A Qualitative Evaluation of the Ohio University Diabetes Certificate Program

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This thesis titled
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Abstract

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A Qualitative Evaluation of the Ohio University Diabetes Certificate Program

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Diabetes mellitus (DM) is a serious metabolic disease, which is primarily characterized by hyperglycemia or elevated blood sugar levels. If the disease remains undiagnosed or is poorly managed, it can lead to a host of complications. The prevalence of DM nationally and globally has grown at an incredible rate. Since 1980, global prevalence has nearly doubled from 4.7% to 8.5% of the adult population, accounting for some 422 million adults (World Health Organization, 2014). In response to the immense public health threat, Ohio University established the Diabetes Certificate Program in 2012 as a means of educating students about the multifaceted and complex condition of diabetes and its management. Students receive a unique interdisciplinary education that includes two courses, an independent study, and additional elective coursework. The Certificate provides participants with a comprehensive understanding of diabetes from a number of different perspectives and allows them to learn about diabetes first hand through research, clinical, and service learning experiences. The purpose of this study was to conduct a program evaluation of the Diabetes Certificate Program as a means of identifying any ongoing successes and challenges. Participants of the study had completed the 17 credit hours required to earn the Certificate. Trained moderators conducted structured focus groups, in which participants were prompted with open-ended questions and discussed their experiences with the program. Thematic analysis was used
to discern common themes generated from the focus groups. Within the categories of successes, ongoing challenges and recommendations, eight general themes were identified. Students reported that they appreciated the opportunity to listen to experts in the field, engage in a diversity of learning methods, and receive preparation for graduate and/or professional school through in-depth knowledge and training acquired from the program. Existing challenges included logistical difficulties related to independent study opportunities and time commitment as well as inconsistency of assignments. Areas for improvement included inclusion of additional experiential learning opportunities and exposure to more research and technology trends in diabetes. In conclusion, this qualitative process evaluation allowed for an in-depth understanding of the successes and challenges of the Diabetes Certificate Program. These findings may be useful to educators interested in designing and implementing a Diabetes Certificate Program at other universities. Finally, this process evaluation represents the first step in understanding the components necessary for improving and sustaining a Diabetes Certificate Program; additional research is needed to confirm the effectiveness of this program in educating students about diabetes.
Preface

Chapter 4 contained within the thesis document serves as a prepublication manuscript for the journal *Evaluation and Program Planning*. This manuscript has been formatted to meet the guidelines set forth by Thesis and Dissertation Services at Ohio University.
I would like to dedicate my work to my husband, David, who has provided constant encouragement and affirmation to me as we navigated the graduate school experience together. I would also like to dedicate this thesis to my incredibly supportive family and friends, without whom I would not be where I am today.
Acknowledgments

I would like to express my sincere thanks to everyone who has been instrumental in the development of this thesis.

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To all of the other faculty and staff and to my classmates, many of whom became close friends throughout my time at Ohio University, thank you an unforgettable 2 years.
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Abstract

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Chapter 1: Introduction

Diabetes Prevalence and Complications

The trend in diabetes mellitus prevalence has been on the upswing for many years and is projected to continue increasing in the years to come. As it stands, an estimated 8.5% of the global population age 18 and older has diabetes (World Health Organization [WHO], 2016). Of those cases, approximately 15 million more men than women are affected, and significantly more people in urban areas are affected than those in rural areas (International Diabetes Federation [IDF], 2015). The majority of individuals impacted are between the ages of 20 and 64 years, nearly 80% live in developing nations, and the highest age-adjusted comparative prevalence lies in North America and the Caribbean (IDF, 2015). In the United States alone, nearly 30 million citizens are considered to have diabetes, and nearly 30% of those cases are undiagnosed (Centers for Disease Control and Prevention, 2014). The WHO (2016) has projected that by the year 2030, diabetes will be the seventh leading cause of death worldwide.

Treatment and management of diabetes varies from type to type and should be individualized to best serve unique needs. According to Subramanian and Hirsch (2014), “In the care of patients with diabetes, an individualized approach is especially important because of the multitude of variables involved in decision-making, including therapeutic choices, disease duration, presence of complications and comorbid conditions and economic factors” (p. 87). Living with diabetes often requires a significant lifestyle change and necessitates a strong support network from family and friends as well as a
team of interprofessional healthcare providers, who work alongside the patients to
develop successful and individualized care plans.

To effectively treat and assist in the management of diabetes, future and current
healthcare providers would benefit greatly from early exposure to thorough education on
diabetes including its prevalence, manifestations, complications, means of treatment and
management, and an overview of how various healthcare providers fit into the treatment
equation. By being exposed to intensive diabetes educational programming during
undergraduate and professional graduate programs as well as opportunities for continuing
education, practitioners can cultivate a greater confidence in their competence and earn
the trust and respect from their patients necessary for successful outcomes. Standard
diabetes management consists of multiple components of care including blood glucose
screening, medications, nutrition, physical activity, and screening for complications
(Skolnik, Johnson, & Neuman, 2017). Several papers have evaluated the barriers to
diabetes management, and a common theme that has arisen is a lack of practitioner
knowledge of and confidence in their ability to provide effective diabetes treatment,
management, and education (Alotaibi, Al-Ganmi, Gholizadeh, & Perry, 2016; Bernard,
Anderson, Cook, & Phillips, 1999; El-Deirawi & Zuraikat, 2001; Lee, Liu, Quek, &
Chew, 2013; Mogre, Ansah, Marfo, & Garti, 2015).

While it is extremely important for healthcare providers to be knowledgeable
about diabetes, promoting public awareness and knowledge of the disease among the lay
population is also critical. A staggering 9.3% of the U.S. population currently is affected
by diabetes with millions more who are suspected to be undiagnosed (Centers for Disease
Control and Prevention, 2014). The pervasive effects of diabetes impact not only those diagnosed, but also their loved ones. The financial expense of diabetes is also outstanding, at an estimated cost to the United States of billions of dollars annually due to direct healthcare costs as well as money lost due to missed work (IDF, 2015). By everyone working together to prevent the disease or improve control of diabetes, positive impacts could be seen in quality of life, cost, and mortality rates. In order to achieve these goals, concentrated efforts to improve awareness of diabetes and combat the epidemic are necessary. The Diabetes Certificate Program at Ohio University is an example of one such program that is attempting to proactively expose students to diabetes and cultivate opportunities for early knowledge acquisition.

**The Diabetes Institute and Diabetes Certificate Program**

Ohio University is uniquely endowed with the Diabetes Institute and all of its affiliated programming. The Institute, which was established in 2012, is a collaborative group of researchers, clinicians, educators, healthcare administrators and students working together to makes strides toward reducing the burden of diabetes regionally, nationally, and globally through the use of innovative research, community outreach, and comprehensive educational programs. In conjunction with the Diabetes Institute, the College of Health Sciences and Professions began offering undergraduate and graduate students the opportunity to earn a Diabetes Certificate in the Fall of 2012. The Certificate enables students to gain a better understanding of the multifaceted condition of diabetes. Through the diverse curricular opportunities, students receive a well-rounded interdisciplinary education in the classroom as well as through clinical, research, and/or
service learning opportunities. Other universities have recognized the need to increase awareness of diabetes and have implemented programs to do so, such as an elective course available to Doctor of Pharmacy students at the University of Minnesota College of Pharmacy and a Diabetes Education and Management Master of Science degree offered at Columbia University (Westberg, Bumgardner, Brown, & Frueh, 2010; Teachers College, Columbia University, n.d.). However, the Diabetes Certificate Program is unique in that it is a nondegree program; it targets both undergraduate and graduate students; and, it promotes an interdisciplinary approach to understanding the disease.

