprehensible and valid across the spectrum of educators in Ontario. Respondents for this pilot phase were recruited via email and word of mouth, through the clinical coordinator of the program. The sample size was 10 respondents from the DCRP.

**2.6.2** **Data collection**

In this phase, data was collected using the initial draft of the DEQ. The researcher met face-to-face with respondents. An invitational email was sent to the respondents that included a hyperlink to a web-based version of the questionnaire. During this phase, the questionnaire was housed on LIME survey, an open source survey application (LimeSurvey, 2012). After providing informed consent, respondents completed the questionnaire and recorded the time to completion. Respondents also were given a piece of paper by the researcher to tabulate any potential concerns, or discrepancies in the questionnaire. These papers were collected by the researchers and any discussions with respondents regarding the questionnaire were also tabulated.

**2.6.3** **Data Analysis**

Upon completion of data collection, all of the data in LIME survey were outputted into an encrypted Excel spreadsheet. Then, the data were cleaned and numerically coded to allow for further data analysis. Descriptive statistics were performed on each individual variable collected in the questionnaire. Nominal variables, from multiple choice questions (e.g., Questions 3-5, 7-14, & 17-30, see *Appendix C*), were expressed by percentages, frequencies, or counts, as well as continuous variables (e.g., Questions 1, 6, 15, & 16, see *Appendix C* ) which were expressed as means, ranges, with standard deviations. This was done to pilot test the data collection procedures, to identify possible anomalies in the survey software, to determine whether respondents could complete all components of the questionnaire, and to ensure that respondents’ responses matched the questions. All written comments regarding the questionnaire were tabulated and discussed by the researchers to determine if changes to the questionnaire were necessary.

**2.7** **Phase 3: Questionnaire Regional Deployment and Pilot-testing Data Management**

**2.7.1** **Study Sample**

Respondents for this phase of the study were recruited from the Grand River DES Chapter of the CDA from to January 15 to February 5, 2013. There were approximately 75 members in this chapter. The Grand River DES Chapter draws membership from DEs living or working in areas, including Guelph, Kitchener, Waterloo, and Cambridge. This DES Chapter includes educators from multiple professions and practice settings, thus ensuring a highly heterogeneous range of educator roles. Recruitment was conducted by contacting the Grand River Chapter Chair and requesting that they distribute invitational emails (see *Appendix E1-3*) to their members.

**2.7.2** **Data Collection**

This phase dealt primarily with determining the feasibility and acceptability of online data collection and data management. Data collection was performed using a revised version of the DEQ. The questionnaire was housed on LIME survey, an open source survey application (LimeSurvey, 2012). The online questionnaire was sent via email to all respondents using a modified Dillman approach, which consists of three invitational emails described below (Hoddinott & Bass, 1986). A modified Dillman approach, as described in the next paragraph, was used to bolster the response rate to increase the sample size. The analysis of the study’s findings is heavily predicated on a sufficiently large response rate, namely 10 subjects per variable criteria as described by Streiner and Norman (2008).

An invitational email was provided to the prospective respondents outlining: a) the study purpose; b) an invitation to be entered into a draw upon questionnaire completing; and c) and a hyperlink to the online questionnaire (see *Appendix E-1*). Two follow-up reminders, a week apart, were sent via the same process to all responders after the initial emailing of the questionnaire (see *Appendix E-2, E-3*). As an incentive to participate, respondents were offered voluntary entry into a draw for one of three-$50.00 gift cards upon completion of the questionnaire. Questionnaires were completed online, and data was immediately collected and tabulated upon submission. The data were then cleaned and numerically coded. Any concerns with the software functionality were noted by the researchers throughout the phase.

**2.7.3** **Data Analysis**

Data were collected electronically using LIME survey, and outputted into an encrypted excel and SPSS file. Data was cleaned, numerically coded, and compiled with the data obtained in Phase 4, to allow for further data analysis activities province-wide. Having determined the number of the sample population, a response rate was calculated, based on the total number of members of the Grand River DES chapter. Since the purpose of this phase was to assess the feasibility of data management and analysis, only preliminary descriptive and multivariate analysis were performed to ensure the validity, and comprehensibility of the questionnaire, using IBM SPSS Version 20 Statistical Software (65). Data from the questionnaire were cleaned and labelled as either continuous or categorical data. Categorical variables, from multiple choice questions, were expressed as percentages, frequencies, or counts. Continuous variables were expressed as means, ranges, with standard deviations. Descriptive data was depicted in both chart and table form upon completion of analysis and were combined with the data that was collected in Phase 4 of the study.

**2.8** **Phase 4: Provincial Deployment of Questionnaire**

**2.8.1** **Study Sample**

Participants were recruited from the remaining 12 regional DES chapters across Ontario. These chapters were located in both urban and rural settings, including northern and southern Ontario. The recruitment period was from February 20 to March 13, 2013. An estimated 600 DEs attend these remaining DES Chapters in Ontario. This estimate was calculated based on the 2012 DES *Annual report*, which described a total of 2,500 DES members in Canada. Each chapter has a chair and/or secretary with a list of the respective members of their chapter. Recruitment at this phase involved deploying an invitational email with a link to the questionnaire to the chairs of the local DES chapters. They, in turn, distributed the email to the members of their respective chapter. Each chair/secretary was asked to confirm the forwarding of recruitment emails to their chapter members.

**2.8.2** ***Data Collection***

In this Phase, data collection occurred, using the DEQfollowing a similar method as in Phase 3. A modified Dillman approach, similar to the previous phase was used; namely, an invitational email followed by two reminder emails, was sent out to all members. Similarly, the DEQ was house on LIME survey software to assist in collecting the data. All respondent data from Phases 3 and 4 were collected electronically in LIME survey and outputted and combined into a single encrypted excel or SPSS file. Data were cleaned and numerically coded to allow for further data analyses.

**2.8.3** **Data Analyses**

Data analyses were performed using IBM SPSS version 20 statistical software (SPSS, 2012) in accordance with the research questions listed above in Phase 3 (see Section 2.2).

1. **Descriptive Analyses**

To address the first four research questions, univariate descriptive statistics were performed on each individual question in the questionnaire. To address research question *i*, the demographic data collected from questions #3-5, 7-14 of the DEQ were tabulated and expressed as frequencies, and percentages. This data were then depicted in table form. For the other DEQ demographic questions (#1, 6, 15, & 16), the data was collected as continuous variables. This data were expressed as means, ranges, with standard deviations and also depicted in table format. Data collected in questions 15 & 16 of the DEQ were depicted in both bar graph and table formats. The bar graphs display the mean number of estimated hours for each activity related to the role of DE (DEQ question #15), and hours spent on professional activities (DEQ question #16). The mean estimates for each of these activities were separated by the profession of the respondent to enable comparisons to be performed with respect to profession. Respondents who reported over 1,500 hours were excluded from analysis, because an estimate of 1,500 total hours worked in the past 6 months would exceed the total paid work hours for a DE who worked 50 hours per week.

To address research questions *ii* & *iii*, the data collected from DEQ questions 17-28 were initially expressed as frequencies, and percentages. These data were further categorized with respect to professional status of the respondent and displayed in bar graph format. The data from questions 24 and 28 of the DEQ were displayed in table format to enable the display of all categories of these variables.

To address research question *iv*, the data from DEQ questions 29-32 was analyzed. Frequencies and percentages were used to express the data from questions 29 and 28. These data were also broken down with respect to profession and displayed in bar graph format. Since questions 31 and 32 were open-ended, the data from these questions were initially listed and then emergent themes were identified from the responses. This categorization was performed by the primary investigator and overseen by local primary investigator. The most common themes were then listed in the results.

*Geographical Analyses*

As part of the data collected by the DEQ the first three digits of respondent Forward Sortation Area postal code were also obtained (Statistics, 2013). This data provided a spatial analysis of DEs and enabled the use of geographical information systems (ARC GIS) to be performed (Environmental Systems Resource Institute, 2012). Visual and graphic descriptions of DEs at a provincial level were created. These figures (see *Figures 1* & *2*) depict the spatial location of respondents with respect to practice setting and profession. These variables were chosen in accordance with research question *I*, to help describe the demographic characteristics of DEs in Ontario. Analysis of these data involved visual interpretation of the findings.

1. **Multivariate Analyses**

*Research Questions I-IV*

Initially, Pearson bivariate correlation matrices were constructed for each categorical variable of the questionnaire, to determine if any significant associations existed between the characteristics of the DE (profession, education, certification, practice-setting, and training related to DM) and the *Structures*, *Processes* and *Outcomes* of this role. This was done to provide comparisons between variables and provide a richer description of DEs. Variables with multiple responses were collapsed into dichotomous variables to assist in interpretation (e.g., the variables, profession became RN vs. not RN, or RD vs. not RD). Another reason variables were collapsed was that many of the variables with multiple possible responses did not meet the 10 subjects per variable criteria as described by Streiner and Norman (2008). Regressions, correlations, t-test, chi-square, and logistic analysis were not performed, unless there are more than 10 subjects per variable. Significant associations with a p-value of less than or equal to 0.05 (p≤0.05), and/or clinical significance were reported in the results section. In addition to Pearson bivariate correlations, student t-test were performed using continuous variables, such as DEQ questions 1, 6, 15, & 16, and compared with categorical variables. Only clinically and statistically significant findings (p≤0.05) were reported in the results section.

*Research Question V*

To address the last research question, further multivariate analyses were performed. The purpose of this analysis was to identify associations between the characteristics of the DE (profession, education, certification, practice-setting, and training related to DM) and the *Structure*, *Process*, and *Outcomes* of this role, See *Appendix G* for a complete list of variables used in multivariate analyses and their rationale. Pearson bivariate correlation matrices were constructed for all the variables used in further analyses. These matrices were displayed in table format in Appendix H.

1. **Explanatory Variables**

Explanatory (independent) variables that were included in the multivariate analyses included: certification status, profession, level of education, health care setting, DM-specific training, as well as other significant variables contained within each respective section of the questionnaire. In accordance with research question v, these explanatory variables were chosen to describe characteristics of role of the DEs that may possibly be associated with the *Structure*, *Process*, and *Outcomes* of the role of DE. As described in *Appendix G*, these variables were chosen for their clinical significance to the role of DE in alignment with the *International Standards for Diabetes Education*, and other supporting literature. Similar to the analyses mentioned above, the variables were collapsed into dichotomous variables.

1. **Response (Dependent) Variables**

Response (dependent) variables used in analysis were divided into the three components: *Structure*, *Process*, and *Outcomes*. To operationalize these terms, three variables from the DEQ were chosen. These three variables in accordance with their respective component of the Donabedian framework are described in greater detail below, along with their respective analysis. A further description of these variables can be found in *Appendix G.*

*Structure*

The dependent variable for the *Structure* component of the DE role was the estimated time devoted to DSME activities (DEQ: Question #15). This variable was chosen for analyses as it provided a broad description of the ways in which the role of DEs is structured in Ontario, in terms of time allocation and role functions. Being a continuous variable, linear regressions were used for these analyses. In the analysis of this dependent variable, all analyses included the variable full-time vs. not full-time employment to control for some variability in hour estimates with respect to employment status. As determined in the bivariate Pearson correlations mentioned above, variables with significant association to the dependent variable (p-value of less than or equal to 0.05) were also controlled for in models. *R*, *R2*, and adjusted *R2* values were obtained from analyses and displayed in table format. For the purposes of analysis, *R2* values below 0.4 would be considered a weak model. These analyses would help determine what characteristics of the role of DE (the explanatory variables listed above) are associated with this variable, and by extension the *Structure* of the role of DE.

*Process*

The dependent variable for *Process* outcomes was the use of the Self-Care7 TM Behaviours (DEQ: Question # 24). The Self-Care7TM is an established framework outlining the behaviours that comprise DSM, and thus, served as a valuable indicator of the breadth of DSME provided by respondents (AADE, 2009; AADE, 2011a). As this measure was collapsed into a dichotomous variable, (Initial measure: Never, rarely sometimes, often, and always discussing; Collapsed measure: always discussing vs. not always discussing) logistic regressions could be performed. As determined in the bivariate Pearson correlations mentioned above, variables with significant associations with the dependent variable (p≤0.05) were also controlled for in models. Models with just the explanatory variable, and models controlling for additional significant associations were both presented in the results. This data was expressed as odds ratios, with significance being indicated by a 95% confidence interval and displayed in table format. These analyses would help determine what characteristics of the DE (the explanatory variables listed above) are associated with this variable, and by extension the *Processes* of the role of DE.

*Outcome*

The dependent variable for the *Outcome* component of the questionnaire was the self-rated importance of outcomes used in DSME (Question #28). This question was based on the *DSME Outcomes Continuum* created by the AADE (Gary, Genkinger, Guallar et al, 2003). This dependent variable provided an indication of what variables are associated with the types of outcomes educators find relevant. This measure was also collapsed into a dichotomous variable (high importance vs. low importance) so that logistic regression could be performed. As determined in the bivariate Pearson correlations mentioned above, variables with significant associations with the dependent variable (p<0.05) were also controlled for in models. Models with just the explanatory variable and models controlling for additional significant associations were both presented in the results. This data were expressed as odds ratios, with significance being indicated by a 95% confidence interval and displayed in table format. These analyses would help determine what aspects of the role of DE (the explanatory variables listed above) are associated with this variable, and by extension the *Outcomes* of the role of DE.

**2.9** **Ethical Considerations**

The study was reviewed by the Student Research Ethics Board of the Hamilton Integrated Research Ethics Board and received the appropriate approval. Although this was considered a minimal risk study, there are concerns that the investigators noted. Respondents could encounter time constraints while completing the questionnaire, being busy health professionals. In addition, there was the risk of a loss of internet connectivity while completing the questionnaire, thus resulting in the loss of both data and subject’s entry. Data from submitted questionnaires were saved on LIME survey.

The questionnaire asked questions related to professional role and practices, which could have caused some anxiety among respondents as they may perceive it as an evaluation of their performance. To minimize these concerns to the questionnaire, no link between personal data and contact information were included, making the questionnaire completely anonymous. The researchers never saw the distribution list of emails. Respondents contact information was not linked to the data. Thus, once a questionnaire was submitted, the data from that respondent could not be removed. Respondents were notified of this in the consent form. Data from non-submitted questionnaires was not collected and analyzed. Respondents were able to complete the questionnaire at a later date, if not fully completed, but would have to restart the questionnaire. Data was stored on a password protected computer in an encrypted file. During completion, a bar at the top of the questionnaire indicated to the respondent their progress in completion of the questionnaire.

**2.9.1** ***Consent Process***

Respondent consent was obtained prior to the completion of the questionnaire. An initial screen displayed in the questionnaire indicated that “by completing this survey you are giving implied consent" (K. Henderson, personal communication, May 17, 2012). Completion of each question in the questionnaire was voluntary. Respondents could answer or skip questions at their own discretion. The contact information of the principal investigator, local principal investigator, and the Research Ethics Board was provided on the recruitment emails, email reminders, and on the LIME home page. Respondents were informed that they could withdraw from the study at any time. They were also informed that if submitted, respondents’ entries could not be removed due to the anonymity of the questionnaire software. For respondents who elected to participate and finish the questionnaire, they had the choice of submitting their email address to be entered in the draw for a chance to win a gift card. Respondents submitted this information to the investigator via an email address created for the study, and upon completion of the draw, their email addresses were deleted.

**Chapter 3: Results**

The results of Phases 1 & 2 are found in the *Chapter 2*, and informed the development of the final version of the DEQ. The following results were collected with the finalized version of the DEQ and depict the data collected in Phases 3 & 4 of this study.

**3.1**  **Response Rate**

The DEQ was deployed electronically in Phases 3 & 4 of this study. The distribution of the questionnaire followed a modified Dillman approach, with an initial invitational email followed by two reminder emails, each one a week apart (Hoddinott & Bass, 1986). The number of respondents increased following each reminder email. The response rate decreased in subsequent phases, from 85% (n=64 of possible 75) in Phase 3, to 22% (n=114 of possible 525) in Phase 4. In addition, not all respondents answered each question in the DEQ, thus, the sample size varied for several questions in the DEQ. Overall, when pooling the respondents from Phase 3 and Phase 4, there were a total of 178 respondents to the DEQ questionnaire, for an overall response rate of 30% across Ontario. This response rate was calculated using the estimated target population, described previously, of 600 DEs in Ontario, all of which are DES chapter members (DES, 2012).

**Table 1**: Demographic Descriptive Data for DEQ Respondents

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | Registered Nurses (n=61 ) | Registered Dietitians (n=94) | Pharmacists  (n=18) | Other(n= 5)\* | Average of total  (n=178) |
|  | Continuous Variables: Mean(standard deviation) | | | | | |
| Age (Years) | | 48.5 (10.5) | 40.22 (11.4) | 46.8 (9.3) | 39.6 (7.7) | 43.7 (11.3) |
| Years in Diabetes | | 9.6 (7.4) | 12.2 (10.1) | 11.6 (7.8) | 5.2 (0.8) | 11.0 (9.5) |
| Categorical Variables: Count (Percentage of profession) | | | | | | |
| Sex: | Male | 1 (1.6) | 2 (2.1) | 6 (33.3) | 2 (40.0) | 11 (6.2) |
| Female | 60 (98.4) | 92 (97.9) | 12 (66.7) | 3 (60.0) | 167 (93.8) |
| Education | College Diploma/Certificate | 18 (29.5) | 0 (0) | 0 (0) | 0 (0) | 18 (10.1) |
| Baccalaureate Degree | 35 (57.4) | 74 (78.7) | 14 (77.8) | 1 (20.0) | 124 (69.7) |
| Master’s Degree | 7 (11.5) | 18 (19.1) | 2 (11.1) | 4 (80.0) | 31 (17.4) |
| Other:\*\* | 1 (1.6) | 2 (2.1) | 2 (11.1) | 0 (0) | 5 (2.8) |
| Employment Status | Full-Time | 45 (73.8) | 78 (83.0) | 14 (77.8) | 5 (100.0) | 142 (80.2) |
| Part-Time | 13 (21.3) | 12 (12.8) | 3 (16.7) | 0 (0) | 28 (15.8) |
| Other | 3 (4.9) | 3 (3.2) | 0 (0) | 0 (0) | 6 (3.4) |
| Diabetes-Specific Training | Yes | 36 (59.0) | 23 (24.5) | 7 (38.9) | 3 (60.0) | 69 (38.8) |
| No | 25 (41.0) | 71 (75.5) | 11 (61.1) | 2 (40.0) | 109 (61.2) |
| Certification | Yes | 52 (85.2) | 75 (79.8) | 18 (100.0) | 4 (80.0) | 149 (84.7) |
| No | 8 (13.1) | 18 (19.1) | 0 (0) | 1 (20.0) | 27 (15.3) |
| Practice Setting | Hospital Out-Patient Adult Clinic | 31 (50.8) | 38 (40.4) | 0 (0) | 3 (60.0) | 72 (40.4) |
| Hospital Out-Patient Pediatric Clinic | 6 (9.8) | 9 (9.6) | 0 (0) | 0 (0) | 15 (8.4) |
| Hospital In-Patient Adult Clinic | 13 (21.3) | 8 (8.5) | 1 (5.6) | 0 (0) | 22 (12.4) |
| Hospital In-Patient Pediatric Clinic | 4 (6.6) | 2 (2.1) | 0 (0) | 0 (0) | 6 (3.4) |
| Community Health Center | 11 (18.0) | 20 (21.3) | 0 (0) | 1 (20.0) | 32 (18.0) |
| Family Health Team/ Community Practice | 18 (29.5) | 39 (41.5) | 4 (22.2) | 2 (40.0) | 63 (35.4) |
| Pharmacy | 0 (0) | 1 (1.1) | 14 (77.8) | 0 (0) | 15 (8.4) |
| Rural | 5 (8.2) | 26 (27.7) | 1 (5.6) | 0 (0) | 32 (18.5) |
| Patient Location | Urban | 19 (31.1) | 29 (30.9) | 8 (44.4) | 3 (60.0) | 59 (34.1) |
| Both Rural and Urban | 35 (57.4) | 37 (39.4) | 8 (44.4) | 2 (40.0) | 82 (47.4) |
| Pediatrics (Type 1 &/or 2) | 7 (11.5) | 11 (11.7) | 7 (38.9) | 0 (0) | 25 (14.0) |
| Patient Population | Adult (Type 1 &/or 2) | 57 (93.4) | 91 (96.8) | 18 (100.0) | 5 (100.0) | 171 (96.1) |
| Diabetes in Pregnancy | 29 (47.5) | 42 (44.7) | 11 (61.1) | 0 (0) | 82 (46.1) |
| Prediabetes | 40 (65.6) | 82 (87.2) | 13 (72.2) | 1 (20.0) | 136 (76.4) |
| People with complex Diabetes | 50 (82.0) | 64 (68.1) | 12 (66.7) | 5 (100.0) | 131 (73.6) |
| Aboriginal Peoples | 38 (62.3) | 46 (48.9) | 9 (50.0) | 4 (80.0) | 97 (54.5) |
| Patient Ethnicity | African American Peoples | 37 (60.7) | 34 (36.2) | 9 (50.0) | 4 (80.0) | 84 (47.2) |
| South Asian Peoples | 44 (72.1) | 53 (56.4) | 15 (83.3) | 5 (100.0) | 117 (65.7) |
| Eastern Asian/Western Pacific Peoples | 34 (55.7) | 38 (40.4) | 9 (50.0) | 4 (80.0) | 85 (47.8) |
| European Peoples | 52 (85.2) | 75 (79.8) | 16 (88.9) | 5 (100.0) | 148 (83.1) |
| Middle Eastern/North African peoples | 37 (60.7) | 40 (42.6) | 11 (61.1) | 4 (80.0) | 92 (51.7) |
| Caribbean peoples | 35 (57.4) | 39 (41.5) | 10 (55.5) | 4 (20.0) | 88 (49.4) |
| South & Central American peoples | 29 (47.5) | 42 (44.7) | 8 (44.4) | 5 (100.0) | 84 (47.2) |
| Language spoken | English | 59 (96.7) | 94 (100.0) | 17 (94.4) | 5 (100.0) | 175 (98.3) |
| French | 6 (9.8) | 8 (8.5) | 3 (16.7) | 0 (0) | 17 (9.6) |
| Other | 8 (13.1) | 8 (8.5) | 4 (22.2) | 0 (0) | 20 (11.2) |

\*Other describes 4 Nurse practitioners, and one un-described.

\*\* Other describes: Michener Institute’s diabetes educator course (n=10); pump training (n=9), and Mohawk College’s diabetes education certificate (n=4).

**3.2 Respondents’ Demographics**

Table 1 displays the demographic data for all study respondents (n=178). Just over half of the respondents were RDs (54%), followed by RNs (34%), pharmacists (10%), and other (3%) respondents. These other types of respondents included nurse practitioners (2%) and one un-described respondent. Almost all the respondents in the study were female (94%); however, when comparing the proportion of female to male respondents for each profession, the largest percentage of male respondents was among pharmacists (33% male respondents, versus 67% female respondents). The age of respondents ranged from 23 to 78 years of age, with a mean age of 43.7 years (SD 11.3). The type of respondents with the most years of experience in the role of DE, were RDs (12.2 years; SD±10.1). Nearly 80% of all respondents reported to work in a full-time capacity. This proportion was fairly consistent across professions; however, there was a lower, but non-significant, proportion of part-time DEs among RD respondents.

As indicated in Table 1, all respondents had at least a college diploma or higher level of education. Only 30% of RN respondents reported a college diploma as their highest level of education, whereas all other types of respondents had higher levels of education. Most respondents had a baccalaureate degree as their highest level of education (RN 57%, RD 79%, and pharmacists 78%). Master’s degrees were reported most often among nurse practitioners (75%) and RD respondents (19%). Only one respondent (1%) reported having a Doctoral degree. Certification as a DE was reported among 85% of all respondents. All pharmacist respondents (n=18) were CDEs, followed by 85% of RNs, and 80% of RDs respondents. Of the respondents, RN respondents reported to have the highest percentage of DM-specific training; this was significantly higher than other types of respondents (59% vs. 28%; p<0.01). The percentage of DM-specific training among pharmacist respondents was 39%, and 25% among RD respondents. Some of the most common types of DM-specific training reported were the Michener Institute’s DE course (6%); pump training (5%), and Mohawk College’s DE certificate (2%).

**Figure 1:** Map of the Location of Respondents in Ontario by Profession Using Respondents Postal Codes ****

Using DEs' postal codes, a topographical map of Ontario was created to describe where DE respondents were located according to their health discipline. *Figure 1* displays the spatial distribution of respondents in Ontario with respect to profession. Globally, the DE respondents were most concentrated near urban areas, such as the Greater Toronto Area and the Greater Hamilton Area, whereas there were a limited number of DEs living in remote northern Ontario. RNs and pharmacist respondents, in particular were focussed around the GTA. RD respondents were mainly located in Northern Ontario, and South-Western Ontario.

**3.3 Practice Setting and Patient Characteristics**

Respondents also were asked to indicate the type of practice setting in which they worked (see Table 1). The most common practice settings that respondents worked in were hospital, out-patient, adult clinics (40%), followed by family health team/community practice (35%), community health centers (18%), hospital, in-patient, adult clinics (12%), hospital out-patient (8%) and inpatient (3%) pediatric clinics. In the hospital setting, there were a greater proportion of DE respondents practicing in the outpatient setting (49%) versus the inpatient setting (16%), for pediatric and adult clinics combined. In addition, among respondents who worked in outpatient settings, there was a higher proportion working in adult clinics (40%), versus pediatric clinics (8%). Of note, half (50.8%) of RN respondents indicated that they worked in a hospital out-patient adult clinic; which was significantly more than other professionals (51% vs. 35%; p<0.05). The results also showed a significantly higher proportion of RN respondents in the inpatient hospital setting (21% vs. 8%; p<0.01) compared to other types of respondents. At least one RD and RN respondents reported to work in all the practice settings listed in the DEQ, with the exception of pharmacies. In addition to the pharmacy setting (78%), pharmacist respondents worked in family health teams/ community practices (22%) and hospital in-patient adult clinics (6%). A significantly lower proportion of DEs with CDE certificates worked in family health team/community practice settings (32% vs 52%; p=0.05) compared to other practice settings. In contrast, a significantly higher proportion of DEs with a Master’s degree or higher, worked in community health center settings (33% vs. 14%; p<0.01) as compared to other practice settings.

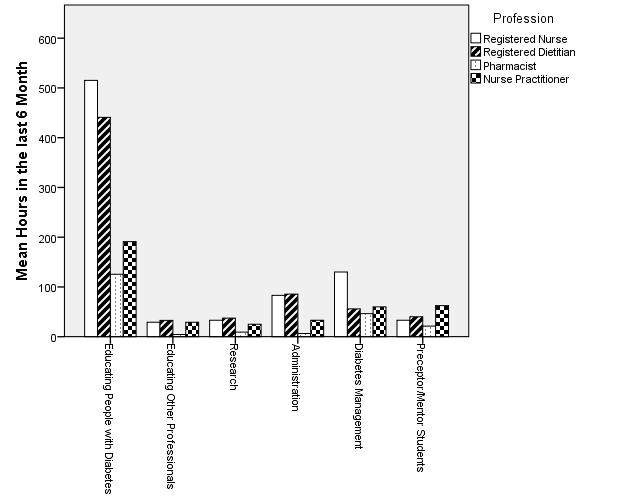
**Figure 2:** Map of the Location of Respondents in Ontario by Practice Setting Using Respondents Postal Codes

**Figure 2** describes the distribution of respondents by type of practice setting using the listed postal codes. Although the majority of respondents (approximately 75%) who reported to practice in hospital settings listed their postal code near urban centers in South-Eastern Ontario, approximately 10% also reported postal codes found in remote settings of Northern Ontario. Respondents who reported to practice in family health teams, community health centers and/or pharmacies listed postal codes found predominantly in South Eastern Ontario, in what appears to be both urban and semi-urban areas.

In addition to their practice setting, respondents had the opportunity to describe the type of patient populations that they saw in their practices (see Table 1). Ninety-six percent of all respondents reported seeing adults with T1DM and/or T2DM, 76% reported seeing individuals with prediabetes, 74% reported seeing individuals with complex DM (multiple co-morbidities and complications), and 46% reported seeing individuals with DM in pregnancy. Only 14% of all respondents identified seeing pediatric patients, of these, pharmacist respondents represented the highest proportion at 39%. Nearly half (46%) of all respondents saw patients with DM in pregnancy, of which pharmacist respondents also had the highest proportion at 61%. RD respondents reported the highest proportion of patients with prediabetes (87% vs. 64%; p<0.01), whereas RN respondents (82%) reported seeing the highest proportion of patients with complex DM (multiple co-morbidities and complications), as compared to the other respondents. All nurse practitioners respondents reported to see patients with complex DM. The ethnicity of patient populations seen respondents were mostly of European background (83%), followed by South Asian (66%), Aboriginal peoples (55%), Middle East/North African peoples (52%), Caribbean peoples (49%), Eastern Asian/Western Pacific peoples (48%), South and Central American peoples (47%), and lastly African American peoples (47%). The majority of respondents spoke English (98%); only 10% spoke French with their patients. Other languages reported to be spoken by DEs were

Spanish (3%), Hindi (3%), and Urdu (2%).

**Figure 3:** Mean Hours Estimates of Time Spent by Respondents on Activities Related to the Role of Diabetes Educator in the Past Six Months



n=166

**3.4 *Structure* Characteristics**

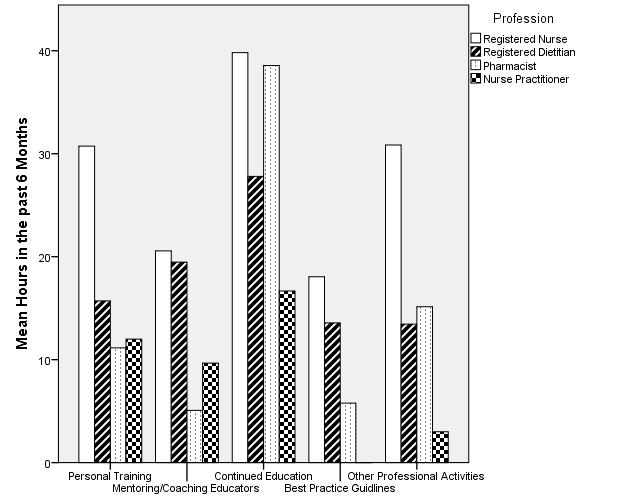
The DEQ also collected data on *Structural* characteristics of respondents. These *Structure* characteristics include variables describing how the role of DEs in Ontario are organized by estimating the time allocated to various aspects of this role. Respondents estimated the amount of time spent in the past six months on various activities related to the role of DEs (see Table 2 and *Figure 3*). The sum of the mean total hours estimated in this analysis was slightly less than 700 hours. This is 340 hours less than the total work hours, if assuming respondents worked 40 hours a week for six months. *Educating people with DM* (428.3 hours; SD±266.2) was the activity related to the role of DEs with the highest mean hour estimates among respondents, with RN respondents estimating the largest mean hours (523.3 hours; SD±258.5; p<0.02), followed by RD respondents (431.1 hours; SD±249.6), nurse practitioners respondents (191.0 hours; SD±203.6), and pharmacist respondents (174.6 hours; SD±193.8). Following *educating people with DM*, the activity with the second largest hour estimate among all respondents was *DM management* (83.7 hours; SD±142.4). The highest mean estimate of this activity were reported by RN respondents (138.9 hours; SD±211.5; p<0.02) followed by nurse practitioner respondents (60.0 hours; SD±45.5), RD respondents (56.9 hours; SD±83.1), and pharmacist respondents (54.7 hours; SD±78.8).

**Table 2:** Mean Reported Hours Spent by Respondents on Activities Related to the Role of Diabetes Educator in the Past Six Months

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Descriptive Statistics** | | | | | | | |
| Activity | N | Range | Minimum | Maximum | Mean | Std. Deviation | Variance |
| Educating People with Diabetes | 166 | 1100 | 0 | 1100 | 428.3 | 266.2 | 70859.9 |
| Educating Other Professionals | 150 | 400 | 0 | 400 | 28.8 | 53.5 | 2858.3 |
| Research | 148 | 416 | 0 | 416 | 33.6 | 59.9 | 3583.9 |
| Administration | 152 | 487 | 0 | 487 | 73.0 | 97.0 | 9412.2 |
| Diabetes Management | 150 | 900 | 0 | 900 | 83.7 | 142.4 | 20282.1 |
| Preceptor/Mentor Students | 147 | 625 | 0 | 625 | 40.5 | 80.6 | 6502.4 |

*Administrative activities* took an estimated mean of 73.0 hours (SD±97.0) for all respondents, of which the highest mean estimate was seen among RN respondents (82.4 hours; SD±90.0), followed by RD respondents (80.2 hours, SD±106.1), nurse practitioner respondents (33.0 hours, SD±45.4) and pharmacist respondents (6.8 ±12.0). Pharmacist respondents’ estimates were significantly lower than other types of respondents (p<0.05). *Research* (33.55 hours; SD±59.87) and *Education of other professionals* (28.79 hours; SD±53.46) were the two activities with the lowest mean estimate of hours for respondents of all professions. The highest mean estimate of hours performing *Research* was seen among RD respondents (38.0 hours; SD±71.9) followed by RN respondents (31.1 hours; SD±43.3), nurse practitioner respondents (25.0 hours; SD±30.0), and pharmacist respondents (15.7 hours; SD±29.5). The highest hourly estimates of *education of other professionals* were among RD respondents (31.8 hours; SD±62.9) followed by RN respondents (30.5 hours; SD±43.0), nurse practitioner respondents (29.0 hours; SD±21.7), and pharmacist respondents (6.1 hours; SD±8.5).

**Figure 4:** Mean Hours Estimates of Time Spent by Respondents on Professional Activities Related to the Role of Diabetes Educator in the Past Six Months



N=166

Following the activities related to the role of DE, respondents also estimated the hours spent in the last six months on professional activities (see Table 3 & *Figure 4*). The sum of the mean hours reported to be spent on professional development activities in the past 6 months among all respondents was a total of 113 hours. This is slightly less that 10% of the total work hours in the past six months, if the respondents are assumed to have worked a 40 hour week for the past six months.

**Table 3:** Mean Reported Hours Spent by Respondents on Professional Activities Related to the Role of Diabetes Educator in the Past Six Months

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Descriptive Statistics** | | | | | | | |
| Activity | N | Range | Minimum | Maximum | Mean | Std. Deviation | Variance |
| Personal Training | 151 | 300 | 0 | 300 | 22.0 | 37.6 | 1413.0 |
| Mentoring/Coaching other Educators | 149 | 200 | 0 | 200 | 18.9 | 32.0 | 1023.4 |
| Continued Education | 161 | 250 | 0 | 250 | 35.1 | 36.1 | 1301.4 |
| Best Practice Guidelines | 149 | 120 | 0 | 120 | 14.7 | 23.7 | 560.3 |
| Other Professional Activities | 141 | 390 | 0 | 390 | 22.3 | 44.9 | 2018.0 |

Of all the professional activities, the majority of time reported by all respondents was spent on c*ontinued education* through workshops/conferences (35.1hours; SD±36.1), the second was *other* (unspecified) *professional activities* (22.3 hours; SD±44.9), followed by *skills training*/recertifying (22.0 hours; SD±37.6), *mentoring/coaching other educators* (18.9 hours; SD±31.9), and *best practice guidelines* (14.7 hours; SD±23.6). The highest hourly estimates of *continued education* were among pharmacist respondents (39.4 hours; SD±48.0) followed by RN respondents (38.3 hours; SD±34.5), RD respondents (32.5 hours; SD±35.2), and nurse practitioner respondents (16.7 hours; SD±16.1). The highest estimates of *other professional activities* were found among RN respondents (35.1 hours; SD±66.5) followed by RD respondents (17.5 hours; SD±31.7), pharmacist respondents (14.3 hours; SD±18.4), and nurse practitioners (7.3 hours; SD±8.8). The highest estimates for *Skills training* were found among nurse practitioner respondents (45.0 hours; SD±66.0) followed by RN respondents (31.2 hours; SD± 53.2), RD respondents (16.9 hours; SD±24.2), and pharmacist respondents (11.2 hours; SD±13.7). The highest estimates for *mentoring/coaching other educators* were found among RD (20.5 hours; SD±34.5) and RN respondents (20.5 hours; SD±33.2) followed by nurse practitioner respondents (16.0 hours; SD±13.0), and pharmacist respondents (5.4 hours; SD±6.9). The highest estimates of *best practice guidelines* were found among RN respondents (17.5 hours; SD±27.3) followed by RD respondents (15.1 hours; SD±23.8), pharmacist respondents (6.7 hours; SD±7.3), and nurse practitioner respondents (5.0 hours; SD±10.0). There were no significant differences in estimated hours spent on professional activities across respondents with respect to their profession. However, as shown in Figure 4, the mean estimates RN respondents were either the highest or second highest in all professional activities described, as compared to other types of respondent profession.

**3.5  *Process* Characteristics**

*Process* characteristics, in accordance with the Donabedian framework, focussed on the activities performed by respondents in the role of DEs in Ontario. This began with describing the initial assessments performed by DEs. DE respondents reported on a number of components included in their initial assessments prior to providing DSME. As displayed in Figure 5, the item reported by the highest proportion of respondents was assessment of *self-care skills* (90%; n=161) followed by *DM knowledge* (89%; n=159), *lifestyle choices* (87%; n=155), *readiness for change* (83%), *cognition/literacy* (80%), *personal supports* (79%), *psycho-social issues* (74%), *behavioural goals* (71%), *safety issues* (65.7%; n=117), *culture/religion* (61%; n=108), and *learning style* (56%; n=100).

**Figure 5:** Percentage Reported Inclusion of Criteria in Initial Assessments by Respondents’ Profession

Bars depict percentage of each profession

Compared with the all other types of respondents, RN respondents reported a significantly higher proportion of assessing *patient safety* (79% vs. 59%; p<0.01) and *psycho-social status* (85% vs. 68%; p<0.01). In contrast to other types of respondents, pharmacist respondents reported a slightly lower amount of *cognition/literacy* (61% vs. 82%; p<0.04), *personal supports* (50% vs. 82%; p<0.01), *culture/religion* (22% vs. 65%; p<0.01), *safety issues* (39% vs. 69%; p<0.02), *readiness to change* (67% vs. 85%; p< 0.05), *learning style* (28% vs. 59%; p<0.02), and *psycho-social status* (39% vs. 78%; p<0.01) in their initial assessment. There was a slightly higher percentage of respondents in hospital settings who reported assessment of *culture and religion* (71% vs. 53%; p 0.01), as compared to respondents in other practice settings (see *Figure 5*).

**Figure 6:** Percentage Reported Use of Methods to Deliver Diabetes Self-Management Education Used, by Respondents’ Profession

As displayed in *Figure 6*, the methods of delivering DSME reported to be used by the largest percentage of respondents included *one-on-one discussions* (90%), followed by *pamphlets/information sheets* (79%), *telephone* (77%), *connecting individual with community resources* (71%), *group interactive/discussion session* (66%), *PowerPoint presentation* (49%), *email* (48%), *conversation maps* (35%), and lastly, *one-on-one scripted dialogue* (8%). A significantly higher proportion of RN respondents, then other types of respondents, reported using *connecting patients with community resources* (82% vs. 66%; p<0.02) as a method of delivery of DSME. A significantly higher use of *interactive group sessions* (76% vs. 56%; p<0.01) was reported by RD respondents.

Pharmacist respondents, however, had significantly lower reported use of, visual technology aids: *PowerPoint* *presentation* (11% vs. 54%; p<0.01), *group interactive sessions* (6% vs. 73%; p<0.01), email (22% vs. 46%; p<0.02), *conversation maps* (6% vs. 39%; p<0.01), and *connecting patients with community resources* (50% vs. 74%; p<0.04), as compared to other types of respondents. A significantly lower proportion of respondents practicing in a community setting reported using *email* (-0.20; p<0.01), whereas a significantly higher proportion of respondents working in a hospital setting reported to use of *email* (58% vs. 40%; p<0.02) and *PowerPoint presentations* (61% vs. 40%; p<0.01), as compared to other respondents.

About two-thirds of respondents (67%) reported that that they found teaching-learning models *helpful* to *very helpful* in providing education. However, only a quarter (22.5%) of respondents reported using a prescribed curriculum, such as the *CDACPG* (4%) and *conversation maps* (1%). Notably, 16% of respondents reported that they were unsure whether they had a prescribed curriculum.

As depicted in *Figure 7*, the topic of DSME reported to be discussed by the largest percentage of respondents was *hyper* and *hypoglycemia* (90%), followed by *physical activity* (90%; n=160), *self-blood glucose monitoring* (88%), *setting individualized goals* (87%), *nutrition management* (85%), *disease process* (83%), *medication management* (80%), *complications and co-morbidities* (78%), *problem-solving* (77%), *monitoring of health parameters* (77%), *psychosocial lifestyle management* (75%), *community resources/medical supplies* (72%), *pregnancy in DM* (33%), and *insulin pump* initiation and adjustment (23%). The reported use of topics differed among respondents with respect to profession. RN respondents reported higher use of the following topics: *psycho-social lifestyle management* (85% vs. 69%; p=0.02), *medication management* (90% vs. 75%; p=0.02), *prevention and surveillance of complications/co-morbidities* (87% vs. 73%; p=0.03), and *community resources/medical supplies* (82% vs. 68%; p=0.04), as compared to other respondents. RD respondents reported greater discussion of the following topics: *nutrition management* (90% vs. 79%; p=0.03), *goal setting* (91% vs. 81%; p=0.04), and *monitoring health parameters* (83% vs. 70%; p=0.04), but a lower reported use of *medical management* (73% vs. 88%; p=0.01) compared to other types of respondents. Fewer pharmacist respondents reported to discussing the following topics: *disease process* 61% vs. 86%; p<0.05), *psycho-social lifestyle management* (56% vs. 77%; p=0.05), *insulin pumps* (0% vs. 25%; p=0.02), *community resources/medical supplies* (39% vs. 76%; p<0.01), *goal setting* (50% vs. 91%; p<0.01), *monitoring health parameters* (39% vs. 81%; p<0.01), and *problem-solving* (39% vs. 89%; p<0.01), compared to other respondents. Discussion of *medical management* (83% vs. 67%; p=0.01), *pregnancy and DM* was reported by significantly more respondents with certification (38% vs. 11%; p=0.05), compared to respondents without. Respondents practicing in a hospital setting reported a significantly higher proportion of *insulin pump* discussions (44% vs. 5%; p<0.01) and *pregnancy in DM* (47% vs. 22%; p<0.01), compared to respondents in community settings. Discussion of *insulin pumps* (10% vs. 41%; p<0.01) and *pregnancy in DM* (25% vs. 45%; p<0.01) was also reported by significantly less by respondents in community settings, as compared to respondents in hospital settings.

**Figure 7:** Percentage Reported Use of Topics in Diabetes Self-Management Education Provided by Respondents’ Profession

Bars depict percentage of each profession

About two-thirds (69%) of all respondents reported that behavioural change strategies were *helpful* to *very helpful* in their practice. Behavioural change strategies are outlined in *Figure 8*. The behaviour change strategy reported to be used most by the respondents was *setting of personalize goals* (85%), followed by *motivational interviewing* (79%), *problem-solving* (73%), *cognitive reframing* (40%), and *other* (4%). Only two percent of respondents indicated that they did not find behavioural change strategies applicable to their position. A significantly lower reported use of *setting personalized goals* (61% vs. 88%; p<0.01) and *problem-solving* (44% vs. 76%; p<0.01) strategies, were reported by pharmacist respondents, compared to other types of respondents.

**Figure 8:** Percentage Reported Use of Behavioural Change Strategies by Respondents’ Profession

Bars depict percentage of each profession

Respondents also reported on the frequency in which they discussed the

behaviours listed in the AADE7TM Self-Care 7 Behaviours (see Table 4).

**Table 4:** Reported Frequencies of Respondents to Discuss Each AADE7TM Self-Care 7 Behaviour

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| AADE7TM Self-Care 7 Behaviours | | Reported Frequency of Discussion  Count(Percentage of profession) | | |
| Never/Rarely | Sometimes/Often | Always |
| Health Eating | Registered Nurse (n=55) | 1 (1.8) | 23 (41.8) | 31 (56.4) |
| Registered Dietitian (n= 86) | 0 (0) | 17 (19.8) | 69 (80.2) |
| Pharmacist (n=16) | 0 (0) | 8 (50.0) | 8 (50.0) |
| Other (n=5) | 0 (0) | 3 (60.0) | 2 (40.0) |
| Being Active | Registered Nurse (n=55) | 0 (0) | 15 (27.3) | 40 (72.7) |
| Registered Dietitian (n=86) | 0 (0) | 34 (39.5) | 52 (60.5) |
| Pharmacist (n=16) | 0 (0) | 7 (43.8) | 9 (65.3) |
| Other (n=5) | 0 (0) | 3 (60.0) | 2 (40.0) |
| Monitoring | Registered Nurse (n=56) | 0 (0) | 16 (28.6) | 40 (71.4) |
| Registered Dietitian (n=86) | 0 (0) | 39 (45.3) | 47 (54.7) |
| Pharmacist (n=16) | 0 (0) | 4 (25.0) | 12 (75.0) |
| Other (n=5) | 0 (0) | 1 (20.0) | 4 (80.0) |
| Taking Medications | Registered Nurse (n=55) | 0 (0) | 11 (20.0) | 44 (80.0) |
| Registered Dietitian (n=86) | 0 (0) | 38 (44.2) | 48 (55.8) |
| Pharmacist (n=16) | 0 (0) | 3 (18.8) | 13 (81.3) |
| Other (n=5) | 0 (0) | 1 (20.0) | 4 (80.0) |
| Problem-Solving | Registered Nurse (n=56) | 0 (0) | 33 (58.9) | 23 (41.1) |
| Registered Dietitian (n=85) | 0 (0) | 51 (60.0) | 34 (40.0) |
| Pharmacist (n=15) | 1 (6.7) | 11 (73.3) | 3 (20.0) |
| Other (n=5) | 0 (0) | 3 (60.0) | 2 (40.0) |
| Reducing Risks | Registered Nurse (n=56) | 0 (0) | 24 (42.9) | 32 (57.1) |
| Registered Dietitian (n=86) | 2 (2.3) | 57 (66.3) | 27 (31.4) |
| Pharmacist (n=16) | 0 (0) | 13 (81.3) | 3 (18.8) |
| Other (n=5) | 0 (0) | 3 (60.0) | 2 (40.0) |
| Healthy Coping | Registered Nurse (n=56) | 0 (0) | 33 (58.9) | 23 (41.1) |
| Registered Dietitian (n=85) | 1 (1.2) | 62 (72.9) | 22 (25.9) |
| Pharmacist (n=15) | 1 (6.7) | 13 (86.7) | 1 (6.7) |
| Other (n=5) | 0 (0) | 4 (80.0) | 1 (20.0) |

Of the seven self-care behaviours, *Healthy Eating* (68%), was most frequently discussed, followed by *Taking Medications* (67%), *Being Active* (64%), *Monitoring* (64%), and *Reducing Risks* (40%). The behaviours that were less likely to be discussed included *Healthy Coping* (26%) and *Problem-Solving* (35%). Significantly more RN respondents reported always discussing: *Taking Medications* (80% vs. 61%; p=0.01); *Reducing Risk* (57% vs. 36%; p<0.01); and *Healthy Coping* (41% vs. 23%; p=0.02), as compared to other respondents, but significantly less RN respondents reported to always discuss *Healthy Eating* (56% vs. 74%; p=0.02). More RD respondents reported to always discuss *Healthy Eating* (80% vs. 54%; p<0.01), but less RD respondents reported to always discuss *Monitoring* (54% vs. 73%; p=0.02); *Taking Medications* (56% vs. 80%; p<0.01); and *Reducing Risks* (31% vs. 48%; p=0.03), as compared to other professions. There was a higher proportion of respondents practicing in a hospital setting reporting to always discuss *Monitoring* (76% vs. 53%; p<0.01) and *Taking medication* (79% vs. 57%; p<0.01), as compared to respondents practicing in a Community setting. A higher proportion of respondents with CDE certification reported always discussing *Taking Medication* (72% vs. 46%; p=0.01) versus respondents without CDE certification. A significantly lower proportion of pharmacist respondents reported always discussing *Healthy Coping* (7% vs. 32%; p=0.04) as compared to other respondents.

**3.6 *Outcome* Characteristics**

*Outcome* characteristics described the measures used by respondents in the role of DEs. Respondents reported using a variety of outcomes to evaluate patients’ knowledge. The outcomes reported to be used by the largest percentage of respondents was *verbal confirmation* (84%), followed by *return demonstration* (77%), *self-blood glucose mon*itoring (SBGM) (69%), *glycated hemoglobin* (57%), *creation of personalized action plan* (50%), *selection of behavioural goals* (44%), *knowledge assessment questionnaires* (13%), and *other knowledge measures* (4%) (see *Figure 9*). Only two respondents (1%) indicated that they did not measure patients’ knowledge. Of all the items listed in the DEQ regarding evaluating patient’s knowledge, *knowledge assessments questionnaires* were reported to be used by only 13% (n=23) of respondents. RD respondents reported a significantly higher use of *personalized action plans* (57% vs. 42%; p=0.04), and *appropriate selection of goals* (51% vs. 36%; p=0.04), as compared with other respondents. Pharmacist respondents reported significantly lower use of *selection of goals* than other respondents (6% vs. 48%; p<0.01).

**Figure 9:** Percentage Reported Use of Knowledge Outcomes by Respondents’ Profession

Respondents reported using a variety of outcomes to evaluate behavioural change. These included *self-blood glucose monitoring* (77%), *attainment of personal goals* (70%), *adherence to a care plan* (69%), *glycated hemoglobin* (66%), *readiness for change* (58%), *demonstrating active problem-solving skills* (29%), level of *motivation* (23%), *self-efficacy tools* (22%), *self-care/management tools* (21%), and not applicable (1%) (see *Figure 10*). RD respondents reported significantly higher use of attainment of personal goals as a measure of behavioural change, as compared with other respondents (78% vs. 61%; p=0.01).