To earn the Certificate, students must complete a minimum of 17 credit hours, including three core courses: (a) Diabetes: Bench to Bedside; (b) Trends in Diabetes; and (c) a 6-9 credit hour Independent Study with an emphasis on research, clinical, or service learning related to diabetes. Diabetes: Bench to Bedside is an online course that provides foundational knowledge on the genetics and physiology of diabetes, as well as clinically relevant issues and social implications associated with the disease (see Appendix A). Trends in Diabetes is a weekly seminar course that educates students about the most recent trends and research in diabetes from numerous different professional perspectives. In addition, the students must complete 6-9 credit hours of related elective coursework in the areas of nutrition, psychology, social and public health, and biological sciences, among others. In these courses, students learn information that is supplemental to the content introduced in the three core courses, affording them a more holistic view of diabetes and allowing them the flexibility to individualize the certificate to their personal
interests and career track. Any undergraduate or graduate student at Ohio University is eligible to complete the Certificate.

The Diabetes Certificate Program presents as an excellent resource for Ohio University students, particularly those in preprofessional healthcare or allied health professions, who will be working the front lines of this growing diabetes epidemic. The Certificate is an opportunity to develop a more coherent sense of understanding and awareness of the prevalence and impact of diabetes on so many individuals in our communities, whom all student will likely interact with in their personal and/or professional lives. By becoming better educated in the complexities of diabetes management and care and more aware of its widespread effects, students who complete the Certificate will be better able to address some of the aforementioned barriers.

**Statement of the Problem and Significance**

Considering the fact that some 415 million people around the world are living with diabetes, it is undeniably a significant threat to global public health (IDF, 2015). The Diabetes Certificate at Ohio University was developed as a way to increase exposure to and understanding of diabetes by all students in response to the high prevalence regionally, nationally and globally. Collecting regular student feedback through a process evaluation, including perceptions of ongoing successes and challenges, is a practical means of evaluating the Certificate’s effectiveness. By conducting a process evaluation to assess the Certificate’s delivery and how it was experienced by students, researchers can identify the significant components of the program that lend to the curricular effectiveness and sustainability of the program over time. Information collected from this
study could also be used to inform the development and implementation of similar programs at other universities across the country to promote greater awareness and understanding of the growing problem of diabetes.

**Research Questions**

This study targeted students who have completed the Diabetes Certificate at Ohio University. A number of structured focus groups were conducted to better understand students’ experience with the Diabetes Certificate, the following research questions were addressed:

1. What aspects of the Diabetes Certificate Program are the most effective and valued by student participants?
2. What are the perceived barriers to optimal program effectiveness?
3. How does participation in the Diabetes Certificate Program impact students’ perceived future career and/or educational endeavors?

**Limitations/Delimitations**

1. The sample of participants was relatively small and the participants were self-selected, so their thoughts and perceptions may not be generalizable to all students’ experiences with and perceptions of the Certificate program.
2. Students participated in the focus groups over the course of 2 years. As the Certificate and related coursework evolved, their experiences were different, which likely influenced responses.
3. As focus groups were conducted with a group of students, some students, particularly those who are shy or soft spoken, may have been hesitant to openly
share their thoughts, especially if their thoughts were in opposition with other participants.

4. As with quantitative research, findings of qualitative research may not extend to a larger population with the same degree of certainty; thus, quantitative research is needed to confirm the qualitative findings and document outcomes over time.

**Definition of Terms**

**Content analysis.** The systematic, objective, quantitative analysis of message characteristics (Neuendorf, 2002).

**Data saturation.** Collection of data in a study until redundancy of the data has occurred (Morse, 1995).

**Diabetes mellitus.** A group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both; the chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels (American Diabetes Association, 2004).

**Focus groups.** A group of people selected for their relevance to an evaluation that is engaged by a trained facilitator in a series of discussions designed for sharing insights, ideas, and observations on a topic of concern (U.S. Department for Health and Human Services, Centers for Disease Control and Prevention, 2011).

**Process evaluation.** Determines whether program activities have been implemented as intended and resulted in certain outputs (U.S. Department for Health and Human Services, Centers for Disease Control and Prevention, 2011).
Qualitative data. Observations that are categorical rather than numerical, and often involve knowledge, attitudes, perceptions, and intentions (U.S. Department for Health and Human Services, Centers for Disease Control and Prevention, 2011).

Thematic analysis. An analysis method that focuses on identifying and describing both implicit and explicit ideas within data, that is, themes; codes are then typically developed to represent the identified themes and applied or linked to raw data as summary markers for later analysis (Guest, MacQueen, & Namey, 2011).

Themes. A phrase or sentence that identifies what a unit of data is about and/or what it means (Saldaña, 2009).
Chapter 2: Literature Review

Overview of Chapter

This literature review will cover generalized information related to diabetes as a chronic disease and as an epidemic, as well as diabetes care, treatment and management. The role of various healthcare practitioners will be identified to justify why completing the Diabetes Certificate is relevant to a variety of different professions involved in providing care and support for individuals with diabetes. The importance of studying it for personal, familial and professional knowledge will also be discussed. Additionally, the Diabetes Certificate Program available at Ohio University will be described and compared with similar programs.

Diabetes

Prevalence of diabetes. In 2014, the WHO (2016) reported that approximately 422 million adults worldwide were living with diabetes, a statistic that is nearly double that of 1980. If these numbers are broken down, about one in every 11 adults has diabetes (IDF, 2015). Beyond these staggering numbers, the IDF (2015) estimates that an additional 193 million people are living undiagnosed, putting them at high risk for developing a host of associated complications. Globally, rates of diabetes are slightly more common in males than females and are much more prevalent in urban than rural populations (IDF, 2015). Considering the ethnic makeup of the United States, there are notably higher rates of diabetes among the American Indian (15.9%), non-Hispanic black (13.2%) and Hispanic populations than in the Asian American (9.0%) and Caucasian or non-Hispanic white population (7.6%) (American Diabetes Association, 2017). Rates of
diabetes worldwide present a significant public health concern to current and future generations.

**Financial cost.** Diabetes carries with it a host of medical costs associated with treatment and management measures. Estimates indicate that globally, more than $827 billion annually are spent on diabetes-related healthcare costs (IDF, 2015). According to a recent publication looking at healthcare costs associated with diabetes, nearly 20% of healthcare costs in the United States can be attributed to the treatment of diabetes (Zhuo et al., 2014). This same article reported that individuals with diabetes may spend twice as much on healthcare over the course of their lifetime as their peers without diabetes (Zhuo et al., 2014). The most significant costs include hospital inpatient care, prescription medications, antidiabetic agents, physician office visits and stints in nursing homes (American Diabetes Association, 2013). Additional money is lost to reduced productivity as a result of missed work or inability to work due to diabetes-related illness or complications. In 2012, the cost of lost productivity amounted to $69 billion in the United States alone (American Diabetes Association, 2013). With projected increases in the prevalence of diabetes, these costs will continue to rise accordingly.

**Diagnostic criteria.** There are three primary tests used to diagnose diabetes. For an individual to have diabetes, they must have confirmed results outside of the normal range with two or more of these measures (National Institutes of Health, 2015). Arguably the most reliable measure, hemoglobin A1C (HbA1c) is an indicator of average blood glucose levels (mg/dL) over the course of 3 months. Hemoglobin is a protein found in red blood cells, which is responsible for transporting oxygen to tissues throughout the body.
(National Institutes of Health, 2015). This protein has a lifespan of about 90 days; thus, levels reflect the average blood glucose level over a 3-month timeframe. The HbA1c is commonly used to diagnose prediabetes, type 1 and type 2, but generally is only used with gestational diabetes in the initial prenatal visit if the woman presents with risk factors that may indicate undiagnosed diabetes pre-pregnancy (National Institutes of Health, 2014).

Another blood test used for the diagnosis of diabetes is the fasting plasma glucose test (FPG). It is the most commonly used diagnostic test because of its convenience and low cost (National Institutes of Health, 2015). The FPG is generally thought to be most reliable in the morning and is only administered after an individual has fasted (no calorie-containing foods or beverages) for a minimum of 8 hours (National Institutes of Health, 2015). This test is effective at diagnosing type 1 and type 2 diabetes as well as prediabetes.

The third test commonly used to diagnose diabetes is the oral glucose tolerance test (OGTT). Results of this test can be used to diagnose type 1 and type 2 diabetes, prediabetes and gestational diabetes. The test is administered after an 8-hour fast, similar to the FPG, and an additional 2 hours after the individual has consumed a beverage containing 75 grams of glucose (National Institutes of Health, 2015). The cutoff values for these three diagnostic tests are outlined below in Table 1.
Table 1

*Blood Test Levels for Diagnosis of Diabetes and Prediabetes*

<table>
<thead>
<tr>
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<th>HbA1c (percent)</th>
<th>FPG (mg/dL)</th>
<th>OGTT (mg/dL)</th>
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<tr>
<td>Diabetes</td>
<td>6.5 or above</td>
<td>126 or above</td>
<td>200 or above</td>
</tr>
<tr>
<td>Prediabetes</td>
<td>5.7-6.4</td>
<td>100-125</td>
<td>140-199</td>
</tr>
<tr>
<td>Normal</td>
<td>5.6 or below</td>
<td>99 or below</td>
<td>139 or below</td>
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**Prediabetes.** Prediabetes is characterized by a notable elevation in blood glucose levels resulting from insulin resistance. As seen in Figure 1, an individual may be characterized as having prediabetes if their HbA1c ranges from 5.7-6.4%, FPG measures in at 100-125 mg/dL and/or the OGTT falls between 140 and 199 mg/dL. These levels are higher than the normal, healthy range but not high enough to be diagnosed with diabetes. A diagnosis of prediabetes puts an individual at an increased risk for developing type 2 diabetes and other associated complications such as cardiovascular disease and kidney disease in the future (Golay & Ybarra, 2005). Upwards of 70% of those having prediabetes go on to develop type 2 diabetes (McCain, 2016).

In 2010, the global prevalence of prediabetes was estimated at 343 million (Bansal, 2015). Because of the relatively common occurrence, individuals age 45 and older who are overweight or obese are at an increased risk and should be screened for prediabetes or diabetes. Also, individuals younger than 45 who are classified as overweight or obese and identify with other risk factors, such as family history of
diabetes, high blood pressure, physical inactivity, abnormal lipids and certain ethnicities including Native American and Hispanic/Latino, should be tested as well, because they are at an increased risk (National Institutes of Health, 2015). Visceral obesity, or excess storage of adipose tissue around the abdominal area, is also a risk factor, because it is linked to insulin resistance (American Diabetes Association, 2017). Left untreated, not only can prediabetes develop into type 2 diabetes, but it can also cause the onset of both macrovascular and microvascular conditions including neuropathy, nephropathy and retinopathy. However, according to the Diabetes Prevention Program (DPP) study, with increased physical activity and appropriate dietary changes, and in some cases, the use of metformin, prediabetes can be reversed and the onset of type 2 diabetes can be prevented (Bethel, Xu, & Theodorakis, 2015).

**Type 2 diabetes.** As with all forms of diabetes, type 2 diabetes (T2DM) is a chronic disease characterized by uncontrolled hyperglycemia. The main pathophysiological features contributing to T2DM are insulin resistance and impaired insulin secretion, both of which involve a decline in function of the beta cells of the pancreas. Insulin resistance occurs when certain cells, namely liver, muscle and fat cells, are not able to properly respond to insulin, decreasing the cells’ ability to absorb glucose from the bloodstream (American Diabetes Association, 2017). This, in turn, necessitates increased production of insulin by the beta cells of the pancreas. In the development of insulin resistance, the pancreas gradually loses its ability to keep up with the body’s demand for insulin to counteract high blood glucose levels, resulting in hyperglycemia.
The cause of insulin resistance is multifactorial. However, obesity appears to be a common feature of T2DM and insulin resistance. According to research by Ford, Williamson and Liu (1997), for each kilogram of weight gained, an individual’s chance of developing diabetes increases by 4.5 to 9%. Obesity and diabetes are so inextricably related that the epidemic is sometimes referred to as “diabesity” (Golay & Ybarra, 2005). An estimated 60-90% of individuals with T2DM are or were previously obese (Golay & Ybarra, 2005). It is generally understood that the manifestation of diabetes from an obese state results from insulin resistance and impaired glucose tolerance (Ford et al., 1997).

Visceral obesity, or the accumulation of excessive fat around the abdominal area, is specifically related to the development of insulin resistance (Golay & Ybarra, 2005). Along with excess weight, other risk factors believed to contribute to the development of insulin resistance include physical inactivity (Hamburg et al., 2007); ethnicity (Falkner, Hulman, Tannenbaum, & Kushner, 1990); long term steroid usage (Andrews & Walker, 1999); certain conditions, including polycystic ovarian syndrome and sleep apnea (Steinberger & Daniels, 2003); and, cigarette smoking (Chiolero, Faeh, Paccaud, & Cornuz, 2008). Risk factors for the development of T2DM are very similar to those seen in individuals with prediabetes.

T2DM, or as it was formerly referred to adult-onset diabetes or non-insulin-dependent diabetes, can surface at more or less any stage of life given the right conditions. The disease typically develops gradually over the course of many years, progressing through a stage that would be considered prediabetes. As it stands, there is no cure for T2DM so taking preventative measures before blood glucose levels reach an
HbA1c of 6.5% or greater is advisable. T2DM has been shown to be prevented or delayed with proper lifestyle changes. The Diabetes Prevention Program (DPP), which attempts to decrease the risk of developing T2DM through lifestyle interventions including weight loss and increased physical activity, has seen impressive results, decreasing the incidence of diabetes by as much as 58% (The Diabetes Prevention Program Research Group, 2002). Pharmacological agents, such as metformin, are also effective in preventing and delaying the onset of T2DM in many individuals with prediabetes. However, according to a large-scale 10-year follow-up study conducted by the DPP, incidence of diabetes was reduced by 34% in the lifestyle intervention group as compared to 18% in the metformin group (Bethel et al., 2015). Thus, adopting appropriate lifestyle modifications is an important means of preventing the onset of disease.

Type 1 diabetes. Type 1 diabetes (T1DM) is often referred to as juvenile diabetes or juvenile-onset diabetes, as it most commonly develops in young people; however, it may also develop in the adult population. Another common name used to refer to T1DM is insulin-dependent diabetes, which references the physiological manifestation of the disease. T1DM accounts for 5-10% of cases worldwide (Maahs, West, Lawrence, & Mayer-Davis, 2010). The pathogenesis of the disease is characterized by the autoimmune destruction of the pancreatic beta cells, resulting in complete insulin deficiency. Specifically, the islet cells are attacked by CD4+ and CD8+ cells as well as macrophages, which render most of the beta cells nonfunctional (Gillespie, 2006). Because of this, the primary treatment modality for T1DM is the use of insulin injections.
Both genetic and environmental factors are believed to contribute to the onset of the disease. Human leukocyte antigen genes (HLA), as with other autoimmune diseases, are the primary genetic components associated with the development of T1DM; however, the genetic underpinnings of the disease are not yet entirely understood, as there are likely a number of confounding factors (Gillespie, 2006). Similarly, environmental factors predisposing individuals to the development of T1DM are believed to be significant, but identification has proven difficult. Some factors that may play a role include viruses, seasonality and geography (Gillespie, 2006). Other unavoidable risk factors that predispose individuals to T1DM include age, race/ethnicity, and gender. Incidence typically peaks between the ages of 10 and 14, individuals of European descent are the most commonly affected and according to many studies, and the disease tends to slightly favor males, particularly in regions with a higher incidence (Maahs et al., 2010).