**Figure 10:** Percentage Reported Use of Behavioural Change Outcomes by Respondents’ Profession

Bars depict percentage of each profession

Respondents also reported using a variety of clinical measures to evaluate the provision of DSME (see *Figure 11*). The clinical measure reported to be used by the largest percentage of all respondents was *glycated hemoglobin* (85%), followed by *SBGM* (85%), *lipids* (75%), *quality of life* (74%), *blood pressure* (70%),*weight/BMI/waist circumference* (67%), *kidney/liver function* (64%), *psychological status* (55%), *patient growth and development* (14%), other (3%), and *not applicable* (1%). A larger proportion of RN respondents reported using *psychological status* as a clinical measure (70% vs. 47%; p<0.01) as compared to other respondents. A higher proportion of RD respondents reported using *lipids* (82% vs. 67%; p=0.02), and *weight/BMI/waist circumference* (74% vs. 58%; p=0.02) as clinical measures, than other respondents, in which significantly less pharmacist respondents reported to use *lipids* than all other respondents (44% vs. 78%; p<0.01).

**Figure 11:** Percentage Reported Use of Clinical Measures by Respondents’ Profession

Bars depict percentage of each profession

As described in Table 5, respondents rated *changes in behaviour* outcomes as the most relevant type of outcomes to their practice (85%), followed by *clinical measures* (79%), *patient knowledge and skills* (76%), p*rocess measures* (42%), and *health status measures* (69%) (see Table 5). A further analysis of the variables summarized in Table 5 is described in *Section 3.10*.

**Table 5:** Reported Relevance of Outcomes Used by Diabetes Educators

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Types of Outcomes | Professions | Relevance to Current Practice:  Count (Percentage of profession) | | |
| Irrelevant | Low-Moderate Relevance | High Relevance |
| Patient Knowledge and Skills | Registered Nurse (n=52) | 0 (0) | 15 (28.8) | 37 (71.2) |
| Registered Dietitian (n=83) | 0 (0) | 15 (18.1) | 68 (81.9) |
| Pharmacist (n=16) | 0 (0) | 7 (43.8) | 9 (56.3) |
| Other(n=5) | 0 (0) | 0 (0) | 5 (100.0) |
|  | **Total (n=156)** | 0 (0) | 37 (23.7) | 119 (76.3) |
| Changes in Behaviour | Registered Nurse (n=52) | 0 (0) | 2 (3.8) | 50 (96.2) |
| Registered Dietitian (n=83) | 0 (0) | 11 (13.3) | 72 (86.7) |
| Pharmacist (n=15) | 0 (0) | 9 (60.0) | 6 (40.0) |
| Other (n=5) | 0 (0) | 2 (40.0) | 3 (60.0) |
|  | **Total (n=155)** | 0 (0) | 24 (15.5) | 131 (84.5) |
| Clinical Measures | Registered Nurse (n=52) | 0 (0) | 9 (17.3) | 43 (82.7) |
| Registered Dietitian (n=82) | 0 (0) | 19 (23.2) | 63 (76.8) |
| Pharmacist (n=15) | 0 (0) | 4 (26.7) | 11 (73.3) |
| Other (n=5) | 0 (0) | 0 (0) | 5 (100.0) |
|  | **Total (n=154)** | 0 (0) | 32 (20.8) | 122 (79.2) |
| Health Status Measures | Registered Nurse (n=52) | 0 (0) | 14 (26.9) | 38 (73.1) |
| Registered Dietitian (n=82) | 0 (0) | 24 (29.3) | 58 (70.7) |
| Pharmacist (n=14) | 0 (0) | 6 (42.9) | 8 (57.1) |
| Other (n=5) | 0 (0) | 3 (60.0) | 2 (40.0) |
|  | **Total (n=153)** | 0 (0) | 47 (30.7) | 106 (69.3) |
| Process Measures | Registered Nurse (n=52) | 0 (0) | 26 (50.0) | 26 (50.0) |
| Registered Dietitian (n=83) | 2 (2.4) | 46 (55.4) | 35 (42.2) |
| Pharmacist (n=14) | 1 (7.1) | 9 (64.3) | 4 (28.6) |
| Other (n=5) | 0 (0) | 5 (100.0) | 0 (0) |
|  | **Total (n=154)** | 3 (1.9) | 86 (55.8) | 65 (42.2) |

**3.7 Facilitators and Barriers to the Role of DE**

As depicted in *Figures 12* and *13,* respondents reported a number of perceived facilitators and barriers to the implementation of the role of DE. The facilitator reported by the highest percentage of respondents was having *sufficient resources* (73%), followed by having *sufficient time* (70%), *access to other members of the DM healthcare team* (67.4%), *organization/management support* (61%), *use of medical directives* (57%), *electronic medical records (EMR)* (57%), *clearly defined roles within the healthcare team* (39%), *case manager/navigator for DM education/management* (15%), and *other* facilitators (6%). A significantly higher proportion of RD respondents reported use of an *EMR* (64% vs. 49%; p=0.04) as a facilitator to the implementation of their role.

**Figure 12**: Percentage Identified Facilitators to the Role of Diabetes Educator Reported by Respondents’ Profession

A higher proportion of respondents practicing in a community setting reported use of an *EMR* as a facilitator to the implementation of their role (64% vs. 45%; p=0.01), as compared to other respondents. A significantly higher proportion of respondents with a Master’s degree reported the presence of a *case manager/navigator* as a facilitator, compared with respondents without a Master’s degree (31% vs. 10%; p<0.01). Of all the respondents, significantly fewer pharmacist respondents reported *access to members of the DM healthcare team* (33% vs. 71%; p<0.01); medical directives (28% vs. 60%; p<0.01); and *electronic medical records* (28% vs. 60%; p<0.01) as facilitators to the implementation of their role.

Bars depict percentage of each profession

**Figure 13:** Percentage of Identified Barriers to the Role of Diabetes Educators Reported by Respondents’ Profession

Bars depict percentage of each profession

Barriers respondents reported to the implementation of their DE role were, in order of frequency, insufficient time (52%) followed by, *lack of organization/management support* (42%), *lack of medical directives* (39%), *insufficient resources* (38%), *poorly defined roles* (32%), poor *access to other members of the DM healthcare team* (30%), lack of *case manager/navigator* for DM education/management (26%) and *EMR* (25%) (see *Figure 13*). Other barriers that were not listed in the DEQ, but were identified by respondents included conflicting messages from other healthcare providers (2%), and administrative aspects of the role (policies, paper charting, & access to lab work) (2%). A significantly higher proportion of respondents with CDE certification reported insufficient time as a barrier to implementation of their role, compared to those without CDE certification (56% vs. 33%; p<0.03). Similarly, there was a higher proportion of respondents practicing in a hospital setting who reported insufficient time as a barrier to implement their role, as compared to those practicing outside of a hospital setting (62% vs. 43%, p=0.01).

Respondents cited a number of benefits to providing education to individuals with DM and/or their caregivers. Some of the most common themes in these responses included improving self-management skills (15%), improving self-efficacy (11%), improving quality of life (10%), and building individual’s knowledge and understanding (10%). Limitations to providing education to individuals with DM and/or their caregivers were also described by respondents, these responses included: the lack of individual’s acceptance of education (21%), insufficient time for DSME (12%), ineffective communication in physician/educator relationships (8%); issues among members of the DM health care team (6%), and issues in the delivery/model of health care in Ontario.

**Table 6:** The Goodness of Fit of Linear Regression Models for the Hours Spent on Activities Related to the Role of the Diabetes Educator with Respect to Respondents’ Profession

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Model Dependent Variables | | Independent Variables\* | | |
| Registered Nurses | Registered Dietitian | Pharmacists |
| Hours educating Individuals with Diabetes | *R* | 0.39a | 0.29a | 0.44a |
| *R2* | 0.15a | 0.08a | 0.19a |
| Adjusted *R2* | 0.13a | 0.07a | 0.18a |
| Hours Educating Other Professionals | *R* | 0.14 | 0.13 | 0.18 |
| *R2* | 0.02 | 0.02 | 0.03 |
| Adjusted *R2* | <0.01 | <0.01 | 0.01 |
| Hours of Researchb | *R* | 0.16 | 0.16 | 0.18 |
| *R2* | 0.02 | 0.03 | 0.03 |
| Adjusted *R2* | <0.01 | <0.01 | 0.01 |
| Hours of Administration | *R* | 0.14 | 0.15 | 0.25 |
| *R2* | 0.02 | 0.02 | 0.06 |
| Adjusted *R2* | 0.01 | 0.01 | 0.05 |
| Hours of Diabetes Management | *R* | 0.33c | 0.26c | 0.17c |
| *R2* | 0.11c | 0.07c | 0.03c |
| Adjusted *R2* | 0.07c | 0.03c | <0.01c |
| Hours Preceptoring /Mentoring Students | *R* | 0.18 | 0.18 | 0.17 |
| *R2* | 0.03 | 0.03 | 0.03 |
| Adjusted *R2* | 0.02 | 0.02 | 0.02 |

\*Note: All models adjusted for (Full time vs. Not Full time) employment

a Model also includes the variable: Diabetes-specific training

b Model also includes the variable: Age

c Model also includes the variables: Certification, Diabetes-specific training, Hospital practice setting, and Community practice setting

**3.8 Multivariate Analyses of *Structure* Characteristics**

Multivariate analysis was used to explore the association between the *Structure* of the role of DE (number of hours spent on activities related to the role of diabetes educator in the past 6 months), and the characteristics of the DE role (profession, education, certification, practice-setting, and diabetes-specific training), as seen in Tables 6 and 7. These tables display the goodness of fit for the linear models with the dependent variable; hours spent on various activities related to the role of DE, and the explanatory variables describing the aspects of the role of DE. The first dependent variable explored was, *educating people with DM*. The variables; *pharmacists* vs*. non-pharmacists,* and b) *DM-specific training* vs. *no DM-specific training,* explained 18% of the variation in the estimated number of hours *educating people with DM*, whereas the variables; a) *RN* vs*. not RN,* and b) *DM-specific training* vs. *no DM-specific training hours,* explained 13% of the variation in the estimated number of hours *educating people with DM*. The variables; *hospital setting* vs*. non-hospital setting,* and b) *DM-specific training* vs. *no DM-specific training,* explained 11% of the variation in the estimated number of hours *educating people with DM*, whereas the variables; a) *community setting vs. non-community setting,* and b) *DM-specific training* vs. *no DM-specific training hours,* explained 10% of the variation in the estimated number of hours *educating people with DM*. The variables; *Master’s degree or higher education* vs*. not a Master’s degree and lower education, and b) DM-specific training* vs. *no DM-specific training,* explained 8% of the variation in the estimated number of hours *educating people with DM*, whereas the variables; a) *certification* vs*. no certification,* and *b) DM-specific training* vs. *no DM-specific training hours,* explained 7% of the variation in the estimated number of hours *educating people with DM*. Lastly, the variables; *RD vs. not RD*, and b) *DM-specific training vs. no DM-specific training*, explained 7% of the variation in the estimated number of hours *educating people with DM*, whereas the variable; a) *DM-specific training* vs. *no DM-specific training hours* alone, explained only 7% of the variation in the estimated number of hours *educating people with DM.*

**Table 7:** The Goodness of Fit of Linear Regression Models for the Hours Spent on Activities Related to the Role of the Diabetes Educators with Respect to Level of Education, Certification, and Practice Setting

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | Independent Variables\* | | | | |
| Model Dependent Variables | | Diabetes-Specific Training | Certification | Level of Education | Community setting | Hospital Setting |
| Hours Educating Individuals with Diabetes | *R* | 0.29 | 0.29a | 0.31a | 0.34a | 0.35a |
| *R2* | 0.08 | 0.09a | 0.10a | 0.12a | 0.12a |
| Adjusted *R2* | 0.07 | 0.07a | 0.08a | 0.10a | 0.11a |
| Hours Educating Other Professionals | *R* | 0.13 | 0.16 | 0.13 | 0.17 | 0.19 |
| *R2* | 0.02 | 0.03 | 0.2 | 0.03 | 0.04 |
| Adjusted *R2* | <0.01 | <0.01 | <0.01 | <0.01 | 0.02 |
| Hours of Pesearchb | *R* | 0.18 | 0.16 | 0.16 | 0.22 | 0.20 |
| *R2* | 0.03 | 0.03 | 0.03 | 0.05 | 0.04 |
| Adjusted *R2* | 0.01 | 0.01 | 0.01 | 0.03 | 0.02 |
| Hours of Administration | *R* | 0.12 | 0.11 | 0.12 | 0.21 | 0.20 |
| *R2* | 0.01 | 0.01 | 0.01 | 0.04 | 0.04 |
| Adjusted *R2* | <0.01 | <0.01 | <0.01 | 0.03 | 0.03 |
| Hours of Diabetes Management | *R* | 0.13 | 0.10 | 0.16c | 0.08 | 0.08 |
| *R2* | 0.02 | 0.01 | 0.03c | 0.01 | 0.01 |
| Adjusted *R2* | <0.01 | <0.01 | <0.01c | <0.01 | <0.01 |
| Hours Preceptoring/Mentoring Students | *R* | 0.19 | 0.17 | 0.17 | 0.18 | 0.18 |
| *R2* | 0.04 | 0.03 | 0.03 | 0.03 | 0.03 |
| Adjusted *R2* | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |

\*Note: All models adjusted for (Full time vs. Not Full time) employment

a Model also includes the variable: Diabetes-specific training

b Model also includes the variable: Age

c Model also includes the variables: Certification, Diabetes-specific training, Hospital practice setting, and Community practice setting

In the analyses of the dependent variables, *hours spent educating other Professionals, hours spend on research,* and *hours spent preceptoring/mentoring students,* no single explanatory variables, or combination of explanatory variables were able to explain more than 5% of the variation in each activity, except the variables a) *RN vs. not RN*, b) *certification vs. no certification*, c) *DM-specific training* vs. *no DM specific training*, d) *Hospital setting vs. not hospital setting*, and e) *community setting vs. not community setting* explained 7% of the variation in the estimated hours performing *DM management*. In all of the linear models listed in Tables 6 and 7, there were no models with an *R2* value over 0.20, indicating that none of the explanatory variables could explain even 20% of the variation in hourly estimates for activities related to the role of DE.

**Table 8:** The Odds Ratios for the Frequency of Discussion of AADE7TM Self-care Behaviours with Respect to Respondents Profession

|  |  |  |  |
| --- | --- | --- | --- |
| AADE7TM Self-care Behaviour | Profession | | |
| Registered Nurses | Registered Dietitians | Pharmacists |
| OR(95% Confidence Interval) for always discussing the behaviour vs. not always | | | |
| Healthy Eating | 0.46 (0.23 to 0.91)\* | 3.47 (1.73 to 6.95)\* | 0.43 (0.15 to 1.22) |
| Being Active | 1.86 (0.92 to 3.78)  *1.51 (0.72 to 3.17)a* | 0.75 (0.39 to 1.43)  *0.96 (0.48 to 1.90)a* | 0.71 (0.25 to 2.02)  *0.61 (0.21 to 1.78)a* |
| Monitoring | 1.75 (0.87 to 3.50)  *1.62 (0.79 to 3.32)b* | 0.45 (0.23 to 0.87)\*  *0.41 (0.21 to 0.81)b\** | 1.85 (0.57 to 6.01)  *3.06 (0.90 to 10.39)b* |
| Taking Medications | 2.59 (1.20 to 5.56)\*  *2.03 (0.88 to 4.67)c* | 0.31 (0.15 to 0.63)\*  *0.34 (0.16 to 0.75)c\** | 2.26 (0.61 to 8.29)  *2.58 (0.65 to 10.22)* c |
| Problem Solving | 1.18 (0.61 to 2.29)  *0.83 (0.40 to 1.70) d* | 1.14 (0.61 to 2.16)  *1.53 (0.76 to 3.06) d* | 0.37 (0.10 to 1.36)  *0.39 (0.10 to 1.55)* d |
| Reducing Risks | 3.13 (1.60 to 6.12)\*  *2.74 (1.37 to 5.47)* e *\** | 0.50 (0.26 to 0.94)\*  *0.58 (0.30 to 1.13)* e | 0.33 (0.09 to 1.19)  *0.28 (0.08 to 1.05)* e |
| Healthy Coping | 2.35 (1.17 to 4.74)\*  *1.98 (0.96 to 4.10)* f | 0.71 (0.36 to 1.41)  *0.89 (0.43 to 1.81)* f | 0.16 (0.02 to 1.22)  *0.13 (0.02 to 1.05)* f |

a Adjusted for the variable: Years of age

b Adjusted for the variables: Hospital practice setting, Community practice setting

c Adjusted for the variables: Hospital practice setting, Community practice setting, years of age, & certification

d Adjusted for the variables: Years of age & Community practice setting

e Adjusted for the variable: Years of age

f Adjusted for the variable: Years of age

**3.9 Multivariate Analyses of *Process* Characteristics**

Multivariate analyses were used to explore the association between the *Process* characteristics of the DE role (discussion of the AADE7™ Self-care behaviours), and the characteristics of the DE role (profession, education, certification, practice-setting, and diabetes training) (see Tables 8 & 9). These tables display the odds ratios (OR’s) of binary logistic models for the dependent variable: discussion of the AADE7™ Self-care behaviours (the odds of reporting to always discuss each of the behaviours), as explained by explanatory variables (profession, education, certification, practice-setting, and DM-specific training). RD respondents were 3.47(95% CI: 1.73 to 6.95) times more likely than other respondents to discuss *Healthy Eating* with individuals. In contrast, RN respondents were 46% (OR 0.46; 95% CI: 0.23 to 0.91) less likely to discuss *Healthy Eating* compared to other types of respondents. Similarly, pharmacist respondents were 43% (OR 0.43; 95% CI: 0.15 to 1.22) less likely to discuss *Healthy Eating* compared to other respondents, although this OR was not significant. Respondents with a Master’s Degree or higher level of education were 1.30 (95% CI: 0.53 to 3.16) times more likely to discuss *Healthy Eating* as compared to other types of respondents.

RN respondents were 1.51 (95% CI: 0.72 to 3.17) times more likely to discuss *Being Active*, as compared to RD respondents who were 96% (OR 0.96; 95% CI: 0.48 to 1.90) less likely to discuss *Being Active*, and pharmacist respondents who were 61% (OR 0.61; 95% CI: 0.21 to 1.78) less likely to discuss *Being Active* when compared to other respondents. The odds of discussing *Being Active* were also slightly higher among respondents working in a community setting (OR 1.04; 95% CI: 1.01 to 1.07) versus respondents not working in a community setting.

RD respondents were 41% less likely to always discuss *Monitoring* with individuals compared to non-RD respondents (0.41; 95% CI: 0.21 to 0.81) (see Table 9). Conversely, respondents working in a hospital setting were 2.78 (95% CI: 1.42 to 5.46) times more likely to discuss *Monitoring* with individuals. Respondents working in a

**Table 9:** The Odds Ratios for the Frequency of Discussion of AADE7TM Self-Care Behaviours with Respect Respondents Level of Education, Certification, and Practice Setting

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| AADE7TM Self-care Behaviour | Characteristics of DEs | | | | |
| Diabetes-Specific Training | Certification | Master’s Degree of higher | Community setting | Hospital Setting |
| Unadjusted and adjusted OR(95% Confidence Interval) for always discussing the behaviour vs. not always | | | | | |
| Healthy Eating | 0.91 (0.46 to 1.81) | 0.45 (0.16 to 1.26) | 1.30(0.53 to 3.16) | 0.94(0.48 to 1.84) | 0.87(0.45 to 1.68) |
| Being Active | 1.19 (0.61 to 2.32)  0.99 (0.49 to 1.99)a | 0.73 (0.30 to 1.81)  0.62 (0.25 to 1.58)a | 0.55 (0.24 to 1.23)  0.51 (0.23 to 1.15)a | 0.61(0.31 to 1.20)  1.04 (1.01 to 1.07)a\* | 0.99 (0.52 to 1.89)  0.82 (0.42 to 1.60)a |
| Monitoring | 1.01 (0.52 to 1.95)  1.00 (0.51 to 1.98)b | 1.62 (0.70 to 3.79)  1.40 (0.58 to 3.35)b | 0.79 (0.35 to 1.79)  0.87 (0.39 to 1.98)b | 0.42(0.21 to 0.83)\*  0.81(0.29 to 2.32)b | 2.78 (1.42 to 5.46)\*  2.39 (0.86 to 6.61)b |
| Taking Medications | 1.38 (0.69 to 2.76)  1.43 (0.65 to 3.14)c | 2.98 (1.26 to 7.02)\*  2.49 (1.01 to 6.11)c\* | 0.91 (0.39 to 2.12)  0.74 (0.31 to 1.81)c | 0.38 (0.19 to 0.80)\*  0.82 (0.26 to 2.61)c | 2.88 (1.42 to 5.84)\*  2.19 (0.70 to 6.81)c |
| Problem Solving | 0.99 (0.51 to 1.91)  0.84 (0.42 to 1.68)d | 2.32 (0.88 to 6.15)  2.00 (0.73 to 5.43)d | 1.16 (0.51 to 2.62)  1.02 (0.44 to 2.38)d | 0.48 (0.25 to 0.92)\*  0.54 (0.28 to 1.05)d | 1.95 (1.02 to 3.71)\*  1.12 (0.40 3.13)d |
| Reducing Risks | 1.31 (0.68 to 2.50)  1.13 (0.58 to 2.21)e | 0.87 (0.37 to 2.04)  0.76 (0.32 to 1.83)e | 0.93 (0.41 to 2.13)  0.98 (0.44 to 2.19)e | 0.66 (0.35 to 1.25)  0.74 (0.38 to 1.42)e | 1.22 (0.65 to 2.30)  1.04 (0.54 to 2.01)e |
| Healthy Coping | 0.94 (0.46 to 1.89)  0.78 (0.37 to 1.61) f | 1.16 (0.45 to 2.96)  1.02 (0.39 to 2.68)f | 0.91 (0.37 to 2.23)  0.72 (0.29 to 1.79)f | 0.56 (0.28 to 1.12)  0.63 (0.31 to 1.29)f | 1.62 (0.82 to 3.21)  1.39 (0.69 to 2.82)f |

a Adjusted for the variable: Years of age

b Adjusted for the variables: Hospital practice setting, & Community practice setting

c Adjusted for the variables: Hospital practice setting, Community practice setting , Years of age, & Certification

d Adjusted for the variables: Years of age, & Community practice setting

e Adjusted for the variable: Years of age

f Adjusted for the variable: Years of age

hospital setting were 2.78 (95% CI: 1.42 to 5.46) times more likely to discuss *Monitoring* with individuals. Respondents working in a community setting were 42% (OR 0.42; 95% CI: 0.21 to 0.83) less likely to discuss the self-care behaviour, *Monitoring*.

Both RN (OR 2.03, 95% CI: 0.88 to 4.67) and pharmacist respondents (OR 2.58, 95% CI: 0.65 to 10.22) were near two times more likely to discuss *Taking Medications*, when compared to other types of respondents. RD respondents were 34% less likely to discuss *Taking Medication* (OR 0.34, 95% CI: 0.16 to 0.75) as compared to non RD respondents. Respondents with certification were also 2.49 (95% CI: 1.01 to 6.11) times more likely to report discussing *Taking Medications* compared to respondents without certification. Similarly, respondents practicing in a hospital setting were 2.88 (95% CI: 1.42 to 5.84) times more likely to report always discussing *Taking Medications* with individuals, as compared to respondents practicing in a community setting.

**Table 10:** The Odds Ratios for Rating the Importance of Diabetes Education *Outcomes* with Respect to Respondents’ Profession

|  |  |  |  |
| --- | --- | --- | --- |
| Types of *Outcomes* | Profession | | |
| Registered Nurses | Registered Dietitians | Pharmacist |
| OR(95% Confidence Interval) for rating the outcomes of high importance vs. not high importance\* | | | |
| Patient Knowledge and Skills | 0.66 (0.31 to 1.42) | 1.96 (0.92 to 4.14) | 0.35 (0.12 to 1.02) |
| Changes in Behaviour | 6.79 (1.53 to 30.12)\*  5.82 (1.28 to 26.44)a\* | 1.44 (0.60 to 3.46)  1.06 (0.41 to 2.73)a | 0.08 (0.03 to 0.26)\*  0.12 (0.03 to 0.40)a\* |
| Clinical Measures | 1.39 (0.59 to 3.27) | 0.73 (0.33 to 1.61) | 0.69 (0.21 to 2.34) |
| Health Status Measures | 1.32 (0.63 to 2.76)  1.96 (0.88 to 4.37)b | 1.16 (0.58 to 2.30)  0.84 (0.40 to 1.75)b | 0.56 (0.18 to 1.71)  0.62 (0.20 to 1.97)b |
| *Process* Measures | 1.62 (0.82 to 3.17) | 1.00 (0.53 to 1.89) | 0.52 (0.16 to 1.73) |

a Adjusted for the variable: Sex

b Adjusted for the variable: Years of age

Respondents practicing in a hospital setting were 1.95 (95% CI: 1.02 to 3.71) times more likely to discuss *Problem-Solving* as compared to respondents who practice in a community setting (OR 0.48; 95% CI: 0.25 to 0.92). No other significant differences could be found between respondents with regards to the discussion of *Problem-Solving*.

The odds of RN respondents discussing *Reducing Risks* (OR 2.74; 95% CI: 1.37 to 5.47) and *Healthy Coping* (OR 1.98; 95% CI: 0.96 to 4.10) were significantly higher when compared with non-RN respondents. There were no significant differences in the odds of discussing these two behaviours with respect to respondents’ certification, level of education, and practice setting.