**Gestational diabetes.** Similar to the development of T2DM, gestational diabetes (GDM) is characterized by glucose intolerance and insulin resistance. However, gestational diabetes can only be diagnosed when a woman is pregnant. GDM, which is not detected until weeks 24 to 28 of pregnancy, is present in nearly 10% of all pregnancies worldwide (Kaaja & Tapani, 2008). If a woman is suspected to be at an increased risk, an oral glucose tolerance test (OGTT) may be administered earlier in the pregnancy to take preventative measures. Risk factors for the development of GDM include overweight or obesity, family history of GDM or T2DM, previous GDM diagnosis, previous macrosomic child, being over the age of 30, among others (Kaaja & Tapani, 2008). Lifestyle modifications, namely diet and exercise, are believed to be the
When most effective means of treatment for GDM (Kaaja & Tapani, 2008). If pharmacological treatment is indicated, the most recent Standards of Medical Care in Diabetes recommends insulin as the preferred treatment over metformin, as there are concerns about the concentration of glyburide negatively impacting the fetus (American Diabetes Association, 2017).

GDM is the most significant risk factor for the future development of T2DM in women (Hanna, Duff, Shelley-Hitchen, & Hodgson, 2017). An estimated 35-60% of women with GDM will develop T2DM within 10-20 years postpregnancy (Hanna et al., 2017). Women with GDM also have an increased risk of developing pre-eclampsia, predisposing them to certain perinatal complications, which may necessitate a cesarean section, often due to the large size of the baby. Additionally, a woman’s chances of developing GDM with a consecutive pregnancy are elevated, particularly if the GDM is not well managed (Kaaja & Tapani, 2008; Damm et al., 2016). Presence of GDM has negative implications for not only the mother but the child as well. Babies born to mothers with GDM are at an increased risk for complications. Macrosomic babies, or large babies weighing 9 pounds or more, are common with GDM, making natural delivery more difficult and potentially dangerous. Because of the increased insulin production in utero, babies often experience episodes of hypoglycemia shortly after birth (National Institutes of Health, 2014). Other risks include congenital abnormalities, the development of respiratory distress syndrome as well as an increased likelihood of being overweight or obese and developing T2DM later in life (Damm et al., 2016).
Comorbidities/associated complications. Diabetes is often associated with a host of other health complications, both macrovascular and microvascular, particularly if the disease is not treated or poorly managed. The most common macrovascular conditions connected to diabetes include coronary artery disease (CAD), peripheral arterial disease (PAD) and stroke (Fowler, 2008). High fasting blood sugar typically occurs as part of the metabolic syndrome, which includes hypertension, dyslipidemia and/or visceral obesity. Cumulatively, these factors, along with chronic inflammation, increase the risk for macrovascular complications by damaging vascular endothelial tissue (Cade, 2008). However, T2DM is also considered an independent risk for CAD (Fowler, 2008).

These statistics illustrate the gravity of diabetes as it relates to macrovascular exacerbations. An estimated 71% of individuals with diabetes have a blood pressure above 140/90 millimeters of mercury and 65% have a low-density lipoprotein (LDL) cholesterol, which contributes to atherosclerosis, above 100 mg/dl or are taking corrective medications (Centers for Disease Control and Prevention, 2014). Cardiovascular disease is the leading cause of death in individuals with T2DM (Mohammedi et al., 2016). In 2010, individuals with diabetes over the age of 20 were 1.8 times more likely to be hospitalized for a heart attack and 1.5 times more likely to be hospitalized for a stroke than their nondiabetic counterparts (Centers for Disease Control and Prevention, 2014). Individuals with T2DM have a three times greater risk of developing PAD, which is a common manifestation of poorly managed atherosclerosis and can be responsible for amputations and cardiovascular events (Mohammedi et al.,
2016). These figures paint a picture of the numerous macrovascular complications that can result from inadequate management of diabetes.

A number of microvascular complications are also associated with poor management of diabetes. The most common are neuropathy, nephropathy and retinopathy. Neuropathy is characterized by the loss of feeling or weakness resulting from nerve damage and damage to the small blood vessels delivering oxygen to the nerves (Malik, 1997) and is most often seen in the extremities. If untreated, it may exacerbate, as the loss of feeling may cause an infection of the lower extremities to go unnoticed, necessitating an amputation. In fact, about 60% of lower-limb amputations in the United States occur in people with diabetes (Centers for Disease Control and Prevention, 2014). Nephropathy is another common side effect of diabetes. Diabetic nephropathy is defined by damage to the kidneys, specifically the glomerulus and its network of capillaries (Cade, 2008). When hyperglycemia is not well managed in an individual with diabetes, the result may be kidney failure if enough blood vessels are damaged, rendering the kidney ineffective at removing waste from the body, necessitating dialysis or a kidney transplant. A quarter of individuals with T2DM are believed to experience diabetic nephropathy that intensifies at a rate of 2-3% annually (Cade, 2008). Retinopathy is the third of the microvascular conditions frequently seen in individuals with diabetes. Similar to nephropathy, retinopathy is characterized by damage to small blood vessels, but in this case, the damage occurs in the retina of the eye and may cause vision loss or blindness. Diabetic retinopathy is the leading cause of blindness among adults in the United States (Joussen et al., 2004). Each year, diabetic retinopathy
is responsible for some 10,000 new cases of blindness in the United States alone (Fowler, 2008).

The Role of Healthcare Professionals in Diabetes Treatment and Management

Factors to consider for effective care. While it is widely understood that there are a number of physiological complications associated with diabetes, the impact of the disease extends well beyond physical health. Diabetes impacts nearly every aspect of an individual’s life, including but not limited to psychological wellbeing, ability to balance a busy schedule with disease management, and maintenance of personal relationships. Further, there are several factors that affect efficacy of diabetes management including the absence of social support, low health literacy, socioeconomic status, and poor attitude or lack of motivation to adhere to treatment and management regimens.

In 2011, Fukunaga, Uehara and Tom explored people’s perceptions of diabetes as well as their thoughts on barriers to disease management and the need for new or modified support services. A group of 74 working adults with diabetes living in Hawaii was surveyed and a handful of common themes emerged from the focus groups. Because of its chronic nature, participants generally agreed that the effects of diabetes pervaded every facet of their lives. All in all, participants identified coordinated diabetes programs, improved public awareness, and effective interprofessional collaboration as important components that should be more available to help ameliorate many of the barriers they were experiencing with regard to the management of diabetes (Fukunaga et al., 2011). Several other studies from the patient perspective support the idea that diabetes is a
complex disease that needs to be addressed from many different angles with the support of various healthcare providers (Huang et al., 2007; Raballo et al., 2012).

In an attempt to summarize existing knowledge about barriers to diabetes management, Nam, Chesla, Stotts, Kroon and Janson (2011) compiled information from several publications investigating patient and clinician perceived barriers to effective self-management. From the healthcare provider’s (HCP) perspective, barriers to providing effective patient-centered care include, but are not limited to, beliefs, attitudes and knowledge toward diabetes management, lack of effective patient-provider communication skills to encourage better outcomes, and demands put on primary care providers from the health care system that disallow ample time to devote to individual patients’ care plans (Nam et al., 2011). The DAWN 2 Study (Diabetes Attitudes, Wishes and Needs Study) was a follow-up to the original DAWN study conducted in 2001 (Funnell, 2006). The DAWN 2 Study is a large-scale international study that was carried out in 2011 to identify attitudes, wishes and needs among healthcare providers (HCP), patients with diabetes, and their respective family members (Funnell, Bootle, & Stuckey, 2015). This study primarily sought to assess current diabetes care and self-management and to identify effective strategies for treatment and management. HCPs surveyed generally indicated that they felt unprepared to provide effective diabetes care, resulting in an inadequate system that is not equipped to manage the diabetes epidemic.

The healthcare team and its role in disease management. There are a number of healthcare professionals who are trained to provide care for the different facets of diabetes. While many patients with diabetes receive the majority of their care from
primary care physicians, meeting individual patient treatment goals can prove difficult
due to time constraints and scope of practice (Hellquist, Bradley, Grambart, Kapustin, &
Loch, 2012). Other professionals who may be involved in the provision of care include
Certified Diabetes Educators (CDEs), registered dietitians, nurses, nurse practitioners,
exercise physiologists, endocrinologists, psychiatrists/psychologists, pharmacists,
podiatrists, and ophthalmologists (Gucciardi, Espin, Morganti, & Dorado, 2016). All
members of the interdisciplinary team are uniquely trained with specific expertise, so
honoring each member’s scope of practice is an important way to maximize effectiveness
of interdisciplinary care. Effective communication among practitioners for the purposes
of developing and following an effective and cohesive treatment plan is also important
(Hellquist et al., 2012).

The makeup of the interprofessional team depends on an individual’s specific
needs in relation to his/her diabetes. The following table attempts to depict the different
roles various professionals may fill in the care of someone with diabetes. Table 2 lists the
most common member of the diabetes care team as identified by the American Diabetes
Association (2017). However, other valuable members of an interprofessional care team
may include community health workers, school nurses, and trained peer leaders (National
Diabetes Education Program & National Institutes of Health, 2011). If complications
with diabetes occur, other specialists including dental professionals, cardiologists,
podiatrists, nephrologists, neurologists, and ophthalmologists may also become important
members of the team (National Diabetes Education Program & National Institutes of
Health, 2011).
Table 2

**Healthcare Professional Roles in Diabetes Management and Care**

<table>
<thead>
<tr>
<th>Professional (Role)</th>
<th>Role/Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary care physician (Nurse practitioner, physician assistant)</td>
<td>Provides general check-ups; refers patients to specialists or other team members.</td>
</tr>
<tr>
<td>Endocrinologist</td>
<td>Specializes in treatment of diabetes and other diseases of the endocrine system.</td>
</tr>
<tr>
<td>Nurse</td>
<td>Supports patient understanding of day-to-day aspects of diabetes self-care management.</td>
</tr>
<tr>
<td>Pharmacist</td>
<td>Provides insight on what medications may be appropriate for different individuals; advises on polypharmacy and possible interactions.</td>
</tr>
<tr>
<td>Registered dietitian</td>
<td>Provides education on nutritional needs for diabetes; recommends appropriate, individualized dietary pattern.</td>
</tr>
<tr>
<td>Certified diabetes educator</td>
<td>Provides education on the complexities of diabetes, diabetes self-management, and medication management.</td>
</tr>
<tr>
<td>Mental health professional</td>
<td>Supports emotional wellbeing, provides patients with resources to help with medical and/or financial needs (social workers).</td>
</tr>
<tr>
<td>Exercise physiologist</td>
<td>Assists in the development of an appropriate fitness program.</td>
</tr>
</tbody>
</table>


The American Association of Diabetes Educators (AADE) has compiled a list of seven essential self-care behaviors, referred to as the AADE7, for individuals with diabetes to achieve good outcomes. The AADE7 includes healthy eating, being physically active, monitoring blood glucose, complying with medication regimens,
problem solving, healthy coping, and risk-reduction (AADE7 Self-Care Behaviors, 2008). CDEs are the professionals primarily tasked with seeing that these seven behaviors are incorporated into effective education programs. CDEs provide education and support to individuals with diabetes with the ultimate goal of encouraging patients to achieve successful self-management for optimal health outcomes. Certification is practice-based and several healthcare providers including psychologists, registered nurses, physicians and registered dietitians with a minimum of 2 years of professional practice experience and 1000 hours of diabetes self-management education (DSME) experience are eligible to take the exam (National Certification Board of Diabetes Educators, 2017). To achieve the best results, clinician support and cooperation with the CDE is advisable (Shirvastava, Shirvastava, & Ramasamy, 2013).

**Individualized and patient-centered care.** Algorithmic, one-size-fits-all approaches are the traditional methods of diabetes care; however, these techniques are fixed, substandard, and often fail to consider differing variables and individuals’ personal goals for diabetes treatment and management (Subramanian & Hirsch, 2014). Individualized, patient-centered care is emerging as a new and often preferable trend in healthcare. Patient-centered care involves the development of mutual respect and understanding between the patient and provider (Powell, Corathers, Rayomd, & Streisand, 2015). This approach to care emphasizes communication strategies such as partnership building, collaborative goal setting, empathizing and a greater degree of sensitivity to personalized needs (Powell et al., 2015). Personalizing care in patients with diabetes is particularly important as there are multiple variables to be considered,
including duration of disease, therapeutic method, presence of comorbidities or diabetes-related complications as well as socioeconomic status (Subramanian & Hirsch, 2014). In a number of studies, patient-centered care has been shown to positively impact long-term patient outcomes and may also be more cost-effective, as unnecessary routine diabetes treatment modalities are avoided (Powell et al., 2015).

**Diabetes Attitudes**

**University students’ perceptions of diabetes.** College is often considered a time in which youth transition to adulthood, gain a sense of independence and in doing so, begin to develop lifelong habits, including those related to diet and physical activity. Because this is such a crucial time for many young adults, developing a sense of awareness and perceptions of risk factors for all-too-common lifestyle diseases, such as diabetes, is important. A study by Reyes-Velázquez and Hoffman (2011) sought to gauge undergraduate college students’ perceptions of T2DM. Focus groups with a total of 30 participants at an unidentified school in the Southern United States were completed, and participants were asked to describe their understanding of T2DM, identify any known risk factors and explain how it develops. The majority of students were able to describe the disease in its most basic form; however, beyond the mention of poor diet and being overweight, students were unable to articulate clearly the risk factors and how T2DM manifests. Another study of college students at Minnesota State University Mankato yielded similar results (Shodunke, 2014). While this study focused more on perceived personal risk, it still reveals that university students generally believe that the risk of developing T2DM in college is not significant. Their perceptions indicate that increased
education on diabetes and its risk factors may be appropriate for university-level students. A third study conducted at three City University of New York campuses sought to gauge personal risk perceptions among a sample of 1,579 diverse students. Results of the study found that 39% of students considered to be at high-risk for developing T2DM did not perceive themselves to be at risk (Mongiello, Freudenberg, Jones, & Spark, 2016). These underestimations of risk and unrealistic perceptions indicate that increased awareness and education on diabetes and its risk factors may be appropriate for young adults, particularly during the developmental college years (Mongiello, Freudenberg, Jones, & Spark, 2016).

**Healthcare professionals’ and patients’ perceptions of diabetes.** The Diabetes Attitudes, Wishes and Needs Study (DAWN Study) is a large-scale international study that was conducted in 2001 to identify attitudes, wishes and needs among patients with diabetes and healthcare providers to make efforts to improve care (Funnell, 2006). Providers expressed concern with adherence to a self-management and care plan, indicating that they believed only about 7.3% of individuals with T1DM and 2.9% of individuals with T2DM followed their recommendations for management strategies (Funnell, 2006). They also believed that a good majority of patients experience psychological problems as a result of concern for their health, which may be negatively impacting their glycemic control. Another common theme that surfaced was a lack of sufficient understanding of these psychosocial consequences of the disease as well as an understanding and appreciation of the diverse ethnicities with whom they serve.
In the DAWN 2 Study, individuals with diabetes and healthcare providers (HCP) were surveyed as well as family members living with people with diabetes (Funnell, Bootle, & Stuckey, 2015). This study primarily sought to assess current diabetes care and self-management and to identify effective strategies for treatment and management. Of the HCP respondents, 78.8% indicated a lack of resources for prevention, 56.1% indicated that communication between the patient and provider was not up to par and the majority reported that psychological support is key for effective care and management but only 52% of practitioners indicated asking their patients how diabetes is affecting their lives (Funnell et al., 2015). These results indicate that practitioners are aware that there are holes in the system and improvements must be made to improve the healthcare system and diabetes outcomes.