**3.10 Multivariate Analyses of *Outcome* Characteristics**

Multivariate analyses were used to explore the association between the *Outcome* characteristics of the DE role (rated importance of outcomes across the DSME continuum), and the characteristics of the DE role (profession, education, certification, practice-setting, and diabetes training) (see Tables 10 & 11). These tables display the odds ratios (OR’s) of binary logistic models for the dependent variable; importance of outcomes across the DSME continuum (the odds of reporting of high importance each of the outcomes), as explained by explanatory variables (profession, education, certification, practice-setting, and DM-specific training).

RN respondents were 5.82 (95% CI: 1.28 to 26.44) times more likely to rate *Behavioural Change* outcomes as *highly important* to their practice, than non-RN respondents. In contrast, pharmacists were 12% (OR 0.12; 95% CI: 0.03 to 0.40) less likely to rate *Behavioural Change* outcomes of high importance to their practice. There were no other significant differences between respondents regarding other outcomes which included, *Patient Knowledge and Skills*, *Clinical Measures*, *Health Status* *Measures,* and *Process Measure* outcomes when comparing respondents by type of profession, level of education, practice settings, and certification.

**Table 11:** The Odds Ratios for Rating the Importance of Diabetes Education *Outcomes* with Respect to Respondents Level of Education, Certification, and Practice Setting

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Types of *Outcomes* | Characteristics of DEs | | | | |
| Diabetes-Specific Training | Certification | Master’s Degree and higher | Community Setting | Hospital Setting |
|  | OR(95% Confidence Interval) for rating the outcomes of high importance vs. not high importance | | | | |
| Patient Knowledge | 0.93 (0.43 to 1.99) | 1.05 (0.39 to 2.87) | 0.78 (0.31 to 1.94) | 0.69 (0.32 to 1.50) | 0.95 (0.45 to 1.98) |
| Changes in Behaviour | 2.50(0.88 to 7.12)  2.25(0.76 to 6.67)a | 0.42(0.09 to 1.93)  0.44(0.09 to 2.14)a | 1.18 (0.37 to 3.76)  1.10 (0.35 to 3.51)a | 0.48 (0.18 to 1.28)  0.54 (0.20 to 1.52)a | 1.41 (0.58 to 3.45)  1.30 (0.49 to 3.22)a |
| Clinical Measures | 1.38(0.60 to 3.17) | 1.24(0.45 to 3.41) | 1.26 (0.44 to 3.61) | 0.93 (0.42 to 2.06) | 1.73 (0.77 to 3.90) |
| Health Status Measures | 0.56(0.28 to 1.13)  0.68(0.33 to 1.41)b | 1.62(0.67 to 3.94)  2.04(0.80 to 5.20)b | 0.52 (0.22 to 1.21)  0.67 (0.28 to 1.59)b | 0.83 (0.41 to 1.69)  0.69 (0.33 to 1.45)b | 1.49 (0.74 to 3.01)  2.00 (0.94 to 4.24)b |
| *Process* Measures | 1.40(0.72 to 2.71) | 1.65(0.67 to 4.11) | 1.35 (0.60 to 3.05) | 0.93 (0.48 to 1.79) | 1.22 (0.64 to 2.33) |

a Adjusted for the variable: Sex

b Adjusted for the variable: Years of age

**Chapter 4: Discussion**

**4.1** **Overview of Chapter**

The purpose of this study was to explore the components of the role of DEs in Ontario. The study was conducted in two main parts: 1) development and preliminary pilot testing of the DEQ; and 2) administration of the DEQ to DEs across Ontario. Chapter four discusses some of the key results from the participating DEs, as well as the strengths and limitations. This thesis work was the first provincial cross-sectional study of DEs in Ontario. The DEQ is a unique tool to describe the role of DEs, and was created using the Donabedian framework and the *International Standards for Diabetes Education* (2009). Given the current paucity in literature describing the role of DEs in Ontario, the data collected in this study provides a foundational understanding of the role of DEs in Ontario.

Although a low response rate limits the conclusions to be drawn from this study, the results suggest that the roles vary with respect to the DE’s practice setting, profession, and level of education. These variations in DEs roles provide important insight and implications for practice, policy, education, and future research into the role of DEs in Ontario. Further consideration of these implications would need to be supported by additional research and evidence.

**4.2 Development and Psychometric testing of the Diabetes Educator Questionnaire (DEQ)**

**4.2.1 Development of the Diabetes Educator Questionnaire (DEQ)**

Development of the DEQ included multiple phases; Phase 1 (pretest), Phase 2 (pilot test), and Phases 3 (Grand River DES) and 4 (Ontario-wide). In accordance with Streiner and Norman’s standards (2009), the development of the DEQ included both pilot testing and review by a panel of experts (2008). In Phase 1, we conducted a pretest to establish the readability, comprehensiveness, and time to completion of the DEQ, by having the original draft of the DEQ completed and reviewed by several DEs. In Phase 2, we conducted a pilot test helped to determine the feasibility of the online version of the DEQ. As outlined by Streiner and Norman (2009), both the pilot test and the pretest sampled DEs of differing professions, levels of education, and practice settings, to promote the representativeness of the data collected (2008). Respondents in Phases 1 and 2 were requested to provide feedback on both the readability, ease of completion, and comprehensiveness of the DEQ. Thus, both samples also served as a form of expert review of the DEQ. As described by Streiner and Norman, an expert panel can include “people who are representative of those with whom the [tool] will ultimately be used” (2009, p. 374). With both samples in Phases 1 and 2 being comprised of practicing DEs, their review would be able to identify any errant forms of jargon, or barriers to the understandability of the questionnaire (Streiner & Norman, 2008).

With the exclusion of only minor changes to the phrasing of several questions, the initial draft of the DEQ progressed through the all phases of the study without any issues related to readability and understanding; thus no changes to the structure or format of the DEQ were required. Similarly, data from all questions contained in the DEQ could be cleaned and analyzed, suggesting the DEQ demonstrated adequate readability and ease of completion.

**4.2.2 Validity of the Diabetes Education Questionnaire (DEQ)**

One characteristic of an ideal questionnaire, outlined by Streiner and Norman is the ability to demonstrate validity (2008). The development of the DEQ employed several strategies to establish the validity of the DEQ. First, the inclusion and exclusion of items in the DEQ was informed by the IDF *International Standards for Diabetes Education* (2009). These standards were developed by a committee of international experts in DSME, and founded on current scientific literature. Using the three standards, *Structure*, *Process*, and *Outcomes*, which are found in both the Donabedian framework, as well as the IDF standards, the DEQ provides a theoretical framework for the scope of the DE role, and the individual items included in the DEQ. For *Structure* standards, the DEQ collected data on the types of profession, level of education, employment status, practice setting, and allocation of DEs’ time, to determine how the role of DE is structured. In accordance with *Process* standards, the DEQ collected data on initial assessment criteria, delivery of DSME, topics included in DSME, use of teaching/learning models, use of behavioural change strategies, and the discussion of the AADE7 self-care behaviours. Lastly, in accordance with *Outcome* standards, the DEQ collected data on the types of criteria DEs use to measure knowledge, application of knowledge, clinical change in the individual with DM, as well as their perceived importance of DSME outcomes. By providing justification for each item in the questionnaire as it relates to the standards, as well as the incorporation of all three standards in the DEQ (see *Sections 1.10, 1.11, 2.6* and *Appendix D*), content validity was demonstrated. Similarly, having the DEQ reviewed, in both the pretest and pilot test, further strengthened the face validity of the questionnaire. The positive feedback by the reviewers suggests that an acceptable level of face validity was achieved.

Although this study utilized several strategies to improve the validity of the DEQ in measuring the DE role, there were limitations to the validity of the DEQ, specifically, criterion validity. As mentioned in *Section 1.9.3*, criterion validity is a measure of how well the questionnaire, both as a whole, and each item in the questionnaire, investigated the intended object of study, as compared to the gold standard. As the literature search demonstrated, there is currently no questionnaire available, to describe the role of DEs in Ontario, and consequently no gold standard. Thus, the *International Standards for Diabetes Education* served as the next best option (2009). Although these standards are not specific to the Ontario context, they describe how the role of DEs across the world should be performed, based on current evidence and expert consensus. This international focus assisted in identifying aspects of the role in Ontario that may be improved. Similarly, further validation of the DEQ items using the CDACPG, current evidence-based guidelines developed for the Canadian healthcare system, contextualize the DEQ to the Ontario population of DEs (2013).

**4.3 Key Findings of Phases 3 & 4**

**4.3.1** *Demographic Characteristics*

To address **Research Question 1** regarding what are the characteristics of diabetes educators in Ontario, demographic data was collected in Phases 3 and 4 and analyzed using descriptive and multivariate analyses. As seen in Table 1, most of the respondents were females (93.8%), over 40 years of age. Respondents had approximately ten years of experience in the DE role. With the exception of diploma-prepared RNs (30%), all respondents in the study had at least a Bachelor degree or higher. The higher proportion of Bachelor prepared DEs is consistent with the professional requirements of RNs, RDs, and pharmacist. Similarly, the higher proportion of Master’s degrees among nurse practitioners respondents is also consistent with the provincial professional requirements of nurse practitioners (NPAO, 2011). The results also suggest that DEs are predominantly working in full-time positions, although it is unclear whether respondents were practicing full time in the role of DE, or in various roles including DE.

Levels of certification among all types of respondents were considerably high. Overall, the majority of respondents (85%) had CDE certification. This finding suggests that the majority of DEs in Ontario find obtaining certification of value to their practice.

There were a higher proportion of RD respondents (53%) compared with RNs (37%, including nurse practitioners) and pharmacist respondents (10%). The high proportion of RD respondents observed in this study differs from a 2008 National DES membership survey. The DES membership survey had a sample of 300 DEs, of which the majority were RNs (50%), followed by RDs (40%), and lastly pharmacists (5%) (DES, 2009). These differences in findings highlight the possibility of concerns regarding the representativeness of the sample collected in Phases 3 and 4. Admittedly, the objective of DES membership survey differed considerably from the DEQ, which may explain the observed differences. The DES membership survey focussed on collecting DES membership feedback, whereas the objective of the DEQ was to study the role of DEs across Ontario. Similarly, the DES membership survey was conducted through the CDA website, whereas the DEQ was conducted through the DES chapters. These differing sampling frames could possibly explain the differences in findings.

Although some differences exist between the findings of the DES membership survey and the DEQ, both suggest that DSME in Ontario is provided in a multidisciplinary manner predominantly by the RN, RD, Pharmacists and NPs These professions, have been recommended by the CDACPG to be important in assisting with the management of DM (2013). As summarized by the CDACPG, meta-analyses of eleven randomized controlled trials support the role of physician and RNs in the DM management, whereas the evidence supporting the role of RDs and pharmacists is limited (CDACPG, 2013). The CDA also identifies, using two meta-analyses of randomized trials, that DM care needs to be provided by a specialized interprofessional team (CDACPG, 2013). As identified in this study, the provision of DSME, as a component of DM care, includes RN, RD, nurse practitioner, and pharmacist DEs.

The predominance of these four professions in the role of DE may also be a result of their eligibility to obtain certification in Canada. Although in Canada certification is restricted to professionals with membership in a recognized regulatory college/body, such as these four professions, other countries have opened certification to many other professionals as well (see *Appendix B*). If this were to occur in Canada, it is possible a differing population of DEs would be observed. Some additional professions that could potentially be included are chiropodists, podiatrists, and physician assistants, as these professionals are involved in managing DM, and are also included in certification in Australia, and the United States (ADEA, 2007; AADE, 2012).

*Practice Setting and Patient Population*

The findings from this study describe the role of DEs to be predominantly located in an outpatient, primary, or hospital setting. Although there were some respondents practicing in inpatient hospital settings, the result of this study suggest that the outpatient, family health team, and community healthcare settings, are where the majority of DE respondents practice. The higher proportion of DEs in these settings is consistent with the distribution of diabetes education programs (DEP), reported by Amirthavasar ( 2012), in that only 41% of DEP’s were in acute care centers, whereas 53% were in community-based settings. Both the findings from Phases 3 and 4, and Amirthavasar et al suggest that in Ontario the provision of DSME is deferred primarily to settings where the individual with DM has a more active role in managing and accessing their care (2012). This finding is also in accordance with the CCM which places increasing level of management on the individual with DM (MoHLTC, 2007; CDACPG, 2013). As mentioned previously, the high prevalence of DM in Ontario suggests that there is a need for the individual living with DM to take on a more active role in DM management (MoHLTC, 2012; MoHLTC, 2007). Thus, this finding supports the current trends in the management of chronic disease in Ontario (CDACPG, 2013).

The location of respondents, as described in *Figures 1* & *2*, outline differences in the roles of DEs. The predominance of RD respondents in remote, rural hospital outpatient settings, as compared to other respondents, seems to suggest that in these settings, the role of DE may be delegated exclusively to an RD as the sole DE. In comparison, the results suggest that in more urban areas, DSME is shared between RDs, RNs, and occasionally pharmacist respondents practicing within an interprofessional team in a family health team, community health center, or hospital setting. Further, to provide the full breadth of DSME, these DEs may possibly have a broader scope of practice, as compared to DEs in an interprofessional setting. The possibility of a sole educator in these remote hospital settings, suggests that differing educational requirements may be needed in these remote settings to ensure that all aspects of DSME are provided. In comparison to RDs practicing in a clinical setting, where DSME may possibly be tailored to the expertise of their profession, these sole RD DEs may require additional training to provide a broader form of DSME. With limited respondents in these remote locations, the existence of this type of sole DE role in rural settings would need to be verified by future studies. Similarly, the needs of individuals receiving DSME would need to be assessed first, to determine if gaps in the provision of DSME truly exist in these remote settings.

The high prevalence of pharmacist respondents practicing in pharmacy settings is also noteworthy. Unlike hospitals, family health teams, community health centers and pharmacies are typically for-profit corporations. Thus, as members of these corporations, it is possible these DEs work under considerably different governing *Structures,* which would dictate their role (e.g., differing performance measures), as compared with DEs in a setting funded by the provincial healthcare system. From a policy perspective, care needs to be taken to ensure that the *Structures, Processes,* and *Outcomes* of DEs role both in for-profit, as well as not-for profit healthcare agencies do not jeopardize the provision of a tailored, learner-centered approach to the role of DEs in Ontario. With growing time constraints and tight budgets, strategies by healthcare agencies to cope with these demands needs to ensure that the provision of all aspects of DSME remains essential to the DE role, to promote DSM.

The data from this study also provide some insight into how the current landscape of DEs meets the needs of Ontario’s population with DM. It appears that the majority of DEs see patients with complex DM. As defined in this study, patients with complex DM typically have multiple co-morbidities and complications, and thus, require more support related to problem-solving, coping, and managing the concerns of DM within the context of multiple chronic conditions. It is interesting to note, RNs and NP respondents were more likely to report caring for patients with complex DM, compared with the other providers. This may be due to the extended medical management that some RN DEs, as well as nurse practitioners provide, either through medical directives or legislation. As mentioned above, with an increasingly older population with DM in Ontario, DM care in general is likely to increase in complexity. Educating DEs who are involved in the care of these complex patients, regarding the management of DM in the context of multiple co-morbidities may be beneficial to ensure that this growing population is adequately assisted. Limited literature exists on DM management in the context of multiple co-morbidities, however, this component of DM care highlights the need for DSME in Ontario not to function in a disease-specific paradigm. Particularly in providing DSME to older adults, incorporating care of multiple co-morbidities into DSME, may help ensure both improved DM and health outcomes (Sinclair et al, 2012).

*Structural Characteristics of the Role of Diabetes Educators*

The *Structure* of the role of DEs used in this study was based on the allocation of DEs work time (hours) with respect to activities related to the role of DE. Not surprising, DEs spent the majority of their time providing DSME and DM management. Compared to other types of respondents, the greater amount of time spent by RN respondents on medical management suggests that for some RNs respondents their role may include more than providing DSME, but also advanced (i.e. medical) interventions. Although this may be highly related to the scope of practice of RNs and nurse practitioners, versus other professional DEs, it could possibly indicate a major difference in the role of DEs. For example, the role of an RN DE who is actively titrating and adjusting DM medications is likely to be different from an RN DE who provides education primarily on SBGM and monitoring health parameters. Spending more time performing medical management activities, suggests that perhaps these RN DEs may need additional training or certification, which includes advanced medical preparation. By differentiating DE certification it may possibly ensure that adequate competencies in medical management of DM are attained by DEs involved in medical management.

As evidenced by this study, administrative tasks also appeared to consume a considerable amount of DEs time. Although administrative tasks (e.g., scheduling, program statistics, etc.), are a necessary part of all DEs roles, this finding suggests that administrative tasks may be an aspect of the role that could possibly be reduced, to maximize the time available to provide DSME to individuals with DM. Interestingly, pharmacist respondents estimated the lowest amount of time spent on administrative tasks. With pharmacists being typically in a commercial, for-profit setting, this suggests that in their role they may have developed effective strategies to minimize the time devoted to administrative tasks, as compared to DEs in not-for-profit healthcare settings. In determining strategies to reduce the time spent on administrative tasks in the health care system, it may be beneficial to look to these pharmacist DE roles for insight into minimizing this time.

It is also interesting to note that DEs spent a limited amount of time providing education to other professionals on DSME. In the Ontario healthcare system, specialized expertise in DSME is limited and needs to be used as efficiently as possible, particularly as the prevalence of DM increases. The CCM, adopted by the Ministry of Health and Long-term Care, identifies the need for clinicians and non-clinicians to work together to address the needs of the individual (2007). By educating other professionals, DEs can potentially build the quality of DSMS provided by non-DEs. Defining respective roles can also facilitate this process. DEs, as specialists in DSME would focus their expertise on the provision of DSME and supporting individuals with complex DM, which require more specialized assistance and expertise related to DSM, and thereby allow other health care professionals to provide broader support for DSM. In accordance with the CCM, collaboration and education of non-DE healthcare professions, by DE, may allow for more efficient and comprehensive DM care. If these findings were to be validated by future studies, this is perhaps an area of the role of DEs that could be further developed in the future.

The results of this study indicate that respondents devoted a considerable amount of time to professional development activities. Workshops and conferences appear to be the greatest sources of professional development. These findings may possibly be related to CDE certification requirements, given that the majority of respondents were CDEs. CDEs are able to receive credits by attending workshops and conferences related to DSME, and put these credits toward recertification. The higher time estimates for professional development activities by RN respondents, as compared to RDs and pharmacist respondents is noteworthy. Although this may reflect the availability of professional development opportunities for the respective professions, it may also indicate the perceived importance and relevance of these opportunities.

**4.3.2** To address **Research Question 2,** regarding what *Processes* diabetes educators use to provide diabetes self-management education, the researcher used analyzed data collected using the DEQ in Phases 3 and 4. The data was taken predominantly from DEQ questions which described methods used by DEs to provide DSME. Data was analyzed using descriptive and multivariate analyses.

*Initial Assessment*

Both the CDA and IDF emphasize the importance of a learner-centered approach to the provision of DSME (CDACPG, 2013; IDF, 2009). Thus, an initial assessment by a DE needs to encompass all essential aspects of the learner. From this study, the majority of respondents indicated that they included many aspects into their initial assessment, as recommended by the IDF, such as an individual’s diabetes knowledge, self-care ability and behavioural goals (2009). The lower reported consideration of culture and learning style in the initial assessment suggests that these components are not as frequently considered by DEs in the provision of DSME, as other criteria included in their initial assessment. A Cochrane review of eleven clinical trials (n=1603) indicated that effective education is delivered in a culturally appropriate and learner centered manner (Hawthorne, Robles, Cannings-John & Edwards, 2008). Perhaps, by continuing to develop more tailored education, and a greater emphasis on making DSME culturally appropriate, these components of initial assessments may become more widely used.

Another interesting finding of this study was that the initial assessments by pharmacist DEs are limited in scope and were less encompassing than those of other DEs. With self-reported assessments lacking cognition/literacy, personal supports, readiness for change, safety, and psychosocial status assessments, it is difficult to determine the extent to which individualized care can be developed for the individual with DM. This finding may be due to the time constraints imposed by working in a for-profit, pharmacy setting, as compared to other settings, where there is support for the time to conduct a more in-depth assessment. It may also speak to the pharmacists’ scope of practice, with a greater focus of the DSME they provide directed to the use of DM medication and monitoring supplies, rather than building other DSM behaviours. Perhaps greater clarity, by the CDECB, or the CDA, on how individualized DSME is to be determined may help demonstrate the value of including these components as part of the initial assessment, in the provision of DSME by pharmacist DEs. In addition, this finding suggests that the role of pharmacist DE may need to be integrated further into the interprofessional team. With increased collaboration between pharmacists and other DEs, all aspects of the individual’s DM management and education needs may be assessed.

*Provision of Diabetes Self-Management Education*

DSME can come in many different forms. This study indicates that the most common manner in which DSME was delivered by respondents is through face-to-face conversations with individuals. This suggests that DSME is already provided on an individual basis. Thus, as the CDACPG emphasize the need for DSME to be learner centered, this one-on-one method of providing DSME serves as an ideal way to ensure that an individualistic, and person-centered approach can be achieved (2013). In contrast, the high reported use of information sheets and pamphlets, suggests that most DSME is also performed in a less interactive manner. However, how and when pamphlets or information sheets are used in providing DSME remains unknown. This information may provide further insight into how DEs build DSM behaviours of individuals. There is evidence to support the use of written materials, but care would be needed to determine whether they can be used as the sole delivery of education or merely as additional support (Farrell-Miller & Gentry, 1989).

The use of online communication, although low in comparison to other delivery models, may highlight a growing frontier in DSME. With the increasing use of the internet and hand held personal computers, this may be an opportunity to explore alternative modes of delivering DSME in Ontario (Sherifali, Greb, Amirthavasar, Hunt, Haynes, Harper et al, 2011; Bond, Burr, Wolf, McCurry & Teri, 2006; Kodama et al, 2012; McCarrier et al, 2009; Ralston, Hirsch, Hoath, Mullen, Cheadle & Goldberg, 2009). Similarly, the higher levels of PowerPoint presentations and email usage in the hospital setting, suggests a promising avenue from which to implement these types of interventions. Recent research also indicates that internet monitoring of individuals blood glucose records by the DE can improve glycemic control (Tildesley et al, 2013).

In addition to electronic communication, providing DSME in a group setting may also be of benefit to DEs. In the *International Standards for Diabetes Education*, it is identified that DSME provided in a group sessions is just as effective as individual one-on-one education (IDF, 2009). A meta-analyses of 11 studies (n=1532) demonstrated that patients who attended a group-based session had a 1.4% reduction in glycated hemoglobin (A1C), as compared to standard treatment (p<0.01). The results indicate that pharmacist respondents used group sessions less frequently, compared to other providers. Although the limited use of group sessions may be a result of the time and space constraints related to the setting of a pharmacy and community clinic, the effectiveness of group-based education, as indicated by the literature, suggests that providing DSME in a group setting may be a promising strategy for DEs to consider. With the growing prevalence rate of DM in Ontario, an increased use of group sessions may also allow for more efficient use of DE expertise.

*Topics of Diabetes Self-Management Education*

This study provides knowledge of the types of topics that respondents incorporated into DSME they provide, as well as the frequency with which these topics are covered. Many of the topics used by respondents appear to be reflective of their professional designation. For example, *Healthy Eating* was most frequently used by RD respondents, whereas topics such as medical management, *Monitoring*, and *Taking Medications,* were used more frequently by RN respondents. As expected, these findings suggest that although each respondent is a DE, many appear to focus the provision of DSME on the expertise of their professional scope of practice. Within an interprofessional healthcare team this diversity would be expected to prevent overlap of DSME. Perhaps in more rural areas where individuals have limited access to other healthcare professionals, the possibility of a more focussed provision of DSME by a single provider may result in individuals not receiving all aspects of DSME. In particular, more frequent use of *Healthy Coping* and *Reducing Risks* by RN respondents, compared to other respondents, suggests that in the absence of RNs these essential components of DSME could possibly receive less attention. Both *Healthy Coping* and *Reducing Risks* behaviours assist in the sustainability of other DSME behaviours and the prevention of additional complications (AADE, 2011a). Similarly, the limited discussion of *Problem-Solving* behaviours by respondents practicing in the community setting may also be an area to further explore in future research, and an area where DEs need more education. Building problem-solving skills in individuals with DMs, not only improves DM outcomes, but can also improve the performance of other self-care behaviours (Agema, Sherifali, 2012, Hills-Briggs & Gemmell, 2007). Thus, discussing problem-solving is important, regardless of the setting in which DSME is provided.

Another interesting finding from this study is the apparent triaging of DSME. In comparing respondents practicing in a hospital versus a community setting, there appeared to be a corresponding division of DSME. From this study, it appeared that among respondents practicing in a hospital setting, there was a greater focus on insulin pumps and DM in pregnancy. As outlined by the CDACPG in the *Organization of Diabetes Care*; individuals with Type 1 DM, or DM in pregnancy, require an interprofessional team which includes a physician (CDACPG, 2013). Thus, the findings of this study appear to reflect this recommendation. In addition, the frequent discussion of medical management, and *Taking Medications*, was more likely among respondents who are CDEs. This finding seems to indicate that certification provides DEs with added accreditation to be involved in the more acute aspects of DM care. The role of the CDE may possibly differ from that of a non-CDE in terms of role. It could also indicate that some CDEs have a greater scope of practice which includes more medical management, than other DEs. Greater clarity with regards to what these various roles entail, and the necessary educational preparation to support this added scope of practice, may enable further development of the DE role. In the United States, the role of Board Certified Advanced Diabetes Manager (BC-ADM) was created for CDEs with extended roles and expertise in DM management. A similar type of DE role in Canada could conceivably serve to define those CDEs with extended scopes of practice, and differentiate them from other CDEs. Differentiating these two DE roles may enable more appropriate training and educational opportunities to be developed, to better meet the needs of the respective roles.

**4.3.3** To address **Research Question 3,** regarding what *Outcomes* do diabetes educators (DE) use to measure the effectiveness of diabetes self-management education (DSME), the researcher used analyzed data collected using the DEQ in Phases 3 and 4. The data was taken predominantly from DEQ questions which described the outcomes and measures used by DEs to evaluate DSME. Data used in this section was analyzed using both descriptive and multivariate analyses.

As members of the healthcare team, DEs, like other healthcare professionals, use measures to guide their practice. From this study, it was evident that there were multiple measures used by respondent, namely, levels of individual’s knowledge, verbal confirmation, and observing return demonstrations/skill assessments. These measures are subject to both the individuals providing the confirmation, as well as the DE evaluating them. Thus, unlike other measures, verbal confirmation and return demonstrations, although greatly individualized, are difficult to quantify. If done properly, they allow the DE to determine whether the specific needs of the individual have been addressed. However, in an evidence-based healthcare system it may be beneficial for DEs to develop quantitative tools to more objectively describe the outcomes associated with DSME. When looking to measure behavioural change in DSM, the *Stanford self-efficacy scale*, *Summary of diabetes self-care activities*, *Patient activation measure*, and *Diabetes problem-solving interview* are all examples of tools developed to measure perceived behavioural change (González, Stewart, Ritter, & Lorig, 2005; Toolbert, Hampson, & Glasgow, 2000; Hibbard, Stockard, Mahoney, & Tusler, 2004; Wysocki et al, 2008). However, this study found that these tools were used infrequently by respondents, highlighting a possible area for further education of DEs. Perhaps greater attention at a policy level to these types of quantifiable outcomes may serve to increase their importance among DEs and further their incorporation in training and education for DEs. Similarly, knowledge assessment questionnaires were also used by very few DEs. Perhaps with more tailoring of assessment tools to the diversity or individuals with DM their use will increase.

As stated by the IDF standards, one of the goals in the provision of DSME is to create positive behavioural change in the individual with the intent of improving self-management of their DM (2009). The perceived importance of behavioural change in the role of DEs was evidenced by the high reported use of goal setting (70%; see Figure 10), and other behavioural change strategies, by respondents. Respondents also reported goal attainment as a common outcome to measure behavioural change. In the provision of DSME, one of the key messages put forth by the CDACPG is the need to empower individuals to achieve their personal goals (2013). Collecting both the initial goals of the individual, and whether the individual achieved the goal, provides DEs with a valuable indicator of the effectiveness of the DSME provided. The IDF identifies that this data can also function in the assessment of DSME services (2009). As in the case of verbal confirmation described above, it would be interesting to further explore how these goals were tabulated and evaluated by each respondent to determine how this data would inform their future practice. Nevertheless, personalized goals do provide DEs with an individualized indicator of the learning and acquisition of DSM behaviours of the individual with DM. In addition, they appear to further support the application of behavioural change theories into the practice of DEs, in particular, that of Bandura’s *Social Cognitive Theory* (Bandura, 2004).

Although the use of goal attainment and goal selection were used by the majority of respondents in this study, their relative importance varied with respect to professions. RN respondents were more likely to rate behavioural change outcomes as high in importance, compared to other providers, suggesting that RNs found behavioural outcomes important to their practice. This finding was interesting, especially when considering that RD respondents reported higher use of goal setting as a topic included in the provision of DSME, higher use of personal action plans, and higher use of appropriate selection of goals as outcomes to assess individuals’ knowledge. Surprisingly, RD respondents rated behavioural change outcomes lower in importance, compared with other respondents. In the evaluation of DSME provision, positive behavioural change was considered to be an important variable to measure the application of knowledge (IDF, 2009). These types of outcomes provide clinically meaningful information to evaluate how the provision of DSME impacts individuals’ self-care behaviours. Lower perceived importance of behavioural change outcomes by RD and pharmacist respondents suggests that further exploration of the use and perceived importance of these outcomes among RDs and pharmacists may be of value. With the provision of DSME guided by a medical model of health care, it is possible that at a systems level, the use of these non-physiological outcomes is undervalued. Perhaps greater attention to how these outcomes translate to physiological outcomes is warranted to help increase their perceived importance and usage.

In conceptualizing outcomes used by DEs, the *DSME Outcome Continuum* is a framework outlining the use of DE outcomes across the continuum of care (Mulkahy et al, 2003; AADE, 2009). The findings of this study indicate that respondents used outcomes from across the *DSME Outcome Continuum*, namely immediate, post-immediate, and long-term outcomes. Interestingly, the use of self-blood glucose monitoring (SBGM), and (A1C) were reported to be used to not only assess knowledge, but also the application of knowledge, and clinical changes. Although the use of SBGM is considered by the *DSME Outcome Continuum* as a measure of behavioural change, A1C is a measure of clinical improvement, by providing an indication of blood glucose levels over the past three months (Mulkahy et al, 2003; AADE, 2009; Selvin et al, 2010). It is only after three months of implementing and sustaining a change in behaviour, will the A1C reading provide an indication of whether the changed behaviour improves glycemic control. Chronic hyperglycemia, hypoglycemia, and other forms of poor glycemic control over the past three months will influence an A1C value, and potentially mask the magnitude of a positive change. Thus, the use of A1C as an evaluation of knowledge acquisition, and application should be used retrospectively, to validate previous education, rather than existing knowledge.

It is also important to contextualize changes in A1C with other outcomes listed in the *DSME Outcomes Continuum*. Especially in older adults, improved DSM skills do not necessarily translate into improved A1C. For example, an individual with frequent hypoglycemia may have a low A1C value, suggesting optimal glycemic control; however, this low A1C value may be reflective of poor DSM. A large cross-sectional study found a strong association between a lower A1C (less than 7.0%) and in increased risk of moderate and severe hypoglycemia (p=0.001) (Davis, Keating, Byrne, Russell, & Jones, 1997). With the recommendations by the CDACPG to provide tailored DSME, it implies use of tailored outcomes to evaluate the DSME (2013). Individualized improvements to self-care practices and behaviours suggest the need to broaden the current spectrum of DSME outcomes to aptly measure these changes.

**4.3.4** To address **Research Question 4;** regarding what are the barriers and facilitators to the role of Diabetes Educator in Ontario, the researcher used analyzed data collected using the DEQ in Phases 3 and 4. The data was taken predominantly from DEQ questions which described facilitators and barriers identified by DEs in the provision of DSME. Data was analyzed using descriptive and multivariate analyses.

In addition to evaluating characteristics of the role of DEs, this study also investigated the perceived facilitators and barriers to the implementation of the DE role. Time and sufficient resources were two of the most common facilitators to the role of DE, as indicated by respondents. In contrast, insufficient time and resources were the two most common barriers to the role of DE. With no previous data on DEs in Ontario, it was difficult to determine how influential these variables are to the role of DE, in comparison to other healthcare professionals. Similarly, it may be of benefit to further explore the specific types of resources, and time demands that DEs perceive as being most influential to their role. The perception of insufficient time was most commonly identified by respondents who practiced in a hospital setting, as well as those with certification. A possible explanation for this perception may be that both CDEs, and DEs practicing in hospital settings, see more acute and/or complex patients, and thus, require more time to provide DSME. Similarly, the increased time allocated to medical management seen among CDEs in this study, may create constraints on their ability to have sufficient time to provide DSME. It is also interesting to compare this to the challenges identified by Amirthavasar et al (2012), who found that among program managers, the highest reported challenges were coordination/communication with other healthcare providers, rather than time and resources. This discrepancy in findings may be indicative of varying perspectives between DEs and managers with regards to the needs of DEs in the provision of DSME.

In support of Amirthavasar et al’s (2012) findings, the influence of management support, medical directives, and access to other members of the health care team were also identified by respondents in this study to be both barriers and facilitators, highlighting the challenge of communication between healthcare professionals (2012). With the adoption of the CCM, the CDA emphasizes the need for an interprofessional and collaborative team of healthcare professionals, including physicians, and specialists, to be involved in the organization of DM care (CDACPG, 2013). These findings suggest that there may be barriers to the ability of DEs to collaborate and communicate with other members of the interprofessional team. In particular, respondents described ineffective communication between DEs and physicians.

This study only provides the perspective of respondents who are DEs, and it would be interesting to investigate the perspective of physicians and other members of the healthcare team. Nevertheless, these findings appeared to highlight that barriers to interprofessional collaboration exist within the DM healthcare team. These findings also suggest that the barriers to implementation of the role of DEs are multi-level and exist at the provider level, as well as the systems level. A perceived lack of organizational and healthcare system support for the role of DEs suggests that research strategies investigating the effectiveness of DEs, using appropriate outcomes, may be beneficial to further validate this role in the healthcare system, and encourage other healthcare professionals to include DEs in care of individuals with DM.

Although this study identified the influence that relationships between DE and other members of the healthcare team had on the role of DEs, this study also found that DE-patient relationship dynamics could possibly impact their role. When asked what DEs perceived as the greatest benefit of their role, many common responses followed these themes: building knowledge, self-efficacy, and self-management skills of individuals with DM. This suggests that DE’s believe that building individuals’ knowledge, behaviours, and skills can be most beneficial to individuals with DM. These statements seem to emphasize respondents’ belief in the effectiveness of the DSME which they provide. In contrast, a common theme that respondents identified as a limitation to their role was the individual’s acceptance of DSME. These respondents commented that although they have the knowledge and ability to provide individuals with the knowledge, behaviour, and skills related to DSM, they were often hindered by the individual’s preferences and unwillingness. This perspective suggests that in some DE-patient relationships there exists a difference of perceived purposes of DSME between the DE and the individual with DM. Current viewpoints at the policy level suggest that DSME is to be provided in a learner-centered approach (IDF, 2009; CDA, 2013). In a learner-centered approach to DSME, the needs and goals of the individuals with DM are continually assessed, established collaboratively and evaluated (IDF, 2009). Thus, as healthcare professionals great care needs to be taken to ensure that it is the individual’s own goals, readiness to learn, and changes in behaviour which are being sought, rather than those of the DE.

Many individuals’ goals may initially be contrary to the evidence-based recommendation which DEs suggest. However, through the incorporation of behavioural change theories (e.g., *Transtheoretical* *Stages of Change),* DEs can work with the individual to facilitate a shared decision-making process, and facilitate positive behavioural changes. In this way DEs can also explore the factors contributing to individuals’ initial lack of readiness to change self-care behaviours and possibly minimize them, or offer an alternative.

**4.3.5** To address **Research Question 5;** regarding what aspects of the role of diabetes educator are associated with the *Structure*, *Process*, and *Outcomes* of the role of diabetes educators, the researcher performed further multivariate analyses of *Structure*, *Process*, and *Outcomes* variables. These analyses included linear and logistic regressions. In this section, significant associations between these outcomes and other components of DEs’ roles are discussed.

One of the key findings of this study was that the roles of DEs are not homogenous in Ontario. Significant variations were found between roles of DEs, with respect to the *Processes* used to provide DSME, and the *Outcomes* used to evaluate DSME. As evidenced by the multivariate analyses performed after Phase 3 and 4, some of the variation in roles of DEs can be explained in terms of the profession, practice-setting, certification and education level of the DE. When looking across the *Structure*, *Process*, and *Outcome* variables of this study, the most considerable variation in the results is explained by respondents’ professional designation (i.e., RN, RD, or pharmacists), particularly in relation to the *Process* dependent variable, namely the discussion of AADE7 Self-care behaviours. As the findings indicate, there were significant differences with respect to DEs’ profession, in the frequency of discussing the AADE7 self-care behaviours, in particular, the discussion of *Problem-Solving*, *Healthy Coping*, and *Reducing Risks* between RN, RD, and pharmacist respondents. The second largest source of variation between roles of DEs found in this study was the setting in which respondents practiced. Topics included in DSME differed between hospital and community settings. Lastly, certification, and level of education, also served to explain some of the variation observed in respondents, in particular, the use of medical management in the role of DE. These sources of variation in the role of DEs may have implications for practice, policy, and education if validated by future research. They also highlight the need for greater clarity in defining the role of DEs. The variations between DEs identified in this study are consistent with the findings of Amirthavasar et al, who described DEPs across Ontario (2012). Their study demonstrated that considerable variation exists in DEPs across Ontario, in terms of the complexity of individuals with DM accessing DEPs, and the level of DSME provided. This variability may provide some explanation for the variation observed in Phases 3 and 4 of this study. Perhaps the variability observed in DEPs has either influenced, or have been influenced by, the variation in the *Structure*, *Process*, and *Outcomes* of the DEs’ roles. Although this may be a plausible explanation for DEs working in DEPs in Ontario, it provides less explanation for DEs who practice outside of a DEP. Regardless of the sources of variation between DEs, the presence of differing DE roles suggests the need revisit current definitions of DE roles in Ontario.

In contrast to the *Process* and *Outcome* analyses, the analyses of the *Structure* dependent variable, namely the hours spend on activities related to the role of DE in the past 6 months, resulted in very limited findings. Possible reasons for the lack of explanatory variables may be the error of respondents’ estimations and recollection. There was a large range in responses, and consequently a high standard deviation (see Tables 2 & 3). By asking respondents to think back six months and estimate their hours on various activities, it may have been difficult for respondents to determine an appropriate or valid response. Perhaps in future studies with the DEQ, shorter time parameters (e.g., one month, or one week) for this question may be necessary to obtain more realistic and accurate responses.

**4.4 Strengths and Limitations of the Diabetes Educator Questionnaire**

**4.4.1. Use of Technology**

In addition to both the validity and development of the DEQ, another strength of the DEQ was the use of an online questionnaire. Sending out the DEQ electronically not only minimized printing costs, study duration, and the manual tabulation of respondents’ data, but also enabled respondents to complete the study at their own convenience. A previous systematic review of 17 observational studies using electronic questionnaires, identified that electronic questionnaires can be beneficial to collect a considerable amount of data in a short period of time (Braithwaite, Emery, de Lusignan, & Sutton, 2003). The review also identified that another benefit of using an electronic questionnaire is the ease of sending the questionnaire to a large sample population, as compared to telephone or mailed questionnaires. For example, in transitioning from Phases 3 to Phase 4, the electronic version of the DEQ was sent to an estimated sample population of 525 DES members in Ontario without any added cost or burden to the researcher. This rapid administration of the DEQ highlights the feasibility of an electronic questionnaire format.

Braithwaite et al (2003) also mentioned some common limitations of electronic questionnaires. One of these limitations is the potential inability to translate all types of questions into an electronic version, due to the constraints of electronic questionnaire technology. One of the strengths of using LimeSurvey technology was the ability to accommodate all the question types included in the DEQ. LimeSurvey offered an extensive amount of options, with regards to the type and number of questions that could be included a questionnaire (2011).These question formats included multiple choice, multiple choice with comments, open-ended, numerical inputs, and many other types of questions (LimeSurvey 2011). Not only was LimeSurvey technology able to accommodate all the questions of the DEQ, it also was a feasible option for collecting electronic cross-sectional data. Throughout Phases 2-4, respondents were able to access and complete the online version of the DEQ without any reported compatibility issues. Respondent data could also be collected immediately upon completion of each phase of the study.

LimeSurvey technology also enabled the researcher to minimize several ethical concerns. By having the DEQ housed on LimeSurvey the data could remain completely anonymous to the researcher. LimeSurvey offers an “anonymous” setting, which inhibits the collection of an invitational code, linking respondents’ data to the respondents’ computers (2011). Thus, completion of the DEQ was completely separate from respondent. One of the pitfalls of LimeSurvey is that it has the potential to allow the same respondent to complete the DEQ multiple times. However, given that respondents are busy healthcare professionals, it is highly unlikely that repeated completion of the DEQ occurred. Another benefit of using LimeSurvey technology was that it was housed at McMaster University. The collected data was physically stored on campus, minimizing the privacy concerns of having respondents data stored at an external location. In summary, the use of LimeSurvey to house the electronic version of the DEQ strengthened the anonymity and feasibility of the study.

**4.4.2. Reliability of the Diabetes Educator Questionnaire**

Although the DEQ has considerable strengths, there were also some limitations to the DEQ, primarily the limited ability to demonstrate reliability. As Streiner and Norman indicate, reliability is the amount of error inherent in a questionnaire (2008). Thus, measuring reliability provides an indication of the believability, consistency, and stability of the findings. In the development and psychometric testing of the DEQ, strategies to measure test-retest reliability were not performed, due to use of an anonymous sample. Without a measure of test-retest reliability, it is difficult to determine the stability of respondents’ repeated responses, as these may vary over time. To further strengthen the reliability of the DEQ, a non-anonymous sample of DEs would have to be used at two points in time, to enable test-retest reliability to be assessed, and thereby provide a measure of the stability of the DEQ.

Another form of reliability in questionnaires is internal consistency (Streiner and Norman, 2008). Without any previous studies describing the role of DEs in Ontario, internal consistency could not be assessed. However, respondents answered the DEQ in a manner that appeared reflective of their expertise and scope of practice. An example of this observed consistency is the increased frequency of discussion of *Healthy Eating* by RD respondents, compared to other types of respondents. As the RD profession has expertise in assisting individuals with eating a healthy diet, the consistency between data collected using the DEQ, and the expertise of the RD profession, provides an indication of the internal consistency of the DEQ. Although a formalized measure of internal consistency was not used, these observational consistencies appear to support a foundational indication of internal consistency.

**4.4.3 Potential Sources of Bias**

*Non-Response Bias*

Another limitation of the study is that all DEQ responses were self-reported. As with any self-reported questionnaire, there is the potential for non-response, social desirability and recall bias. Non-response bias suggests that significant differences may exist between respondents and non-respondents (Loiselle, Profetto-McGrath, Polit, & Beck, 2004). The possibility of differences between respondents and non-respondents to the DEQ is therefore plausible. Individuals who chose to complete the DEQ may have been more immersed in the development and deployment of the DEs role. The small response rate observed in Phase 4 suggested that non-response bias may have had a considerable influence on the results, whereas, the large response rate in Phase 3 suggests otherwise. Without any previous literature describing the population of DEs in Ontario, and the limited response rate of the study, it is impossible to definitively establish the extent of this form of bias in the study.

*Social Desirability Bias*

Another potential form of bias in the DEQ is social desirability bias. Social desirability bias, suggests that respondents may have answered the questions in a desirable, rather than accurate manner, in an attempt to appease the researcher (Streiner & Norman, 2008). Thus, data collected in the study may describe an ideal, versus accurate, description of respondents’ roles. Although a source of bias, several steps were taken to reduce social desirability in this study, namely anonymizing DEQ respondents, and allowing respondents to complete it online, outside of the influence of others. Even with these strategies in place, there may have been the potential for bias to be inherent in the completion of the DEQ.

Second, although the intent of the DEQ was not to evaluate the quality of the DSME which DEs provide, it is possible that respondents may have perceived the DEQ as a form of performance review, simply by misunderstanding the content and direction of the questions. This concern was not voiced by the reviewers during the pretest, or by respondents in the pilot tests. In the absence of similar studies of DEs in Ontario, the effect of this form of bias on the outcomes of the study is difficult to determine. To minimize this potential source of bias and negative perception, full disclosure of the study aims were provided prior to consenting to the study (see *Appendix F*). These strategies were implemented to promote the transparency of the study and minimize this potential source of social desirability bias.

*Recall Bias*

Recall bias is the accuracy and reliability of respondents to recall retrospective data (Ciliska, Cullum, & DiCenso, 2008). Of all the questions included in the DEQ, #15 and #16 may have possibly been subject to recall bias. These questions ask respondents to provide estimates of the hours they spent in the past six months on activities related to the role of DE, and professional activities related to their role as a DE, respectively. The high level of variance in responses, suggests that respondents may have had difficulty with recalling hourly estimates in the past six months. This high degree of variance considerably weakens the reliability of the data collected in these two questions. As described by Streiner and Norman, reliability provides an indication of the degree to which the observed variation between respondents is attributed to the true difference between respondents, versus the variation caused by measurement error (2008). Combining the high level of observed variation, with a lack of a statistically strong linear models to explain the variance in the sample (see *Section 3.8*), and the presence of several outliers, suggests that the data collected in Questions # 15 and #16 may have considerable inherent error. To minimize the variation in responses for questions #15 and #16, a shorter time estimate, for example recalling the time spent in the past week on the activities, may be more advantageous. A shorter time estimate may also improve the ease of completion and reliability of these results.

**4.4.4 Anonymity of the DEQ**

The DEQ was sent to respondents in an anonymous manner. The use of an anonymous medium (i.e. email link) was to reduce social desirability of respondents. One drawback of anonymity was that respondents to the DEQ could not be contacted, and any inconclusive responses could not be clarified. To minimize this concern, the majority of the DEQ questions were closed ended, ensuring all responses could be categorized in a logical manner. However, the final two questions of the DEQ were open-ended, allowing respondents to provide as much, or as little data, as desired.

**4.5 Strengths and Limitations of the Administration of the Diabetes Educator Questionnaire**

**4.5.1 Study Design**

This study developed and administered a unique questionnaire tailored to the role of DEs in Ontario, providing an initial foundational description of the role of DEs across Ontario. The use of a cross-sectional design was the ideal choice of study design to address the initial research questions. The use of a cross-sectional design offered a convenient, inexpensive method to collect data on DEs. Similarly, the study included many of the traits that an ideal cross-sectional study would include (see *Section 1.9.4*). Thus, being the first study to investigate the role of DEs in Ontario it enables the generation of hypotheses and further areas of investigation into this role.

**4.5.2 Feasibility**

The use of several phases of pilot testing, particularly in Phase 3, offered a staged approach to determine study feasibility. By sending the DEQ electronically, via the Grand River DES chair, to each of the chapter’s members, the researcher was able to recruit the majority of DES members within the chapter. The findings from Phase 3 suggested that using a similar sampling frame would provide a feasible strategy for Phase 4. Similarly, the high response rate in Phase 3 (85%) suggested that the employed recruitment strategy was feasible for a larger population. Phase 3 also provided insight into the data collection and analysis strategies outlined in *Section 2.7*. Respondents’ data was housed on LimeSurvey and downloaded upon completion of Phase 3 without any issues identified. Thus, upon completion of Phase 3, the findings suggested that further completion of this study was a feasible option.

**4.5.3 Use of Sampling Frame**

A further strength of this study was the use of a modified Dillman approach to recruiting respondents. This is a previously validated strategy to help increase response rates in a cross-sectional survey study (Hoddinott & Bass, 1986; Schleyer & Forrest, 2000). By employing this strategy, the use of two reminder emails increased the response rate in both Phases 3 and 4, compared to the initial invitational email alone. This finding further supports sending multiple reminders to potential respondents as a strategy to increase sample size. Similarly, the use of a sampling frame, namely the DES chapters of Ontario, provided an effective and minimally invasive method to send the DEQ to the target population. In addition, by only contacting the chairs of the DES, minimal risk to the privacy of the individual respondents could be performed.

**4.5.4 Response Rate**

Although the use of a modified Dillman approach improved the response rate, the response rate among all DES members in Ontario, obtained in Phase 3 and 4 combined, was still low at 30%. The sample is well short of the acceptable 80% response rate, mentioned in *Section 1.9.4*. With a 30% response rate, the majority of the target population did not respond to the questionnaire. For this reason, limited conclusions can be drawn from this study regarding the implications for practice, policy, education and future research. Similarly, the multivariate analyses of some relevant variables could not be performed, when adhering to the ten subjects per variable rule, as outlined by Norman and Streiner (2008). At best, this study’s findings can provide only a preliminary understanding of the current role of DEs in Ontario.

One possible explanation for this low response rate is the amount of contact the researcher had with the target population. In Phase 2, the researcher was in direct contact with the respondents, resulting in a perfect response rate (100%). In Phase 3, the researcher was known to the respondents, being a fellow member of the Grand River DES chapter. This degree of contact could possibly contribute to the 85.3% response rate observed in Phase 3. Lastly, in Phase 4, the respondents only heard of the researcher and the study through the invitational email. This level of contact resulted in the lowest response rate (21.7%) among the remaining DES chapters in Ontario. The association between the amount of contact and response rates in internet questionnaires is supported by previous research (Cook, Health, Thompson, 2000).

If the DEQ were to be used in future studies, considerable strategies to improve the response rate would be necessary to address the low response rate. One possible strategy to improve the response rate could be to improve the contact between the researcher and potential recruits. In this study, the added step of relaying the invitational emails and reminders through the chapter chairs may have created two steps in response rates, thereby decreasing the overall response rate of the study. Additionally, not all chapter chairs confirmed that they relayed each email to their respective members. Thus, conceivably some potential respondents may not have received the complete modified Dillman approach. By directly contacting the potential respondents, the researcher can be assured that the modified Dillman approach is appropriately implemented. Another possible strategy to improve the response rate would be a face-to-face invitation to the study, versus the online invitation employed in this study. Although this strategy would require more time and resources, it could improve the response rate, as witnessed in Phases 2 and 3.