**Diabetes Education**

**Components of provider education.** According to the WHO’s Global Report on Diabetes, the core components of an effective diabetes management program include ongoing access to person-centered care from a multidisciplinary team, health education and counseling, frequent follow-up, and a care plan that is continually updated to meet individuals’ needs (WHO, 2016). To effectively realize these needs, practitioners should have a solid base of knowledge with respect to diabetes and effective intervention strategies to promote sound management and treatment of the disease. To standardize care, these strategies should focus on the promotion of healthy eating and physical activity habits, appropriate medications for blood glucose control, medications to reduce
risk of related cardiovascular symptoms, exams for early detection of microvascular complications, and standard referral to appropriate care providers (WHO, 2016).

Several opportunities for professionals to become better educated on diabetes exist. A systematic review conducted by Renders et al. (2001), examined the effectiveness of various intervention strategies targeted at healthcare professionals to improve diabetes patient care. The article concluded that the inclusion of postgraduate education opportunities for practitioners may be an effective way to improve diabetes outcomes, so long as the professionals are open to and appreciate the need for updates and modifications to their practice (Renders et al., 2001). Most professionals are required to complete a certain number of hours of continuing education credits to maintain certification/licensure although these may not necessarily be dedicated to diabetes. Physicians assistants for example must complete 100 hours every 2 years for the first 10 years after certification (National Commission on Certification of Physician Assistants, 2017) and registered dietitians are required to complete 75 hours every 5 years after certification (Commission on Dietetic Registration, 2017). The American Diabetes Association recognizes the importance of practitioners keeping relevant with their knowledge of diabetes and in turn offers several continuing education opportunities to support quality improvement. Free continuing education credits through the ADA are available to physicians, nurse practitioners, nurses, pharmacists, registered dietitians, certified diabetes educators, among others, and include scientific sessions, live and online programs, the Annual Postgraduate Course, and the Annual Clinical Conference on Diabetes (American Diabetes Association, 2017). By seeking out continuing education
focused on diabetes care through professional organizations or other opportunities, practitioners will be better positioned to provide high quality, skilled care to patients with diabetes.

**Educational opportunities for practitioners in training.** For the best outcomes, practitioners should have thorough education on the risks and complications of diabetes during their respective trainings so they are best able to help patients effectively manage a diabetes diagnosis. With the growing prevalence of diabetes and a growing older adult population, the need for practitioners who are knowledgeable about diabetes is invaluable (Funnell, Anderson, & Oh, 1994). In the mid-1990s, the University of Michigan Diabetes Research and Training Center (DRTC), one of many multidisciplinary research units funded by the National Institutes of Health, decided to convert its well-established diabetes patient education program to one that would meet the needs of undergraduate students studying to become future healthcare professionals or those with a special interest in the disease (Funnell et al., 1994). The researchers felt offering a diabetes education course at the university level was an excellent opportunity to disseminate important and understudied information on diabetes and to influence the attitudes of young health profession students (Funnell et al., 1994). Students enrolled in the “Life with Diabetes” course attended educational sessions by faculty and practitioners from an array of specialties, which covered topics ranging from pathophysiology of diabetes to nutrition to monitoring strategies and patient empowerment (Funnell et al., 1994). A variety of teaching methods were used including lectures, active discussions, patient anecdotes and skill practice in diet tracking and blood glucose monitoring (Funnell et al.,
Changes from pre- and posttest measures indicate that this 1 credit-hour course significantly improved students’ attitudes toward and understanding of diabetes and suggest that implementing coursework like this at the university level should be considered a viable option if the necessary resources are available (Funnell et al., 1994).

Other attempts have been made to deliver diabetes education to health profession students and practitioners (Rodrigues, Vieira, & Torres, 2010; Westberg, Bumgardner, Brown, & Frueh, 2010). One such effort was made by researchers at the University of Minnesota College of Pharmacy, who honed in on the need for further education on diabetes among doctor of pharmacy students (Westberg et al., 2010). In response to this need, a one-credit course was developed that provided students with basic foundational knowledge of diabetes delivered by faculty and diabetes educators that would prepare them for a weeklong immersive experience in which they would perform regular blood glucose checks, insulin injections (with saline) and carbohydrate counting (Westberg et al., 2010). At the conclusion of the course, students reported increased confidence in their ability to perform and teach appropriate diabetes self-management skills and an enhanced ability to empathize with patients with diabetes (Westberg et al., 2010).

Several other universities have also recognized the importance of providing further education to future and current healthcare professionals to make them better equipped to rise to the occasion and meet the needs of the expanding population of individuals with diabetes. Table 3 provides a comparison of diabetes education programs offered at Columbia University, University of California San Francisco, Capella
University, and University of Florida, as they compare to the Diabetes Certificate at Ohio University.
### Comparison of Diabetes Education Programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Admission Criteria</th>
<th>Credits</th>
<th>Setting</th>
<th>Curriculum</th>
</tr>
</thead>
</table>
| Ohio University Diabetes Certificate Program  | Ohio University undergraduate or graduate student | 17      | Blended; online, in-person | Diabetes: Bench to Bedside  
Trends in Diabetes  
Independent Study in Diabetes  
Elective courses in Nutrition, Biology, Chemistry, Exercise  
Physiology, Psychology, Child and Family Studies, Social and Public Health |
| Columbia University MS in Diabetes Education and management | Bachelor’s degree in an (allied) health profession | 36      | Online          | Behavior Strategies for Diabetes Prevention and Control  
Pathophysiology of Diabetes and Its Complications  
Assessment of the Person with Diabetes  
Preventative and Therapeutic Interventions  
DSME Programs: Development, Implementation, and Evaluation  
Elective courses in Health and Education and Human Development |
| Columbia University Certificate in Advanced Diabetes Topics | Master’s degree | 16      | Online          | Behavior Strategies for Diabetes Prevention and Control  
Pathophysiology of Diabetes and Its Complications  
Assessment of the Person with Diabetes  
Preventative and Therapeutic Interventions  
DSME Programs: Development, Implementation, and Evaluation |
| University of California San UCSF School of Nursing | UCSF School of Nursing (units) | 6       | In-person       | Management of Pediatric Diabetes  
Clinical Management of Adult Diabetes |
<table>
<thead>
<tr>
<th>Francisco Diabetes Minor</th>
<th>Master’s student</th>
<th>Family and Behavioral Approaches to Diabetes Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capella University Diabetes Nursing Graduate Certificate</td>
<td>Bachelor’s degree in nursing, 1-year work as licensed RN</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evidence-based Education, Planning, and Outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nonpharmacologic Interventions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pharmacologic Interventions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data Evaluation and Program Development</td>
</tr>
<tr>
<td>University of Florida Professional Certificate in Diabetes Education</td>
<td>Healthcare professional with 20 years clinical experience</td>
<td>49.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nutrition and Exercise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medication and Monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acute and Chronic Complications</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Teaching, Problem-solving, Psychosocial Assessment and Coping</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Management through the Lifespan</td>
</tr>
</tbody>
</table>

*Note. Sources: (a) Ohio University, Diabetes Certificate Program; (b) Teachers College, Columbia University, Diabetes Education and Management; (c) University of California- San Diego; (d) Capella University, Diabetes Nursing Certificate Online; (e) University of Florida, Diabetes Educator Academy.*
When comparing the Ohio University Diabetes Certificate Program with these other diabetes-focused programs offered at other universities, a few aspects stand out. Notably, the Diabetes Certificate Program is available to both undergraduate and graduate students and does not have other prerequisites, such as having earned a certain degree or completed a specific number of hours in the field. This permits students of all backgrounds and career tracks to become educated on the complexities of diabetes and is a means of proactively introducing this information from a younger age and/or stage of personal and professional development. Because the Certificate does not require students to hold a certain degree or be enrolled in a particular major, this fosters an interdisciplinary environment in which students learn about diabetes among peers in different career tracks. This mimics the realities of effective diabetes care and management, which requires an effective team of professionals who all contribute their individual expertise to achieve desired outcomes (Gucciardi, Espin, Morganti, & Dorado, 2016). Similar to the master’s degree offered at Columbia, students also have the ability to individualize their Certificate experience by selecting from an extensive list of elective courses. Lastly, the Diabetes Certificate utilizes a blended learning format, which allows students to learn in an online-based setting as well as the more traditional in-person lecture format.