An additional factor to consider in the observed response rate, is that response rate calculations made in Phases 3 and 4 of this study are based on 2012 DES membership estimates. Membership levels at the time of Phases 2 and 3 may have changed; creating either inflated or reduced rates in comparison to reality. In the future, tracking the number of DEs who received an online questionnaire may provide a more realistic estimate of the true response rate.

Engaging the CDA and the DES could potentially improve the response rate. As the CDA is the primary organization involved in DM management in Canada, and also comprises the DES membership across Ontario, they are a key stakeholder in the completion of this study. Having developed the DEQ independent of the CDA, it may have reduced the engagement of this stakeholder in the study, and consequently the response rate. In future research on the role of DEs in Ontario, engagement of the both the CDA and the DES may prove essential to obtain larger response rates.

**4.5.5 Cross-Sectional Design**

Although a cross-sectional design has considerable benefits and strengths (see *Section 1.9*), it also has several limitations. By sending out the DEQ at one point in time, only point prevalence data can be obtained and causation between variables cannot be established (Newman et al, 2007). Thus, data collected in this study described DEs at only one point in time, and further changes in the roles of DEs in Ontario may differ with the outcomes of this study. In the months following the completion of Phases 3 and 4 of the study, the 2013 CDACPG were released. With the availability of current, evidence-based recommendations for DEs’ practice, it is possible that the role of DEs in Ontario may have evolved slightly. In short, the findings from this cross-sectional study are time-sensitive and provide only a “snap shot” view of DE roles.

**4.5.6 Representativeness of the Sample**

Another limitation of this study is the representativeness of the sample obtained in Phases 3 and 4. The sampling frame was conducted through the active membership in the Ontario DES Chapters. By sampling just one source, it is possible that the population of DEs who are members of DES chapters are not representative of the greater population of DEs in Ontario. The DES chapters are aligned with the CDECB, enabling CDEs to earn credits toward their recertification through attending events put forth by the DES. Conceivably, the ability to provide credits toward recertification may result in CDEs being more likely to become members of a DES chapter, in comparison to non-CDEs. Further, professionals who are eligible for CDE certification (i.e., RN, RD, pharmacists and nurse practitioners) may be higher within the chapters.

In addition to providing opportunities to obtain credits toward certification, the DES chapters also provide members with opportunities to access research literature and other professional development opportunities. Since membership in this body is voluntary, but requires registration fees, membership could potentially favour DEs with a greater investment to DSME. Similarly, with increased access to recent evidence and professional development opportunities, it may be possible that the practices of DES members’ may be more reflective of current evidence, than non-DES members.

One strategy initially proposed to address these two potential sources of bias was to simultaneously sample DEs through the Diabetes Regional Coordination Centers (DRCC’s), managed by the Local Health Integration Networks, in addition to the DES chapters. The DRCC’s were regional networks with access to professionals currently working in DSME at a local level. Thus, greater variation in profession, practice-setting, certification, and education related to DM between DEs was anticipated. However, during the creation of this study, the DRCC’s were absorbed by Local Health Integration Networks, and consequently this sampling source was no longer an option. In order to strengthen the representativeness of the sample, use of additional sampling frames would be highly beneficial. Some possible sampling frameworks to improve the representativeness of the sample include professional bodies, such as the Registered Nurses’ Association of Ontario, College of Nurses of Ontario, College of Dietitians of Ontario, and the Ontario College of Pharmacists. Consideration of additional sampling frames may be an avenue to obtain a more representative sample of DEs in Ontario.

**4.6 Education, Practice, and Policy Implications of the Study**

**4.6.1 Implications for Education**

Currently in Ontario, there is no specified level of education or training that DEs must obtain to deliver DSME. Completion of the certification examination is only required for DEs ascribing to become CDEs. As identified by respondents, there are several courses offered in Ontario that prospective DEs may choose to acquire knowledge of DSM. In addition to varying levels of DSME training, respondents also differed in graduate and undergraduate preparation. These findings suggest that there is a need to standardize current definitions, preparation and education of DEs in Ontario. As defined by the IDF, DEs have “specialized training in DSME and DSMS” (IDF, 2009, p. 32). The IDF is not explicit as to what this specialized training entails, except that training should incorporate the *IDF International Curriculum for Diabetes Health Care Professional Education*. In Ontario and Canada, the definition of DEs education is not as clear. The CDACPG does not provide a definition of DEs or the necessary training to provide DSME (2013). Similarly, the CDECB only identifies the need for excellence, sound knowledge base, and good communication skills, but does not specify how these qualities are to be obtained (2012). Thus, without any clear definition of what level of education and training is necessary to become a DE in Ontario, it is not surprising that there are considerable differences between DEs’ level of education, training, and role.

In addition to the need for clarity on the required education for DEs, the barriers to interprofessional collaboration identified in this study suggest the need for further interprofessional education for DE. Similarly, further exploration of barriers to interprofessional collaboration may assist in promoting collaboration. In accordance with the CCM, DM care is provided by an interprofessional team (CDACPG, 2013). Thus, DEs need to work collaboratively with other members of the DM care team.

An emerging strategy to build collaboration among professional is interprofessional education (WHO, 2010). Interprofessional education focusses on fostering collaboration between healthcare professionals even prior to entering the workforce. Although a 2009 Cochrane review of both randomized and non-randomized trials failed to find sufficient high quality literature to demonstrate the effectiveness of interprofessional education, this Cochrane review identified that in four randomized controlled trials, interprofessional education improved collaboration, quality of care, workplace culture, patient satisfaction, knowledge and skills to professionals, and reduced errors (Reeves, Zwarenstein, Goldman, Barr, Freeth, Hammick, & Koppel, 2009). The review also identified studies demonstrating that interprofessional education had no effect on similar types of outcomes. However, the authors suggest that in an increasingly complex and interprofessional healthcare system, the use of interprofessional education may be of considerable benefit, and that further higher quality studies of interprofessional education are warranted (Reeves, Zwarenstein, Goldman, Barr, Freeth, Hammick, & Koppel, 2009). Interprofessional education may be an opportunity to not only facilitate collaboration and networking, but may also build capacity in healthcare and improve health outcomes (WHO, 2010).

The potential benefit of building interprofessional education in the role of DEs may be considerable. Building interprofessional education into both the existing role and preparation for becoming a DE, may assist in building communication networks, and improve the efficiency of DSME. This is important given the multifactorial nature of DM.

Although interprofessional education, described by the WHO, pertains predominantly to individuals entering healthcare professions, it may be beneficial for current DEs to also receive education on functioning as part of an interprofessional team. Tricco et al and Shojania et al, identify the benefits of clinician education through workshops and other forms of professional training (2012 & 2006). Incorporating into clinician education, topics on team functioning and collaboration may be beneficial for current DEs as members of interprofessional teams. Interprofessional education could be provided at both educational institutions by each profession, but may also be part of orientation in practice settings, in which case it could be provided by the DM care team.

Another implication of this study relates to the identification that some DEs’ roles include medical management, or use of medical directives, whereas other roles may not. The presence or absence of medical directives in a practice-setting may have implications for the education and preparation of DEs prior to following these directives.

**4.6.2 Implications for Practice**

Not only does this study identify possible areas for further education of DEs in Ontario, it also suggests potential areas for DEs to further develop the provision of DSME. One area identified in this study is the need to tailor DSME to the individual with DM. In particular, the limited incorporation of individuals’ cultures and learning styles into their initial assessment, suggests that strategies are needed to incorporate culture and learning style into existing DSME. Some possible strategies to enable further incorporation may be the development of more cultural-specific DSME materials, translating current DSME materials, and the development of culturally sensitive audio/visual DSME materials. Similarly, procuring census tract data may enable the identification of diversity in cultures that may exists in a DEs’ patient population. As indicated by Hawthorne et al (2008), use of culturally appropriate DSME can have benefit, at least in the short-term to improve glycemic control, knowledge, and healthy behaviours, thus may be valuable to build into the provision of DSME.

In addition to tailoring the messaging of DSME, this study identified the potential for using new modes of communication to provide DSME (e.g., telephone, email, and possibly social media) in addition to personal communication. As this study suggests, DEs are already using some of these modes of communication. With the increasing prevalence of electronic communications world-wide, further use of these modes may be of benefit to enable DSME to be provided in a more convenient and patient-centered manner. Similarly, recent evidence suggests the benefit of these newer forms of communication in providing education (Sherifali, Greb, Amirthavasar, Hunt, Haynes, Harper et al, 2011; Bond, Burr, Wolf, McCurry & Teri, 2006; Kodama et al, 2012; McCarrier et al, 2009; Ralston, Hirsch, Hoath, Mullen, Cheadle & Goldberg, 2009). Although these newer forms of communication may be of benefit, the value of one-on-one conversation, particularly for individuals with poor glycemic control, should still be considered, as demonstrated in a previous systematic review (Duke, Colagiuri, & Colagiuri, 2009). Similarly, the availability and opportunity to perform some of these newer modes of communication may not be available in all DE practice settings.

The infrequent discussion of the AADE7 self-care behaviours, *Problem-Solving*, *Healthy Coping*, and *Reducing Risks* observed in this study suggests that increased focus on these behaviours may be needed. The CDACPG recommends that cognitive-behavioural interventions should be used for all individuals with DM (2013). *Problem-Solving*, *Healthy Coping*, and *Reducing Risks* behaviours are included in these interventions, and thus are integral components of DSME for all individuals with DM. In the incorporation of the CCM by DEs, the addressing these behaviours may assist individuals in managing their own care. Possible strategies to increase these behaviours may be to include models of behavioural change, self-efficacy, or problem-solving into DSME curriculum, and materials.

As discussed previously, the role of DE may not be restricted to providing DSME to individuals with DM. Interprofessional collaboration also provides an ideal opportunity for DEs to share expertise in DSME with other members of the healthcare team. The finding that respondents provided limited education to other healthcare professionals highlights an important gap in the DE role. Building interprofessional collaboration between DEs and other healthcare professionals without expertise in DSME may promote DM care across the healthcare system and help build DSM in patients seen by other healthcare professionals. Tricco et al demonstrated that educating clinicians can improve patient outcomes, thus educating other healthcare professionals on the provision of DSME may possibly provide benefit to the patient as well as the healthcare system, by making DSME more universal (2012).

Lastly, this study highlights the need to ensure that DSME is provided using a client-centered approach. The identification of a lack of acceptance to DSME, on the part of the individual with DM, to be a barrier to DEs’ roles, highlights the value of incorporating aspects of the *Transtheoretical Model of Change* in DEs practice (Prochaska, & Velicer, 1997). In accordance with this model, a DE should consider a perceived lack of acceptance, as an opportunity to explore the determinants of this resistance, and provide alternatives, rather than perceiving the resistance as an indication to cease providing DSME (Prochaska, & Velicer, 1997; DES, CDA & Leadership Sinai Centre for DM, 2001). Further, an observed lack of acceptance to DSME provides the DE with an indication that an individual may be at the initial stages of change, and DSME should be individualized accordingly.

**4.6.3 Implications for Policy**

The findings of this study also provide implications for policy related to the role of DE in Ontario. Currently, in Ontario, there is only one type of DE certification. DEs of various professions (i.e., RN, RD, pharmacists, and nurse practitioners), regardless of differences between the competencies of their respective profession, all receive the same certification as CDEs. Similarly, there currently is no distinction between CDEs in hospital versus community settings. Our study findings suggest that there are significant differences in the roles of DEs with respect to profession, practice setting, and level of education. At a policy level, the use of only one credentialed DE benchmark in Ontario suggests that much of the variation in these roles is not currently recognized. Thus, the provision of DSME would vary across Ontario.

A finding of this study suggests that some DEs work in a multi-professional setting with DEs of other professions, whereas other DEs work as the sole DE. The study also found that some RN DEs may possibly be involved in a role that includes more active medical management, in comparison to other DEs with a greater focus on behaviour change and knowledge acquisition. Thus, from the viewpoint of a health care system, not all DEs roles, even if certified, can be considered the same. This suggests that greater clarity in terms of the role of DEs needs to be determined.

Other countries, such as the United States, have acknowledged differences between DEs, by creating separate benchmarks among DEs (e.g., BC-ADM) based on their level of preparation and training. They have also categorized DSME providers into five levels, namely non-healthcare professionals (Level 1), healthcare professional non-DE (Level 2), non-credentialed DE (Level 3), credentialed DE (Level 4), and advanced level DE (Level 5) (AADE, 2011c). A Level 5 provider would primarily be involved in the care of complex patients, and are also actively involved in the medical management of these patients, possibly in a manner reflective of some RN respondents in this study (AADE, 2011c). The differentiation of providers involved in DSME ensures clarity at a policy level as to the expertise, competencies, and scope of the various professionals in terms of the DSME they can provide. With only one DE benchmark in Ontario, further development of the DE role can only occur at a generalist level. All variations between DE roles across Ontario would need to be included in the defined role of CDE.

With the increasing prevalence of DM in Ontario, this study identified that DEs often experience time and resource constraints which interfere with the provision of their role. Strategies to use DE resources as efficiently as possible are warranted at both the policy and practice level to minimize these constraints, as well as address the growing prevalence. One possible strategy is utilizing the role of DEs to educate other healthcare professionals on providing DSME. Although this may initially reduce the time DEs may spend with their clients even further, in the long-term it may facilitate the broader uptake and use of DSME among non-DE healthcare professionals.

Another possible strategy for increasing the quality and efficiency of the DE role at a policy level may be to address ineffective communication channels between DEs and other members of the healthcare team, particularly communication with primary healthcare providers. The identification of challenges in communication with other members of the interprofessional team suggests the need for more formalized and policy driven strategies to facilitate this communication and address these barriers.

Two recent meta-analyses identified several effective strategies to improve the quality in DM care, of which formalizing communication channels was deemed to be effective (Tricco et al, 2012; & Shojania et al, 2006). Some of these strategies included facilitating the transfer of patient information between member of the healthcare team, electronic prompts or reminders for clinicians regarding patients’ information, use of clinical information systems to organize patient data which is shared between providers, and the ability to provide feedback to other members of the healthcare team (Tricco et al, 2012; & Shojania et al, 2006). The meta-analyses indicated that these strategies can provide some improvements to DM management, particularly with regards to individuals with poor DM management. As identified by the CDACPG the integration of the CCM into DM care requires the use of an interprofessional team (2013). As foundational to an interprofessional team, collaboration and effective communication are needed to ensure that quality DM care, as well as DSME are provided. The presence of these barriers highlights the need to further develop quality improvement strategies at a policy level.

**4.7 Future Research Implications**

This study provides a cross-sectional description of the role of DE in Ontario. By using point prevalence data, on DEs specifically, it is difficult to contextualize these findings, and interpret their implications to DM care across Ontario. To assist in the interpretation of these findings, some possible strategies would include a qualitative focus group, or the development of a similar tool to measure the educational needs of individuals with DM. The use of a focus group of DE in Ontario could help ground the quantitative data obtained in this study, by exploring the context and meaning of significant study findings. For example, exploring the varied perceptions of DSME outcomes among professions may help explain the observed differences. This could be done to help further explain the finding of this study and provide a much clearer description of the role. Studying the educational needs of individuals with DM could help determine whether the role of DE, as it currently described, adequately addresses the needs of the individuals with DM. Both of these strategies would serve to enrich the description of the role of DE.

Some areas for further research related to the role of DEs would be to compare the role of DEs working in an interprofessional team environment, versus those working individually, or with other DEs. This would enable comparisons of DE models of care in DM. At a *Structural* level, comparisons could possibly be made between the types of professions, levels of education, and use medical directives between the various practice settings. Similarly, at a *Process* level comparisons could be made in the provision of DSME, the use of interprofessional collaboration, facilitators, and barriers found within the various practice settings. Lastly, comparing the use of outcomes within the various models of care may assist in identifying respective strengths or limitations of each model of care. These comparisons would further qualify the exploration of the possible differences that exist across the vast expanse of health care programs across Ontario. Similarly, although this study demonstrated the use of various *Structure*, *Processes*, and *Outcomes* used in the role of DE, from the perspective of DEs, it would be interesting to compare the perceptions of these components of the role between the providers and people living with DM. By conducting a cross-sectional study of the providers of DSME, only their perceptions could be determined. Determining the perceptions of those receiving DSME, through a similar cross-sectional study of individuals receiving DSME would also provide valuable data to further develop the role of DEs in Ontario to meet the needs of individuals with DM.

**4.8 Conclusion**

In summary, this study outlines the development of the DEQ as a tool to explore the role of DEs. The DEQ has several strengths, namely, content, face, criterion validity, and some level of internal consistency through the use of the Donabedian framework and the *International standards for diabetes education* 3rd Ed, as well as the use of pretest, pilots, and several phases of development (2009). There are also considerable limitations to this study, primarily due to the low response rate. This limits the interpretation of the findings, manly regarding the education, practice, and policy implications. Possible conclusions of this study are discussed with the understanding that these would require validation in future research. Although limited by a small response rate, the DEQ suggests that there are variations in the role of DEs with respect to profession, practice-setting, certification, education, and other variables. Similarly, the findings of this study support the need for greater clarity with respect to the definition and scope of practice of the role of DEs in Ontario.

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**Appendix A: Existing Diabetes Educator Questionnaires**

**United States**

**American Association of Diabetes Educators (AADE)**

*National Diabetes Education Practice Survey 2010 AADE*

Martin, 2011.

*National Diabetes Education Practice Survey 2008 AADE*

Martin et al, 2008.

*National Diabetes Education Practice Survey 2005 AADE*

Peeples & Austin, 2007.

*AADE 2006*

Funnell et al 2006.

*Survey of AADE 2002-2003*

Barlow, Crean, Heizler, Mulcahy, & Springer, 2005.

**National Certification Board for Diabetes Educators**

*National Certification Board for Diabetes Educators 2008*

Zrebiec, 2009.

*National Certification Board for Diabetes Educators 2004*

Zrebiec, 2005.

*National Certification Board for Diabetes Educators 2000*

Zrebiec, 2001.

**Australia**

**Australian Diabetes Educator Association (ADEA)**

*ADEA 2005*

Dunning, T. (2006). Diabetes educators' self-reported experiences, skills and attitudes towards research.*Journal of Diabetes Nursing, 10*(8), 309-316.

*ADEA 2008*

Hill, P., & Clark, R. (2008). The Australian diabetes educators' skills and readiness for the tsunami of diabetes in the 21st century.*Australian Journal of Advanced Nursing, 26*(2), 55-65.

**Canada**

Diabetes Educator Section (2009) Diabetes educator section strategic plan 2010-2015. *Canadian Diabetes Association*. p. 1-23.

**Appendix B: An International Comparison of DEs’ Role**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Organization** | **CDECB1**  Canadian Diabetes Educator Certification Board | **NCBDE2**  National Certification Board for Diabetes Educators | **AADE3**  American Association of Diabetes Educator | **ADEA4**  Australian Diabetes Educator Association | **UK DE5**  European Nurses Diabetes Collaborative University Program (**ENDCUP**) | **IDF6**  International Diabetes Federation |
| **Educator Title** | Certified Diabetes Educator (CDE) | Certified Diabetes Educator (CDE) | Board Certified Advanced Diabetes Manager (BC-ADM) | Credentialed Diabetes Educator (CDE) | Post-graduate Certificate in Clinical Diabetes | *International Standards for Diabetes Education (3 Ed.) (2009)* |
| **Eligibility:**  **Professional Status** | Registered with a regulatory body in Canada as a health professional:  -Nurses (CNO, CRNM, SRNA)  -Dietitians (NSDA, CDO)  - Pharmacists (OCP) | -Clinical Psychologist  - Registered Nurse  - Occupational Therapist  -Optometrist  - Pharmacist  - Physical Therapist  - Physician (MD,DO)  - Podiatrist  -Dietitian (reg. CDR)  -Physician Assistant (reg. NCCPA)  -Exercise Specialist (reg. ACSMCCES)  -Exercise Physiologist (reg. ACSMRCEP)  - or Masters in Social Work | -Registered Nurse  -Registered Dietitian  - Registered Pharmacist  -Physician Assistant  -Physician | - Registered Nurses  - Accredited Practicing Dietitians  - Registered Medical Practitioners  - Registered Pharmacists accredited by Australian Association of Consultant Pharmacy or the Society of Hospital Pharmacists Australia to conduct medication management reviews  - Podiatrists  - Accredited Exercise Physiologists | Registered Nurse | **Standard: S.5.** *Multidisciplinary teamwork and communication are evident among those providing DSME and diabetes care services.*  **S.5.b:**  The core DSME team include:  -Person with diabetes  -Nurse  -Dietitian/nutritionist  -Physician  **May** include:  - pharmacist  - psychologist, counsellor and/or social worker  - podiatrist/chiropodist  - an exercise physiologist  - a community or lay health worker  - peer mentors. |
| **Eligibility:**  **Practice Experience** | 800 hours of practice in DSME  - Within 3 years  - With regulatory body | Min. 2 years in current discipline  -1000 hours in DSME | 500 hours clinical practice in advanced DM management  - Within 48 months  - With current registration | 1800 hours practice in the specialty field of DM education  - In past 4 years | 2 years in DM care  -50% or working time exclusively diabetes care | **Standard S.6.1:**  *Personnel involved in DSME have a sound clinical understanding of diabetes, and are knowledgeable about teaching and learning methods and diabetes care.* |
| **Eligibility:**  **Education Level** | Unspecified | Unspecified | Master’s degree, post Master’s, or Doctoral degree relevant to DSM | Graduate level: see below | Non-specified | **Indicators S.6.1a**  *Personnel who deliver DSME have received initial training in teaching and counselling skills, behavioural interventions and diabetes care.*  **Indicators S.6.1a**  *Training courses for people specializing in DSME are consistent with the IDF*  *International Curriculum for Diabetes Health Care Professional Education, or recognized by local authorities.* |
| **Eligibility:**  **Diabetes-Specific Education** | Unspecified | Unspecified | Complete graduate certificate in diabetes education and management  - Accredited by ADEA  -Within 6 years | Non-specified |
| **Other Requirements** |  | 15 hours of continuing education in Diabetes  - Within 2 years. |  | 1. Submit evidence of participating in professional development relevant to the specialty field of diabetes education  -Within 2 years  2.Participate as a mentee in a mentoring relationship registered with the ADEA Mentoring Program | - Member of FEND\*  -Consent of dept.  - English speaking | **Indicator S.6.2d**  *On an annual basis, DSME personnel participate in continuing professional development related to diabetes education and care.*  **Indicator S.6.2e**  *There is written evidence that DSME personnel have received continuing education provided by accredited bodies.* |
| **Time to Re-certification** | 5 years | 5 years | 5 years | 3 years | Unspecified | **Standard S.6.2.**  *The competence and performance of personnel involved in DSME are reviewed at least annually, and an individual learning and development plan implemented to strengthen knowledge, skills and attitudes.* |
| **Re-certification** | **Opt 1:** Take the exam  **Opt 2:** Credit Portfolio:  1) Practice Review and Self-Assessment.  2) Organized Learning.  3) Personally Designed Learning.  4) Educational/ Developmental or Teaching.  5) Publications, Research and Quality Improvement.  6) Professional Leadership. | **Opt 1:** Take the Exam  **Opt 2:** 75 clock hours of continuing education  **Require:**  Min. of 1000 practice hours. | Complete 75 hours of Continuing education:  Professional Development requirements  **Require:**  Min. of 1000 practice hours. | Maintaining Credentialing:  -Continued Education  -Professional & Community Involvement  -Professional Responsibility & Accountability  -Mentoring | Unspecified | **Standard S.6.3**  *Professional DSME personnel are appointed based on demonstrated competencies, not on a rotational basis.* |
| **Definition of Diabetes Education** | *Education, diabetes-management advice or care to one or more of the following:*  *­ Those at risk for diabetes,­ Those with prediabetes,*  *­ Those with diabetes, their families, or health professionals, utilizing*  *competencies* | “the ongoing process of facilitating the knowledge, skill, and ability necessary for self-care… The process incorporates the needs, goals and life experiences of the person with pre-diabetes or diabetes and is guided by evidence-based standards.” | See DSME/T Definition below | -Therapeutic as well as an education intervention.  -Integrates self-management education with the attainment of clinical goals and targets.  - Referral and collaboration with  health professionals involved in the multidisciplinary care team  -Integrate the provision of clinical care with the education process.  -Client centred and outcomes focused  -Integrates client identified needs and goals with clinical targets to achieve a continuum of outcomes. |  | “Process by which people with diabetes, their family and/or significant social contacts are engaged as active respondents in the acquisition and application of the knowledge and practical, problem-solving and coping skills needed to achieve optimal health outcomes” |
| **Definition of** **Diabetes Educator** | Health professional, committed to excellence in diabetes education, who has a sound knowledge base in diabetes care/management and education processes,  as well as good communication skills | -Medical/health care professional who possesses comprehensive knowledge of and experience in diabetes management, pre-diabetes, and diabetes prevention.  -Educates & supports people affected by diabetes to understand and manage the condition.  - Promotes self-management to achieve individualized behavioural and treatment goals that optimize health outcomes. | See AADE (2010), *The Scope of Practice, Standards of Practice, and Standards of Professional Performance for DEs.* | Health professionals who provide comprehensive, interdisciplinary diabetes self-management education as described by ADEA (see Above) and who meet the criteria of the ADEA Credentialing Program. |  | “a person who has received specialized training in DSME and DSMS, and provides DSME and DSMS to people with diabetes, their family and/or significant social contacts – may be a peer or a nurse, dietitian, psychologist, physician, pharmacist or other healthcare provider” |

\*FEND: Foundation of European Nurses in Diabetes

1 Adapted from: CDECB (2012). *Examination handbook 2012*. Ontario: Canadian Diabetes Educator Certification Board. Retrieved April, 2012 from: http://cdecb.ca/index.php?id=main

2 Adapted from: NCBDE (2012). *2012 certification examination for diabetes educators.* Arlington Heights: National Certification Board for Diabetes Educators. Retrieved April, 2012 from: http://www.ncbde.org/

AADE(2010). *The Scope of Practice, Standards of Practice, and Standards of Professional Performance for Diabetes Educators*. Retrieved April, 2012 from: http://www.diabeteseducator.org/ProfessionalResources/Library/PositionStatements.html

3 Adapted from: AADE (2012). *Candidate Handbook for the American Association of Diabetes Educators (AADE) Board Certified Advanced Diabetes Management (BC-ADM) Examination*. American Association of Diabetes Educators (AADE). Retrieved April, 2012 from http://www.diabeteseducator.org/ProfessionalResources/Certification/BC-ADM/

AADE(2010). *The Scope of Practice, Standards of Practice, and Standards of Professional Performance for Diabetes Educators*. Retrieved April, 2012 from: http://www.diabeteseducator.org/ProfessionalResources/Library/PositionStatements.html

4 Adapted from: ADEA (2012). *Become a Credentialled Diabetes Educator*. Australian Diabetes Educators Association. Retrieved April, 27, 2012, from http://www.adea.com.au/main/diabeteseducators/credentialleddiabeteseducators

ADEA (2007). *The Credentialled Diabetes Educator in Australia: Role and Scope of Practice.* Australia: Australian Diabetes Educators Association. Retrieved April, 27, 2012, from http://www.adea.com.au/main/forhealthprofessionals/guidelinesandstandards

ADEA. (2008). *National Core Competencies for Credentialled Diabetes Educators.* Australia: Australian Diabetes Educators Association. Retrieved April, 2012, from http://www.adea.com.au/main/forhealthprofessionals/guidelinesandstandards

5 Adapted from: FEND. (2011). *European Nurses Diabetes Collaborative University Programme: ENDCUP*. Newcastle: Federation of European Nurses in Diabetes. Retrieved April, 2012 from: http://www.fend.org/projects/fend-endcup

6 Adapted from: IDF (2009). *International standards for diabetes education*. Belgium: International Diabetes Federation. Retrieved April, 2012 from: http://www.idf.org/node/23551

**Appendix C: The Diabetes Educator Questionnaire**

**Demographic:**

1. What is your age? \_\_\_\_\_\_\_\_\_\_\_ (Years)
2. What are the first three digits of your work postal code? \_\_ \_\_ \_\_
3. What is your sex?
   * Female
   * Male
4. What is your highest level of education?
   * High school diploma
   * College diploma/certificate
   * Baccalaureate degree
   * Master’s degree
   * Medical doctor
   * Doctoral degree
   * Post-Doctoral degree
5. What is your current profession?
   * Registered nurse
   * Registered practical purse
   * Nurse practitioner
   * Dietitian
   * Pharmacist
   * Endocrinologist
   * General Practitioner
   * Cardiologist
   * Psychologist
   * Social worker
   * Podiatrist/Chiropodist
   * Kinesiologist/Exercise Physiologist
   * Other (Please specify:\_\_\_\_\_\_\_\_\_\_\_)
6. In total, how many years have you been involved in diabetes care and education? \_\_\_\_\_\_\_\_\_\_\_
7. What is your current employment status?
   * Full time
   * Part-time
   * Casual
   * Un-employed
   * Other (Please specify: \_\_\_\_\_\_\_\_\_)
8. Do you have a ***current*** Certified Diabetes Educator (CDE) accreditation through the Canadian Diabetes Education Certification Board (CDECB)?
   * Yes
   * No, but I am working towards my CDE certification
   * No, but I had CDE certification in the past
   * No, never had CDE certification
9. Have you completed any other form of training or accreditation related to diabetes education?
   * Yes (If yes, please specify:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
   * No
10. In what health care setting do you provide diabetes education?
    * Hospital out-patient adult clinic
    * Hospital in-patient adult ward
    * Hospital out-patient pediatric clinic
    * Hospital in-patient pediatric ward
    * Community health center
    * Family health team/ Community practice
    * Pharmacy
    * Other: (Please specify:\_\_\_\_\_\_\_\_)
11. Of the three options listed below, which bests describes where your patient population lives?
    * Rural areas
    * Urban areas
    * In both rural and urban areas

**Note:** By rural area we mean any area not considered within a city limits.

1. Which of these characteristic(s) describe the population to which you provide diabetes education? (Check all that apply)
   * Pediatrics (Type 1 and/or Type 2)
   * Adults (Type 1 and/or Type 2)
   * Diabetes in pregnancy (Including Gestational Diabetes Mellitus)
   * Prediabetes (Having higher blood glucose than normal levels, but not high enough to be diagnosed with diabetes)
   * People with complex diabetes (Multiple co-morbidities and complications, e.g., renal failure)
   * Other
2. Which ethnic group(s) is included in your patient population? (Check all that apply)
   * Aboriginal peoples
   * African American peoples
   * South Asian peoples
   * Eastern Asian/Western Pacific peoples
   * European peoples
   * Middle Eastern/North African peoples
   * Caribbean peoples
   * South and Central American peoples
   * Other (Please Specify:\_\_\_\_\_)
3. In what language(s) do you provide diabetes education? (Check all that apply)
   1. English
   2. French
   3. Other (Please specify:\_\_\_\_\_\_\_\_\_)

**Note:** The next two questions will not be used for any specific quality assurance purposes, rather, to obtain an understanding of the activities of a diabetes educator and the respective time allocation.

1. Please provide an estimate of the **total number of hours** you spent on the following ***activities related to your role as a diabetes*** educator, in the **past 6 months (Insert dates)?**

If you did not perform some of the activities listed, please write “0”.

**Educating people with diabetes:** (1-on1 visits, group sessions, etc.) \_\_\_\_\_\_\_\_\_\_\_ (Hours)

**Educating other Health Care Providers related to your role as a diabetes educator:**  \_\_\_\_\_\_\_\_\_\_ (Hours)

**Research related to your role as a diabetes educator:** (Clinical research, online research, etc.) \_\_\_\_\_\_\_\_\_\_ (Hours)

**Administration related to your role as a diabetes educator:** (scheduling, program statistics, etc.) \_\_\_\_\_\_\_\_\_\_\_ (Hours)

**Diabetes Management:** (Completing medical directives, interventions, etc.)\_\_\_\_\_\_\_\_(Hours)

**Preceptor/Mentor Students or new health care professionals related to your role as a diabetes educator:** \_\_\_\_\_\_\_\_\_\_ (Hours)

Total hours \_\_\_\_\_\_\_\_\_\_

1. Please provide an estimate of the **total number of hours** you spent on the following **professional activities** **related to your role as a diabetes educator**, in the **past 6 months (Insert dates)**?

If you did not perform some of the activities listed, please write “0”.

**Personal skills training** **and recertifying** (e.g., insulin pump management) \_\_\_\_\_\_\_\_\_\_(Hrs.)

**Mentoring/coaching** **fellow educators** (Formal or informal) \_\_\_\_\_\_\_\_\_\_(Hrs.)

**Continued education** **related to diabetes** (Workshops, conferences, etc.) \_\_\_\_\_\_\_\_\_\_(Hrs.)

**Best Practice** **Guidelines** (Or best practice for organization, clinic, etc.) \_\_\_\_\_\_\_\_\_\_\_(Hrs.)

**Other professional activities** **related to your role as a diabetes educator:** \_\_\_\_\_\_\_\_\_\_(Hrs)

**Total Hours:**  \_\_\_\_\_\_\_\_\_\_\_

**Diabetes Self-Management Education (DSME):**

*Definition: T*he ongoingprocess of facilitating knowledge, skills and ability necessary for diabetes self-care, delivered by specialized health care professionals. The overall intent of such programs is to support: a) informed decision making and active collaboration with diabetes team members; b) self-care behaviours; c) problem solving; and d) improvement to clinical outcomes, health status and quality of life. (Adapted from Haas, 2012).

1. What aspects do you include in an ***initial assessment*** of an individual prior to providing Diabetes Self-Management Education (DSME)? (Check all that apply)
   * Diabetes knowledge
   * Self-care skills (self-monitoring blood glucose, nutrition management, etc.)
   * Level of cognition and literacy
   * Lifestyle choices (Level of activity, stress management, etc.)
   * Personal supports
   * Cultural and religious values
   * Safety issues
   * Behavioural goals
   * Readiness to change
   * Learning style
   * Psychosocial status
   * Other \_\_\_\_\_\_\_\_\_\_\_\_\_

**Individual Knowledge:**

1. What method(s) do you use to provide education to individuals? (Check all that apply)
   * One-on-one conversation
   * One-on-one scripted dialogue
   * Group power point presentation
   * Group interactive/discussion sessions
   * Pamphlet or information sheets
   * Email conversation
   * Telephone conversation
   * Conversation maps
   * Connecting clients with community resources
   * Other: (Please specify\_\_\_\_\_\_\_\_\_)
2. To what extent do you find teaching-learning models (Any model/theory outlining the process of providing education/teaching to individuals, e.g., Stages of Change) helpful in providing education to your patients?
   * Very helpful
   * Helpful
   * Somewhat helpful
   * Limited helpfulness
   * Not at all helpful
   * I don’t use teaching-learning models in my practice
3. In providing diabetes self-management education (DSME), is there a prescribed curriculum that you follow?
   * Yes Please Indicate:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   * No
   * Unsure
4. What components of DSME do you include in your education practice? (Check all that apply)
   1. Disease process (Pathophysiology, disease progression, etc.)
   2. Psychosocial lifestyle management (Coping and management of stress)
   3. Nutrition management (Dietary choices, portion size, etc.)
   4. Physical activity (Exercise, mobility, strength training, etc.)
   5. Hypoglycemia and hyperglycemia prevention and management
   6. Medication management (Regimen, dosages, schedule, etc.)
   7. Insulin pump initiation and adjustment
   8. Blood glucose monitoring
   9. Pregnancy
   10. Prevention and surveillance of complications and co-morbidities
   11. Community resources/Medical supplies
   12. Setting individualized goals
   13. Monitoring of health parameters (Lipids)
   14. Problem-solving
   15. Other: (Please specify \_\_\_\_\_\_\_\_\_\_)
5. To what extent do you find behavioural change strategies, e.g., Motivational Interviewing, helpful to inform your practice?
   * Very helpful
   * Helpful
   * Somewhat helpful
   * Limited helpfulness
   * Not at all helpful
   * I don’t use teaching-learning models in my practice
6. What behavioural change strategies do you commonly use in your practice? (Check all that apply)
   * Setting personalized goals
   * Cognitive reframing (e.g., Any type of cognitive therapy that changes the way individuals approach issues)
   * Problem-solving
   * Motivational Interviewing (e.g., Any type of counseling that focuses on increasing personal motivation)
   * Other: (Please specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_)
   * Not applicable, I do not use a specific behavioural strategy
7. How often do you discuss with individuals each of the behaviours outlined? Please indicate with an “x” in the box that best describes how often.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Self-Care7 TM Behaviours\* | Frequency of discussion | | | | |
| Never | Rarely | Sometimes | Often | Always |
| Healthy Eating |  |  |  |  |  |
| Being Active |  |  |  |  |  |
| Monitoring |  |  |  |  |  |
| Taking Medications |  |  |  |  |  |
| Problem Solving |  |  |  |  |  |
| Reducing Risks |  |  |  |  |  |
| Healthy coping |  |  |  |  |  |

\*Adapted from AADE 7 Self-Care

**Perceived Benefits of Diabetes Self-Management Education**

**Individuals’ Knowledge**

1. As a diabetes educator what do you use to determine if individuals understand the education that you provide? (Check all that apply)
   * Knowledge assessment questionnaires
   * Return demonstration for skills assessment
   * Verbal confirmation from individual
   * Creation of a personalized action plan
   * Appropriate selection of behavioural goals
   * Glycated Hemoglobin (A1C)
   * Self blood glucose monitoring (SBGM)
   * Other: (Please specify \_\_\_\_\_\_\_\_\_\_\_\_)
   * Not applicable, I do not generally assess individuals’ knowledge or skills

**Individuals’ Application of Knowledge**

1. What tools do you use to measure successful behavioural change? (Check all that apply)
   * Self-efficacy, (e.g., Stanford Self-efficacy scale)
   * Self-care/management (e.g., Summary of diabetes self-care activities, SDSCA tool)
   * Motivation level (e.g., Patient activation measure, PAM)
   * Readiness for change (e.g., stages of change)
   * Attainment of personal goals (e.g., Individual action plan)
   * Self blood glucose monitoring (SBGM) results
   * Demonstrate active problem-solving skills (e.g., Diabetes Problem-Solving Interview DPSI)
   * Glycated Hemoglobin (A1C)
   * Adherence to care plan (e.g., following medication regimen, attendance at clinical visits, etc.)
   * Not applicable, I don’t measure behavioural change
   * Other: (Please specify \_\_\_\_\_\_\_\_\_\_\_)

**Individuals’ Clinical Measures**

1. Which clinical measures have guided your education? (Check all that apply)
   * Glycated Hemoglobin (A1C)
   * Self blood glucose monitoring (SBGM) results
   * Blood Pressure
   * Lipids (LDL, TC/HDL ratio, TG, HDL)
   * Weight/BMI/waist circumference
   * Kidney/Liver function
   * Quality of life
   * Psychological status (e.g., depression scale, distress scale, etc.)
   * Growth and development (for children with diabetes)
   * Not applicable, I don’t use clinical measures
   * Others: (Please specify:\_\_\_\_\_\_\_\_\_\_\_)
2. What types of outcomes do you personally find most relevant to providing education to patients/caregivers? Please indicate with an “x” the level of relevance to your practice.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Activities: | Relevant to Current Practice | | | |
| Irrelevant | Low Relevance | Moderate Relevant | High Relevance |
| Patient’s knowledge and skills (e.g., ability to recall information or demonstrate skill) |  |  |  |  |
| Changes in behaviours (e.g., physically active, problem-solving, adherence) |  |  |  |  |
| Clinical Improvements (e.g., A1C, self- blood glucose monitoring results, etc.) |  |  |  |  |
| Health Status (e.g., quality of life, number of diabetes complications) |  |  |  |  |
| Process Measures (e.g., number of eye & feet exams, attendance) |  |  |  |  |

**Facilitators and Barriers to Practice**

1. Which factors do you think ***make your role as a diabetes educator easier***? (Check all that apply)
   * Sufficient time
   * Clearly defined roles within the diabetes team
   * Access to other diabetes team members
   * Sufficient resources (Educational materials, teaching space)
   * Organizational/management support
   * Use of medical directives
   * Electronic medical records
   * A Case manager/navigator for diabetes education/management
   * Other: (Please specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
2. Which factor do you think make ***your role as a diabetes educator more difficult***? (Check all that apply)
   * Insufficient time
   * Poorly defined roles within the diabetes team
   * Limited access to other diabetes team members
   * Insufficient resources (Educational materials, teaching space)
   * Limited organizational/management support
   * Lack of medical directives
   * Electronic medical records
   * Lack of a Case Manager/navigator for diabetes education/management
   * Other: (Please specify: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
3. What do you see as the most important benefit to providing education to individuals with diabetes and/or their caregivers? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What do you see as the biggest limitation to providing education to individuals with diabetes and/or their caregivers? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Appendix D: Theoretical and Content Validity of the Diabetes Educator Questionnaire**

***Structure* Standards**

* Organizational support
  + Summary: That DSME be supported by the organization as integral to diabetes care. This includes the necessary resources, outcomes, and inclusion in the diabetes services.
  + Location in Questionnaire: Questions # 29-32.
* Coordination
  + Summary: That there is a person in place to organize and administer DSME services, in order to ensure adherence to *Process* and *Outcome* standards.
  + Location in Questionnaire:
* Physical Space and equipment
  + Summary: That the available DSME resources match the patient population’s needs. This includes sufficient physical space, education resources, communication technology, etc.
  + Location in Questionnaire: Questions #10, 15, 16, 29-32.
* Advisory Committee
  + Summary: That an advisory committee is in place to ensure the input of all members in decision-making regarding the implementation of DSME.
  + Location in Questionnaire:
* The Team and Teamwork
  + Summary: That teamwork and communication is evident among those providing DSME.
  + Location in Questionnaire: Questions # 5, 15, 16, 29-32.
* Professional Skill and Continuing Education
  + Summary: That those providing DSME have a strong understanding of diabetes as a disease, diabetes care, and teaching learning methods. Also, that this competence be reviewed regularly.
  + Location in Questionnaire: Questions # 4-6, 8, 9, 15-24.
* Curriculum
  + Summary: That DSME be focussed on the individual patient’s needs and be designed to improve their self-management.
  + Location in Questionnaire: Questions # 20, 21, 24.
* Support Systems
  + Summary: That partnerships and pathways are created to promote consistency in diabetes services and resource use. Also, that DSME services be accessible after initial usage.
  + Location in Questionnaire: Questions #29,30

***Process* Standards**

* Community Assessment
  + Summary: That DSME is developed to fit the needs of the patient population
  + Location in Questionnaire: Questions #10-14.
* Individualized Plan
  + Summary: That planning DSME is individualized, learner-centered, and continually modified to meet the needs of the individual.
  + Location in Questionnaire: Question# 17
* Implementation
  + Summary: Implementing DSME is learner centered, focussing on cognitive learning, behavioural change, healthy coping, and self-management. Also that the DSME is evidence based.
  + Location in Questionnaire: Questions# 18, 19, 22-24.
* Access
  + Summary: That the accessibility and awareness of DSME services be maintained in the community.
  + Location in Questionnaire:(none)
* Evaluation
  + Summary: That DSME services are evaluated regularly and appropriate changes are made.
  + Location in Questionnaire: (none)

***Outcomes* Standards**

* Knowledge
  + Summary: Individuals with diabetes understand the manifestation, implications, treatments, managements, and necessary lifestyle choices of having diabetes.
  + Location in Questionnaire: Questions #25,28
* Application of Knowledge
  + Summary: Individuals with diabetes make informed decisions, and take action toward health living while maintain personal values.
  + Location in Questionnaire: Questions# 26, 28
* Clinical Outcomes
  + Summary: Improvements are seen in the physical, psychological, and emotional health of the individual with diabetes.
  + Location in Questionnaire: Questions # 27, 28
* The Community- Primary Prevention
  + Summary: That the community is aware of risk factors for diabetes, and understand ways to delay the onset of diabetes.
  + Location in Questionnaire: (none)
* Community Support
  + Summary: That the community is aware of what individuals with diabetes needs are and where they can find support.
  + Location in Questionnaire: (none)

Adapted from: International Diabetes Federation. (2009) *International Standards for Diabetes Education* (3rd ed.). Belgium: International Diabetes Federation

**Appendix E-1: Welcome Email**

Dear Diabetes Educator,

Have you ever wondered what other diabetes educator’s roles look like in Ontario? How or where other diabetes educators practice, and what activities they perform?

Currently in Ontario there is considerable variation in the role of the diabetes educator. Not only are different professionals performing this role, but various activities, processes, and practice settings are used to provide diabetes education. This variation is valued in the role of diabetes educator, as it indicates the complexity of the care each educator provides. With this in mind, we are conducting a provincial survey entitled, *The Diabetes Educator Role in Ontario: A Provincial Perspective.* This study is led by **Pieter Agema**, RN, BScN, MScN Student and **Diana Sherifali** RN, PhD, CDE, at McMaster University’s School of Nursing.

With the support of (**insert DES/DRCC coordinators name**), we invite diabetes educators of all practice settings and roles to become a volunteer for *The Diabetes Educator Role in Ontario* study. As a volunteer, we ask you **to complete a questionnaire that takes a maximum of 15 minutes**. The questionnaire will ask you questions regarding your role as a diabetes educator. **The purpose of the study** is to create a description of diabetes educators in Ontario, so that educators, health care decision makers and researchers can learn more about this vital role.

All we ask is that you follow this link: (Insert link) By completing the questionnaire, you can be eligible to win one of (three/seven) **$50 gift cards to *The Bay*!!**

If you have any technological concerns, don’t hesitate to contact [agemap@mcmaster.ca](mailto:agemap@mcmaster.ca) for assistance.

This study has been reviewed by the Hamilton Health Sciences/McMaster Faculty of Health Sciences Research Ethics Board (HHS/FHS REB). The REB is responsible for ensuring that respondents are informed of the risks associated with the research, and that respondents are free to decide if participation is right for them. If you have any questions about your rights as a research respondent, please call The Office of the Chair, HHS/FHS REB at 905.521.2100 x 42013.

We value your input and appreciate your dedication to diabetes education in Ontario

Sincerely,

Pieter Agema  RN, BScN, MScN student  
Primary Investigator  
School of Nursing, McMaster University  
1280 Main St. West  
Hamilton, Ontario, L8N 3Z5

agemap@mcmaster.ca  
905-525-9140, ext. 21435

**Appendix E-2: First Reminder Email**

Dear Diabetes Educator,

A big thank you to all the diabetes educators that have already participated in *The Diabetes Educator Role in Ontario* study! It is wonderful to have received so much input! Your input will provide a rich description of diabetes educators across Ontario. Currently, we have heard from (insert percentage) % of diabetes educators, and we greatly encourage all who have not yet volunteered for this study to join their ranks, by following the link below. This questionnaire will close on (**insert date here**), so we ask you to complete it as soon as possible.

Just as a reminder, *The Diabetes Educator Role in Ontario: A Provincial Perspective* study isled by **Pieter Agema**, RN, BScN, MScN Student and **Diana Sherifali** RN, PhD, CDE, at McMaster University’s School of Nursing.

With the support of (i**nsert DES/DRCC coordinators name**), we invite diabetes educators of all practice settings and roles to become a volunteer for study. As a volunteer, we ask you **to complete a questionnaire that takes a maximum of 15 minutes.** The questionnaire will ask you questions regarding your role as a diabetes educator. The purpose of the study is to create a description of diabetes educators in Ontario, so that educators, health care decision makers and researchers can learn more about this vital role.

All we ask is that you follow this link (\_\_\_\_\_\_\_\_\_\_\_insert link to questionnaire \_\_\_\_\_\_\_\_\_\_\_)! By completing the questionnaire, you can be eligible to win one of (three/seven) **$50 gift cards to *The Bay***!!

If you have any technological concerns, don’t hesitate to contact [agemap@mcmaster.ca](mailto:agemap@mcmaster.ca) for assistance.

This study has been reviewed by the Hamilton Health Sciences/ McMaster Faculty of Health Sciences Research Ethics Board (HHS/FHS REB). The REB is responsible for ensuring that respondents are informed of the risks associated with the research, and that respondents are free to decide if participation is right for them. If you have any questions about your rights as a research respondent, please call The Office of the Chair, HHS/FHS REB at 905.521.2100 x 42013.

We value your input and appreciate your dedication to diabetes education in Ontario

Sincerely,

Pieter Agema  RN, BScN, MScN student  
Primary Investigator  
School of Nursing, McMaster University  
1280 Main St. West  
Hamilton, Ontario, L8N 3Z5

agemap@mcmaster.ca

905-525-9140, ext. 21435

**Appendix E-3: Second Reminder Email**

Dear: Diabetes Educator,

The *Diabetes Educator Role in Ontario: A Provincial Perspective* is coming to a close. Many thanks to all of you who participated! (insert percentage) % of educators in Ontario have completed the study. Your input will provide a rich description of diabetes educators across Ontario. To all of you who have not yet volunteered, good news! This questionnaire is still open! We strongly encourage you to volunteer as soon as possible. All we ask is that **you follow the link below and complete the Diabetes Educator Questionnaire**. The closing date of this study is (**insert date here**). Following this deadline, we will be in contact with the lucky winners who participated in our draw for a **$50 gift card to *The Bay****.*

Just as a reminder, *The Diabetes Educator Role in Ontario: A Provincial Perspective* is led by **Pieter Agema**, RN, BScN, MScN student and **Diana Sherifali** RN, PhD, CDE, at McMaster University’s School of Nursing. With the support of (**insert DES/DRCC coordinators name**), we invite diabetes educators of all practice settings and roles to become a volunteer for study. As a volunteer, we ask you to **complete a questionnaire that takes a maximum of 15 minutes**. The questionnaire will ask you questions regarding your role as a diabetes educator. **The purpose of the study** is to create a description of diabetes educators in Ontario, so that educators, health care decision makers and researchers can learn more about this vital role.

All we ask is that you follow this link (\_\_\_\_insert link to questionnaire\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)! By completing the questionnaire, you can be eligible to win one of (three/seven) **$50 gift cards to *The Bay***!!

If you have any technological concerns, don’t hesitate to contact [agemap@mcmaster.ca](mailto:agemap@mcmaster.ca) for assistance.