While these things are true, it should be appreciated that all of these programs are making strides to increase exposure to and understanding of diabetes, which is extremely important considering its prevalence and the negative impact the disease can have on individuals, communities and the health system. The different programs have differing
target audiences. Ohio University’s Diabetes Certificate Program is intended for any student who is interested, as it aims to reach a wide population and avoid exclusion by only offering coursework specific to and easily understood by healthcare majors. It is offered as a certificate, which can be conceptualized as an interdisciplinary minor, because certificates are only offered when there is no comparable major available at the University. The master’s degree at Columbia University is intended for clinicians with a bachelor’s degree who are currently working in diabetes or would like to prepare for the Certified Diabetes Educator examination. Completion of the program is flexible given the online nature and may be done full- or part-time. The Certificate in Diabetes Topics at Columbia is more geared toward individuals who already hold a master’s degree and would like to improve their knowledge of diabetes through advanced coursework. The Diabetes Minor at UCSF provides graduate students an opportunity to gain an edge over their peers and learn about effective behavioral and medical means of managing diabetes. Capella University’s program is also intended for those in the field of nursing, but is targets working professionals who are seeking evidence-based education on the role of the nurse in delivering improved diabetes care. The University of Florida’s Professional Certificate in Diabetes education is intended for healthcare professionals who are eligible to take the CDE exam but are looking for advanced education for exam preparation and require flexible course offerings. The coursework offered meets the competencies set forth by the American Diabetes Association of Diabetes Educators.
Summary

Diabetes is one of the most prominent public health concerns in our world today. The prevalence of the disease is steadily rising and affects not only individuals with the disease, but family members of those with diabetes, the economy, and the healthcare system. Knowledge of the complex realities of diabetes is significantly lacking among the general public and among healthcare professionals alike. The purpose of this study is to evaluate the programmatic effectiveness of the Diabetes Certificate Program offered to undergraduate and graduate students at Ohio University, in an effort to increase awareness and understanding of the disease and influence the implementation of similar educational programs elsewhere.
Chapter 3: Methodology

Research Design

This study served to provide insight into students’ experiences with the Diabetes Certificate Program through the use of focus groups. As a member of the research team, I did not participate in the data collection phase of the process. For the purposes of my thesis research, I did actively assist in the analysis of the data with two other researchers. The results of the analysis, which are found in the following sections, were used to identify successes and challenges of the Certificate and to inform recommendations for future improvements and/or implementation of a similar program at other universities.

Six independent focus groups were conducted with undergraduate and graduate students who completed or were currently enrolled in the Diabetes Certificate Program at Ohio University. Focus groups are a qualitative means of collecting data through semistructured group interviews (Morse, 1995). The idea behind focus groups is that the participants are able to share and develop attitudes, beliefs, perceptions, and expectations through interaction with others, rather than in isolation, as in an individual interview (Krueger & Casey, 2000; Morgan, 1988). Trained facilitators ask participants a series of questions in an interactive group setting, in which participants are encouraged to talk openly among themselves. In the world of health research, focus groups are used primarily to (a) support educators in the development of more effective targeted educational messages and programs to support development of specific knowledge and skills; (b) guide the design of appropriate research questions and analytic models with the use of larger-scale quantitative data; and, (c) inform the interpretation of broader existing
quantitative research findings (Krueger & Casey, 2000; Morgan, 1988). In the case of this research, data from the focus groups will be used to inform program improvements in the future.

**Diabetes Certificate Program**

The Diabetes Certificate Program is a unique 17 credit-hour program that serves to educate Ohio University undergraduate and graduate students about diabetes from a multidisciplinary perspective. This program is supported by the Diabetes Institute and the College of Health Sciences and Professions. The Certificate has been offered as a program independent of students’ major coursework since the Fall of 2012. The Certificate includes three core courses: (a) Diabetes: Bench to Bedside, (b) Trends in Diabetes, and (c) Independent Study in Diabetes. Diabetes: Bench to Bedside is a comprehensive online-based course that offers an exploration of the underlying genetics and pathophysiology of diabetes and clinically relevant issues surrounding diabetes from medical, self-management, and prevention perspectives. Trends in Diabetes, the second required course of the Certificate, is a seminar discussing the latest trends and discoveries in diabetes research and clinical care. The capstone course, Independent Study in Diabetes, is a hands-on learning experience emphasizing research, clinical, or service learning related to diabetes. Additionally, students select 6-9 credit hours of elective courses to fulfill the remaining requirements from the following subject areas: Anthropology, Biological Sciences, Chemistry, Child and Family Studies, Communications, Exercise Physiology, Nutrition, Psychology, and Social and Public Health. The Certificate is designed to reach beyond the traditional classroom setting to
provide opportunities for interactive and immersive learning to assist students in developing a more in-depth understanding of diabetes, as it becomes increasingly prevalent and as they prepare to move into the working world where they will undoubtedly interact with individuals with diabetes in a number of capacities and careers.

**Subjects**

Purposive sampling was employed to recruit participants. Inclusion criteria included all undergraduate and graduate students who completed the Diabetes Certificate Program and were currently enrolled in a degree program at Ohio University. A recruitment email was drafted and sent to students who were identified through the Diabetes Certificate Program enrollment list. Participation in the study was voluntary. Participants provided informed consent prior to participation in the focus groups and also received compensation for their time. A total of 21 students participated in the six focus groups, which were held over the course of two years.

**Data Collection**

Students who agreed to participate in the focus groups read and signed an initial consent form at the time of the focus group (see Appendix B). The consent form contained information about the purposes of the study, the intended outcomes, possible risks and benefits of participation and an explanation of how participants’ personal information was used. The consent specifically mentioned the voluntary nature of participation to avoid coercion. The document also explicitly informed participants that should they choose to withdraw from the study at any time for any reason, there would be no adverse effects to their student standing at Ohio University.
A structured discussion guide was developed and field-tested for flow and clarity of questions (see Appendix C). Questions included general inquiries about student experiences with and opinions of the Diabetes Certificate program as well as questions specifically relating to Diabetes: Bench to Bedside, Trends in Diabetes, Independent Study in Diabetes, and students’ future plans. Focus groups were conducted at easily accessible locations (e.g., conference rooms and classrooms) on the Ohio University campus and lasted approximately 45 to 60 minutes. The discussions were led by trained moderators who asked participants broad, open-ended questions about their experiences in the Diabetes Certificate Program. All focus groups were audio-recorded and transcribed verbatim; participants’ names and identifiers were removed to protect their confidentiality. Prior to participation, participants also completed a brief demographic form (see Appendix D).