This study has been reviewed by the Hamilton Health Sciences/McMaster Faculty of Health Sciences Research Ethics Board (HHS/FHS REB). The REB is responsible for ensuring that respondents are informed of the risks associated with the research, and that respondents are free to decide if participation is right for them. If you have any questions about your rights as a research respondent, please call The Office of the Chair, HHS/FHS REB at 905.521.2100 x 42013.

We value your input and appreciate your dedication to diabetes education in Ontario

Sincerely,



Pieter Agema  RN, BScN, MScN student  
Primary Investigator  
School of Nursing, McMaster University  
1280 Main St. West  
Hamilton, Ontario, L8N 3Z5  
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**Appendix F: Questionnaire Welcome Page**

**Many thanks for your interest in volunteering to complete this questionnaire! We ask you to carefully read through the following information, prior to completing the questionnaire.**

**LETTER OF CONSENT**

**The Diabetes Educator Role in Ontario: A Provincial Perspective**

**Principal Investigator:** **Local Principal Investigator:**

Pieter Agema Dr. Diana Sherifali

School of Nursing School of Nursing

McMaster University McMaster University

Hamilton, Ontario, Canada Hamilton, Ontario, Canada

**(905) 525-9140 ext. 21435** **(905) 525-9140 ext. 21435**

E-mail: (agemap@mcmaster.ca) E-mail: (dsherif@mcmaster.ca)

**Purpose of the Study:** The purpose of this study is to describe the role of diabetes educators in Ontario.

You are invited to take part in this study on (Insert Date). We are asking you to volunteer since you are a health care professional involved in diabetes education in Ontario. We are hoping to learn about your role as a diabetes educator through a questionnaire we created.

**What will happen during the study?**

Upon consenting to this study you will be asked to complete the *Diabetes Educator Questionnaire* seen on the next webpage. We will ask you questions related to your demographics (age, sex, etc.), education, profession, experience, practice setting, diabetes education activities, perceived benefits of education, and factors influencing your role as a diabetes educator. We ask you to answer the questions as accurately as possible. We estimate that the questionnaire will take a maximum of 15 minutes to complete. Upon completion of the questionnaire you will be given the option to submit your email address for entry into a draw for one of (three/seven) $50 gift cards to *The Bay*. This is completely optional. Having submitted the questionnaire you will have completed the study.

**Are there any risks to doing this study?**

It is not likely that there will be any harms or discomforts from completing this questionnaire. There is the risk of a loss of internet connectivity during the completion of the questionnaire. If this occurs, we ask you to attempt the questionnaire again. All non-submitted questionnaires will not be collected. There is also the risk that some of the questions may make you feel slightly uncomfortable. You do not need to answer questions that you do not want to answer or that make you feel uncomfortable. And you can withdraw (stop taking part) at any time. We describe below the steps we are taking to protect your privacy.

**Are there any benefits to doing this study?**

This study will identify the role that DEs enact in Ontario and provide a better understanding of strategies to assist DEs in their role. Clarification of the role of DEs will also serve to increase the awareness of policy/decision maker’s to the function of DEs, with the hopes of further development of this role.

**Payment or Reimbursement**

Although you will not be reimbursed for your time, by volunteering for this study, you will be eligible to participate in a draw for one of (three/seven) $50 gift cards to *The Bay*. To participate, you will have to submit your email address to an email address: [questionnairediabeteseducators@gmail.com](mailto:questionnairediabeteseducators@gmail.com) created specifically for the draw. The purpose of collecting your email is to verify your participation in the draw, email account upon completion of the draw. Your email address will not be shared used for any other purpose then to participate in the draw, and to distribute the prizes from the draw in the event that you win.

**Confidentiality**

You are participating in this research anonymously. No one including me will know that you have participated. Every effort will be made to protect (guarantee) your confidentiality and privacy I will not use any information that would allow you to be identified. The data you provide will be kept in an encrypted file on a computer that will be protected by a password. Once the study has been completed, the data will be destroyed five years later.

**What if I change my mind about being in the study?**

Your participation in this study is voluntary. If you decide to be part of the study, you can stop (withdraw), from the questionnaire for whatever reason, even after agreeing to the consent form or part-way through the questionnaire or up until it is submitted. If you decide to withdraw, there will be no consequences to you. If you do not want to answer some of the questions you do not have to, but you can still be in the study. *O*nce you have submitted your responses for this anonymous questionnaire, your data will be put into a database and will not be identifiable to you. This means that once you have submitted your questionnaire, your responses cannot be withdrawn from the study, because I will not be able to identify which data is yours.

**How do I find out what was learned in this study?**

I expect to have this study completed by approximately *September, 2013.* If you would like a brief summary of the results, please let me know how you would like it sent to you.

**Questions about the Study**

If you have questions or need more information about the study itself, please contact me at:

[agemap@mcmaster.ca](mailto:agemap@mcmaster.ca)

(905) 525-9140 ext. 21435

This study has been reviewed by the Hamilton Health Sciences/McMaster Faculty of Health Sciences Research Ethics Board (HHS/FHS REB). The REB is responsible for ensuring that respondents are informed of the risks associated with the research, and that respondents are free to decide if participation is right for them. If you have any questions about your rights as a research respondent, please call The Office of the Chair, HHS/FHS REB at 905.521.2100 x 42013.

**CONSENT**

**By clicking on the the “next” button I indicate that...**

* I have read the information presented in the information letter about a study being conducted by *Pieter Agema* and *Dr. Diana Sherifali*, of McMaster University.
* I understand that if I agree to participate in this study, I may withdraw from the study at any time or up until submitted.
* I agree to participate in the study.

**Appendix G-1: Dependent Variables use in Multivariate Analyses**

|  |  |  |  |
| --- | --- | --- | --- |
| Component of the IDF Framework*3* | *Structure* | *Process* | *Outcome* |
| Name of Variable | Time spent on activities related to the role of diabetes educator | The frequency of discussion of Self-Care7 TM Behaviours1 | The importance of outcomes on the DSME Outcomes Continuum2 |
| Type of Variable | Continuous | Dichotomous | Dichotomous |
| Description of measure | Hours spent in the past 6 months | Always discussing vs. not always discussing | High importance vs. not high importance |
| DEQ Questions used in analysis | Question # 15: | Question # 24 | Question #28 |
| Method of analysis | Linear Regression | Logistic Regression | Logistic Regression |
| Rationale: | By analyzing factors related to the role of diabetes educator with the time spent on activities related to the role of diabetes educator, a clearer description of the structure of the role in Ontario can be obtained | By analyzing factors related to the role of diabetes educator with the frequency of discussion of self-care behaviours, a clearer description of the processes used in the role of diabetes educator in Ontario can be obtained | By analyzing factors related to the role of diabetes educator with the reported importance of DSME outcomes, a clearer description of the outcomes used in the role of diabetes educator in Ontario can be obtained |
| IDF Standards Rationale*3* | S.1.h, S.5.d, S.5.h, S.6.1, S.6.2, S.6.3 | S.7, P.3.1, P.3.2 | P.5, O.1, O.2, O.3 |
| References: |  | AADE, 2009; AADE, 2011a | Mulcahy et al, 2003; AADE, 2011b |

1 AADE, 2011a

2 AADE, 2011b

*3* IDF, 2009

**Appendix G-2: Independent Variables use in Multivariate Analyses**

|  |  |  |  |
| --- | --- | --- | --- |
| Variable and Location in the DEQ | Definition of Variable | Null Hypothesis | Rationale: |
| Registered Nurse (RN)  (DEQ: Question #5) | Dichotomous: RN vs. not RN | Reporting a professional status as an RN is not associated with *Structure* (Time spent on activities related to the role of diabetes educator), *Process* (The frequency of discussion of Self-Care7 TM Behaviours1), and *outcome* (The importance of outcomes on the DSME Outcomes Continuum2) variables. | To determine if differences exist in the role of diabetes educator with respect to profession.  *IDF Standards Rationale3*:  *Structure*: S.1.h, S.5.d, S.6.2  *Process*: S.7, P.1, P.2, P.3.2  *Outcomes*: P.5, O.1-O.3 |
| Registered Dietitian(RD)  (DEQ: Question #5) | Dichotomous: RD vs. not RD | Reporting a professional status as an RD is not associated with *Structure* (Time spent on activities related to the role of diabetes educator), *Process* (The frequency of discussion of Self-Care7 TM Behaviours1), and *outcome* (The importance of outcomes on the DSME Outcomes Continuum2) variables. | To determine if differences exist in the role of diabetes educator with respect to profession.  *IDF Standards Rationale3*:  *Structure*: S.1.h, S.5.d, S.6.2  *Process*: S.7, P.1, P.2, P.3.2  *Outcomes*: P.5, O.1-O.3 |
| Pharmacist(Pharm)  (DEQ: Question #5) | Dichotomous: Pharm vs. not pharm | Reporting a professional status as an pharm is not associated with *Structure* (Time spent on activities related to the role of diabetes educator), *Process* (The frequency of discussion of Self-Care7 TM Behaviours1), and *Outcome* (The importance of outcomes on the DSME Outcomes Continuum2) variables. | To determine if differences exist in the role of diabetes educator with respect to profession.  *IDF Standards Rationale3*:  *Structure*: S.1.h, S.5.d, S.6.2  *Process*: S.7, P.1, P.2, P.3.2  *Outcomes*: P.5, O.1-O.3 |
| Certification  (DEQ: Question #8) | Dichotomous: Certification vs. no certification | Reporting certification as a CDE is not associated with *Structure* (Time spent on activities related to the role of diabetes educator), *Process* (The frequency of discussion of Self-Care7 TM Behaviours1), and *Outcome* (The importance of outcomes on the DSME Outcomes Continuum2) variables. | To determine if differences exist in the role of diabetes educator with respect to certification.  IDF Standards Rationale*3*:  *Structure*: S.1.h, S.5.d, S.6.2  Other rationale:  CDACPG, 2013; CDECB, 2012 |
| Diabetes Related Training  (DEQ: Question #9) | Dichotomous: Training vs. no training | Reporting to have completed diabetes related training is not associated with *Structure* (Time spent on activities related to the role of diabetes educator), *Process* (The frequency of discussion of Self-Care7 TM Behaviours1), and *Outcome* (The importance of outcomes on the DSME Outcomes Continuum2) variables. | To determine if differences exist in the role of diabetes educator with respect to diabetes related training  IDF Standards Rationale*3*: S.6, S.8.2  Other rationale: CDACPG, 2013 |
| Education  (DEQ: Question #4) | Dichotomous: Master’s degree or higher vs. | Reporting an education of a Master’s degree or higher is not associated with *Structure* (Time spent on activities related to the role of diabetes educator), *Process* (The frequency of discussion of Self-Care7 TM Behaviours1), and *Outcome* (The importance of outcomes on the DSME Outcomes Continuum2) variables. | To determine if differences exist in the role of diabetes educator with respect to the level of education  IDF Standards Rationale*3*: S.6, S.8.2  Other rationale: CDACPG, 2013 |
| Hospital Practice Setting  (DEQ: Question #10) | Dichotomous: Hospital practice setting vs. not hospital practice setting | Reporting a practice setting as a hospital setting is not associated with *Structure* (Time spent on activities related to the role of diabetes educator), *Process* (The frequency of discussion of Self-Care7 TM Behaviours1), and *Outcome* (The importance of outcomes on the DSME Outcomes Continuum2) variables. | To determine if differences exist in the role of diabetes educator with respect to the practice setting  IDF Standards Rationale*3*: P.1, P.2  Other rationale: CDACPG, 2013 |
| Community Practice Setting  (DEQ: Question #10) | Dichotomous: Community Practice Setting vs. community Practice Setting | Reporting a practice setting as a Community Setting is not associated with *Structure* (Time spent on activities related to the role of diabetes educator), *Process* (The frequency of discussion of Self-Care7 TM Behaviours1), and *Outcome* (The importance of outcomes on the DSME Outcomes Continuum2) variables. | To determine if differences exist in the role of diabetes educator with respect to the practice setting  IDF Standards Rationale*3*: P.1, P.2  Other rationale: CDACPG, 2013 |

1 AADE, 2011a

2 AADE, 2011b

*3* IDF, 2009

**Appendix H-1:** Bivariate Pearson Correlation Matrix for Demographic Variables and Reported Hours Spent on Activities Related to the Role of Diabetes Educator Variables of the DEQ

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Correlations** | | | | | | | | | | | | | |
|  | Item 1 | Item 2 | Item 3 | Item 4 | Item 5 | Item 6 | Item 7 | Item 8 | Item 9 | Item 10 | Item 11 | Item 12 | Item 13 |
| Item 1: Educating People with Diabetes | 1 | 0.21\*\* | 0.21\*\* | 0.19\* | 0.37\*\* | 0.22\*\* | -0.05 | -0.05 | 0.05 | 0.02 | 0.16\* | -0.05 | 0.04 |
| Item 2: Educating Other Professionals | 0.21\*\* | 1 | 0.86\*\* | 0.77\*\* | 0.35\*\* | 0.38\*\* | 0.09 | -0.03 | -0.14 | 0.09 | 0.07 | <-0.01 | 0.01 |
| Item 3: Research | 0.21\*\* | 0.86\*\* | 1 | 0.76\*\* | 0.40\*\* | 0.35\*\* | 0.09 | -0.03 | -0.16\* | 0.01 | 0.12 | -0.11 | 0.11 |
| Item 4: Administration | 0.19\* | 0.77\*\* | 0.76\*\* | 1 | 0.37\*\* | 0.29\*\* | 0.11 | -0.05 | -0.09 | <0.01 | 0.07 | 0.04 | -0.05 |
| Item 5: Diabetes Management | 0.37\*\* | 0.35\*\* | 0.40\*\* | 0.37\*\* | 1 | 0.29\*\* | -0.13 | -0.02 | -0.03 | -0.18\* | 0.16\* | -0.08 | 0.09 |
| Item 6: Preceptor/ Mentor Students | 0.22\*\* | 0.38\*\* | 0.35\*\* | 0.29\*\* | 0.29\*\* | 1 | 0.08 | 0.02 | -0.02 | -0.03 | 0.11 | -0.01 | <0.01 |
| Item 7: Professiona | -0.05 | 0.09 | 0.09 | 0.11 | -0.13 | 0.08 | 1 | 0.03 | -0.33\*\* | -0.12 | -0.31\*\* | 0.01 | 0.06 |
| Item 8: Level of Educationb | -0.05 | -0.03 | -0.03 | -0.05 | -0.02 | 0.02 | 0.03 | 1 | 0.04 | 0.14 | 0.06 | -0.06 | 0.13 |
| Item 9:Years of Age | 0.05 | -0.14 | -0.16\* | -0.09 | -0.03 | -0.02 | -0.33\*\* | 0.04 | 1 | 0.14 | 0.17\* | 0.25\*\* | 0.20\*\* |
| Item 10: Certificationd | 0.02 | 0.09 | 0.01 | <0.01 | -0.18\* | -0.03 | -0.12 | 0.14 | 0.14 | 1 | -0.12 | 0.13 | -0.09 |
| Item 11: Diabetes-Specific Training | 0.16\* | 0.07 | 0.12 | 0.07 | 0.16\* | 0.11 | -0.31\*\* | 0.06 | 0.17\* | -0.12 | 1 | 0.01 | 0.04 |
| Item 12 Hospital Practice Settinge | -0.05 | <-0.01 | -0.11 | 0.04 | -0.08 | -0.01 | 0.01 | -0.06 | 0.25\*\* | 0.13 | 0.01 | 1 | -0.75\*\* |
| Item 13 Community Practice Settingf | 0.04 | 0.01 | 0.11 | -0.05 | 0.09 | <0.01 | 0.06 | 0.13 | 0.20\*\* | -0.09 | 0.04 | -0.75\*\* | 1 |
| \*\*. Correlation is significant at the 0.01 level (2-tailed). | | | | | | | | | | | |  |  |
| \*. Correlation is significant at the 0.05 level (2-tailed). | | | | | | | | | | | |  |  |

n=148-178

**a** Variable is dichotomous with Registered Dietitian as the reference point vs. not Registered Dietitian

**b** Variable is dichotomous with Master’s Degree and above as reference point vs. Bachelor Degree and below

c Variable is dichotomous with Female as the reference point

d Variable is dichotomous with Certification as the reference point vs. no Certification

e Variable is dichotomous with a Hospital practice setting as the reference variable

f Variable is dichotomous with a Community practice setting as the reference variable

**Appendix H-2:** Bivariate Pearson Correlation Matrix for Demographic Variables and the Reported Discussion of AADE7 Self-Care Behaviours Variables of the DEQ

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Correlations** | | | | | | | | | | | | | | |
|  | Item 1 | Item 2 | Item 3 | Item 4 | Item 5 | Item 6 | Item 7 | Item 8 | Item 9 | Item 10 | Item 11 | Item 12 | Item 13 | Item 14 |
| Item 1: AADE7: Healthy Eatinga | 1 | 0.41\*\* | 0.27\*\* | 0.21\*\* | 0.19\* | 0.23\*\* | 0.15 | 0.04 | 0.28\*\* | -0.12 | -0.02 | 0.04 | -0.03 | -0.02 |
| Item 2: AADE7: Being Activea | 0.41\*\* | 1 | 0.36\*\* | 0.30\*\* | 0.16\* | 0.32\*\* | 0.21\*\* | 0.20\* | -0.07 | -0.05 | 0.04 | -0.11 | >-0.01 | -0.11 |
| Item 3: AADE7: Monitoringa | 0.27\*\* | 0.36\*\* | 1 | 0.70\*\* | 0.19\* | 0.25\*\* | 0.27\*\* | 0.17\* | -0.19\* | 0.09 | <0.01 | -0.04 | 0.24\*\* | -0.20\* |
| Item 4: AADE7: Taking Medicationsa | 0.21\*\* | 0.30\*\* | 0.70\*\* | 1 | 0.26\*\* | 0.27\*\* | 0.28\*\* | 0.24\*\* | -0.26\*\* | 0.20\* | 0.07 | -0.02 | 0.24\*\* | -0.21\*\* |
| Item 5: AADE7: Problem Solvinga | 0.19\* | 0.16\* | 0.19\* | 0.26\*\* | 1 | 0.46\*\* | 0.53\*\* | 0.22\*\* | 0.03 | 0.14 | >-0.01 | <0.01 | 0.16\* | -0.18\* |
| Item 6: AADE7: Reducing Risksa | 0.23\*\* | 0.32\*\* | 0.25\*\* | 0.27\*\* | 0.46\*\* | 1 | 0.58\*\* | 0.18\* | -0.17\* | -0.03 | 0.06 | 0.01 | 0.05 | -0.10 |
| Item 7: AADE: Healthy Copinga | 0.15 | 0.21\*\* | 0.27\*\* | 0.28\*\* | 0.53\*\* | 0.58\*\* | 1 | 0.18\* | -0.08 | 0.02 | -0.02 | -0.04 | 0.11 | -0.13 |
| Item 8: Years of Age | 0.04 | 0.20\* | 0.17\* | 0.24\*\* | 0.22\*\* | 0.18\* | 0.18\* | 1 | -0.33\*\* | 0.14 | 0.17\* | 0.04 | 0.25\*\* | -0.20\*\* |
| Item 9: Professionb | 0.28\*\* | -0.07 | -0.19\* | -0.26\*\* | 0.03 | -0.17\* | -0.08 | -0.33\*\* | 1 | -0.12 | -0.31\*\* | 0.03 | 0.01 | 0.06 |
| Item 10: Certificationc | -0.12 | -0.05 | 0.09 | 0.20\* | 0.14 | -0.03 | 0.02 | 0.14 | -0.12 | 1 | -0.12 | 0.14 | 0.13 | -0.09 |
| Item 11: Diabetes- Specific Training | -0.02 | 0.04 | <0.01 | 0.07 | >-0.01 | 0.06 | -0.02 | 0.17\* | -0.31\*\* | -0.12 | 1 | 0.06 | 0.01 | 0.04 |
| Item 12: Level of Educationd | 0.04 | -0.11 | -0.04 | -0.02 | <0.01 | 0.01 | -0.04 | 0.04 | 0.03 | 0.14 | 0.06 | 1 | -0.06 | 0.13 |
| Item 13: Hospital Settinge | -0.03 | >-0.01 | 0.24\*\* | 0.24\*\* | 0.16\* | 0.05 | 0.11 | 0.25\*\* | 0.01 | 0.13 | 0.01 | -0.06 | 1 | -0.75\*\* |
| Item 14: Community Settingf | -0.02 | -0.11 | -0.20\* | -0.21\*\* | -0.18\* | -0.10 | -0.13 | -0.20\*\* | 0.06 | -0.09 | 0.04 | 0.13 | -0.75\*\* | 1 |
| \*\*. Correlation is significant at the 0.01 level (2-tailed). | | | | | | | | | | | | | | |
| \*. Correlation is significant at the 0.05 level (2-tailed). | | | | | | | | | | | | | | |

(n=160-178)

a Variables are dichotomous with Always discussed as the reference point vs. not Always discussed.

**b** Variable is dichotomous with RD respondent as the reference point vs. non-RD respondent

c Variable is dichotomous with Certification as the reference point vs. no Certification

**d** Variable is dichotomous with Master’s Degree and above as reference point vs. Bachelor Degree and below

e Variable is dichotomous with a Hospital practice setting as the reference variable

f Variable is dichotomous with a Community practice setting as the reference variable

**Appendix H-3**: Bivariate Pearson Correlation Matrix for Demographic and the Rated Importance of Types of Outcomes Related to the Role of Diabetes Educator Variables of the DEQ

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Correlations** | | | | | | | | | | | | | |
|  | Item 1 | Item 2 | Item 3 | Item 4 | Item 5 | Item 6 | Item 7 | Item 8 | Item 9 | Item 10 | Item 11 | Item 12 | Item 13 |
| Item 1:Outcome: Knowledge Measures | 1 | 0.06 | 0.22\*\* | 0.20\* | 0.16\* | 0.14 | -0.09 | -0.04 | -0.10 | 0.01 | -0.02 | -.01 | -0.08 |
| Item 2: Outcome: Behaviour Measures | 0.06 | 1 | 0.01 | 0.12 | 0.17\* | 0.07 | -0.01 | -0.32\*\* | 0.08 | -0.09 | 0.14 | 0.06 | -0.12 |
| Item 3: Outcome: Clinical Measures | 0.22\*\* | 0.01 | 1 | 0.09 | 0.24\*\* | -0.06 | 0.05 | 0.01 | -0.05 | 0.03 | 0.06 | 0.11 | -0.02 |
| Item 4:Outcome: Health Status Measures | 0.20\* | 0.12 | 0.09 | 1 | 0.27\*\* | 0.03 | -0.10 | -0.11 | -0.23\*\* | 0.09 | -0.13 | 0.09 | -0.04 |
| Item 5: Outcome: Process Measures | 0.16\* | 0.17\* | 0.24\*\* | 0.27\*\* | 1 | >-0.01 | 0.06 | -0.12 | 0.09 | 0.09 | 0.08 | 0.05 | -0.02 |
| Item 6: Profession | 0.14 | 0.07 | -0.06 | 0.03 | >-0.01 | 1 | 0.03 | -0.18\* | -0.33\*\* | -0.12 | -0.31\*\* | 0.01 | 0.06 |
| Item 7: Level of Education | -0.09 | -0.01 | 0.05 | -0.10 | 0.06 | 0.03 | 1 | 0.05 | 0.04 | 0.14 | 0.06 | -0.06 | 0.13 |
| Item 8: Sex | -0.04 | -0.32\*\* | 0.01 | -0.11 | -0.12 | -0.18\* | 0.05 | 1 | -0.02 | 0.05 | -0.06 | -0.09 | 0.11 |
| Item 9: Years of Age | -0.10 | 0.08 | -0.05 | -0.23\*\* | 0.09 | -0.33\*\* | 0.04 | -0.02 | 1 | 0.14 | 0.17\* | 0.25\*\* | -0.20\*\* |
| Item 10: Certification | 0.01 | -0.09 | 0.03 | 0.09 | 0.09 | -0.12 | 0.14 | 0.05 | 0.14 | 1 | -0.12 | 0.13 | -0.09 |
| Item 11: Diabetes-Specific Training | -0.02 | 0.14 | 0.06 | -0.13 | 0.08 | -0.31\*\* | 0.06 | -0.06 | 0.17\* | -0.12 | 1 | 0.01 | 0.04 |
| Item 12: Hospital Setting | -0.01 | 0.06 | 0.11 | 0.09 | 0.05 | 0.01 | -0.06 | -0.09 | 0.25\*\* | 0.13 | 0.01 | 1 | -0.75\*\* |
| Item 13: Community Setting | -0.08 | -0.12 | -0.02 | -0.04 | -0.02 | 0.06 | 0.13 | 0.11 | -0.20\*\* | -0.09 | 0.04 | -0.75\*\* | 1 |
| \*\*. Correlation is significant at the 0.01 level (2-tailed). | | | | | | | | | | | | | |
| \*. Correlation is significant at the 0.05 level (2-tailed). | | | | | | | | | | | | | |

(n=152-178)

**a** Variable is dichotomous with RD respondent as the reference point vs. non-RD respondent

b Variable is dichotomous with Certification as the reference point vs. no Certification

cVariable is dichotomous with Master’s Degree and above as reference point vs. Bachelor Degree and below

d Variable is dichotomous with a Hospital practice setting as the reference variable

e Variable is dichotomous with a Community practice setting as the reference variable