**Data Analysis**

After completion of the focus groups, the research team performed content analysis by independently marking and categorizing key words, phrases, and texts to identify codes and characterize overarching themes (Krippendorf, 2004), which described student perceptions of and experiences with the Diabetes Certificate Program. This process continued until saturation was reached and no new codes emerged. Data from each focus group were analyzed separately by the three researchers and then compared to identify common themes across groups. To verify consistency of findings, all focus group transcripts, participant observations and field notes from the researchers were converged to establish intercoder reliability as previously described (Neuendorf, 2002).
Rigor

To establish trustworthiness of qualitative research, a validated paradigm to ensure rigor is commonly used, which includes four criteria: credibility, transferability, dependability and confirmability (Guba, 1981). Credibility, which seeks to ensure that research addresses what was actually intended, was supported by conducting member checks among the three researchers to confirm corroboration of participant feedback and accuracy of data (Denzin, 1978; Shenton, 2004). The second criteria, transferability, or the ability of one study’s findings to be applied to another situation (Shenton, 2004), was supported with the detailed description of the Diabetes Certificate Program, the research questions we sought to answer, and the methodology with which the program would be evaluated so that findings may be compared with similar programs (Trochim, Donnelly, & Arora, 2016). Dependability, which is an attempt to prove that if the study were repeated under the same circumstances, very similar results would be achieved (Shenton, 2004), was supported by tracking the decision making process with the use of an audit trail, or a thorough description of the steps of the research process that were conducted (Miles, Huberman, 1994). The final criteria, confirmability, or the attempt to achieve objectivity and minimize investigator bias (Shenton, 2004), was supported by the fact that two of the study’s researchers who participated in review of the findings to achieve corroboration, did not actively partake in data collection or analysis (Trochim et al., 2016). By employing these methods, the researchers were able to ensure trustworthiness and rigor of the research to the best of their ability.
Chapter 4: A Process Evaluation of a Diabetes Certificate Program for Undergraduate and Graduate Students¹

Abstract

The prevalence of diabetes is on the rise regionally, nationally and globally. Despite the significance of this growing public health concern, many people remain ill-informed about its widespread effects. The novel Diabetes Certificate Program at Ohio University serves to educate students on the complexity and multifaceted nature of the disease. This paper describes the results of a process evaluation in the form of focus groups that was conducted to learn about students’ experiences with and the effectiveness of the Certificate. The data revealed several common themes regarding program strengths, challenges and recommendations for improvement. The themes related to program successes included opportunities to learn from experts in the field, the diversity in learning methods used, and graduate and/or professional school preparation. Themes of ongoing challenges included logistical difficulties and dissatisfaction with assignments. The themes related to recommendations included a desire for more experiential learning and an interest in additional exposure to research and technology trends in diabetes. Overall, the results of this process evaluation serve as an opportunity

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to incorporate student feedback to enhance the quality of the Diabetes Certificate Program and to inspire the development of related programs to reach students at other universities.

KEYWORDS: Diabetes, higher education, program evaluation, focus groups

Introduction

Diabetes is one of the most significant and growing chronic health problems in the United States, affecting 9.3% of the population (29.1 million people) (Centers for Disease Control and Prevention, 2014). Diabetes is typically marked by the body’s inability to make insulin as well as the body’s inability to effectively use the insulin it produces. Prevalence rates have increased dramatically in recent decades and they are expected to rise even more with the largest increase in adults age 75 years and older (Kirkman et al., 2012). Diabetes is the seventh leading cause of death in the US, despite often being underreported on death certificates (Centers for Disease Control and Prevention, 2014). Its costs to society represent 23% ($265 Billion) of current health care expenditures in the United States, with more than half attributable to adults age 65 and older (American Diabetes Association, 2013). Further, annual medical spending for people with diabetes is more than double that of people without diabetes (Zhuo et al., 2014). By 2050, models predict that diabetes, both diagnosed and undiagnosed, will increase from the current 1 in 11 adults to an astounding 1 in 3 adults (Boyle, Thompson, Gregg, Barker, & Williamson, 2010). For these reasons, concentrated efforts to combat the diabetes epidemic are needed.
Specialized diabetes education and training for future health care professionals, paraprofessionals, and other individuals working or in contact with diabetes patients may be one strategy to combat this epidemic and improve the health and well-being of individuals with diabetes. An estimated 20.5 million students are enrolled in U.S. colleges and universities (U.S. Department of Education, 2016). Thus, education and training programs offered to undergraduate and graduate students have the potential to reach a wide audience. Programs that teach students about the different types of diabetes, short-term and long-term complications, different treatments and technologies, and psychosocial and cultural considerations can prepare pre-professionals as well as the future workforce to better prevent and treat diabetes.

Several studies support the notion that healthcare providers are not sufficiently equipped with the knowledge to effectively address the diabetes epidemic and support their patients in successfully managing their condition (Bernard, Anderson, Cook, Phillips, 1999; Lee, Liu, Quek, & Chew, 2013; Mogre, Ansah, Marfo, & Garti, 2015; Uding, Jackson, & Hart, 2002). Notable barriers to supporting diabetes management include, but are not limited to, preconceived beliefs, attitudes and knowledge toward diabetes management, ineffective patient-provider communication skills to encourage better outcomes (Nam, Chesla, Stotta, Janson, & Kroon, 2010), lack of resources for prevention, and inadequate psychological support (Funnell, Bootle, & Stuckey, 2015). These findings suggest that providing earlier educational opportunities and exposure to the many facets of diabetes would likely improve practitioner competence and confidence in their ability to appropriately support patients with diabetes.
The Diabetes Certificate Program is a 17 credit-hour program that provides a unique opportunity for undergraduate and graduate students at Ohio University to learn about diabetes from a multidisciplinary perspective. The Certificate is separate from a student’s major coursework and requires that a student take additional credits to earn the certificate. The curriculum includes a set of three core courses: (a) Diabetes: From Bench to Bedside, (b) Trends in Diabetes, and (c) Independent Study in Diabetes. Diabetes: Bench to Bedside is a comprehensive online course offering an exploration for the underlying genetics and physiology of diabetes and clinically relevant issues surrounding diabetes from medical, self-management, and prevention perspectives. Trends in Diabetes introduces students to novel discoveries in diabetes research and the latest trends in clinical care. The Independent Study in Diabetes is an experiential capstone course with emphasis on research, clinical, or service learning experience related to diabetes. Additionally, students have a choice of electives based in the following areas: Anthropology, Child and Family Studies, Social and Public Health, Psychology, Biological Sciences, Chemistry, Communications, and Nutrition. This program is designed to reach beyond the classroom through interactive learning to help students better understand diabetes as it becomes increasingly prevalent locally, nationally, and globally.

As a first step in assessing the feasibility and effectiveness of the Diabetes Certificate Program, we conducted a process evaluation to assess the effectiveness with which the program was delivered as well as how it was experienced by undergraduate and graduate students. Process evaluations allow researchers and providers to gain insight
into the best practices of the program (Steckler & Linnan, 2002). Understanding the key components that contribute to program impact and success is critical to ensuring its effectiveness and sustainability over time (Steckler & Linnan, 2002). This evaluation was specifically conducted to identify ongoing successes and challenges of the Diabetes Certificate Program after year 3 of implementation. The purpose of this paper was to provide a detailed description of the Diabetes Certificate Program and present the findings of the process evaluation.

**Methods**

**Research design.** We conducted focus groups with current undergraduate and graduate students who completed the Diabetes Certificate Program at a large Midwestern university. Focus groups are a qualitative technique in which data are collected through semi-structured group interviews (Morse, 1995). The premise of focus group research is that attitudes, beliefs, perceptions, and expectations are not developed in isolation but rather through interaction with others (Krueger & Casey, 2000; Morgan, 1988). Thus, questions are asked in an interactive group setting where participants are free to talk with other group members. In health research, focus groups are particularly useful tools that can: (a) help educators develop more effective targeted educational messages and programs to provide specific knowledge and skills; (b) guide the design of research questions and analytic models using larger-scale quantitative data; and (c) inform the interpretation of broader existing quantitative research findings (Krueger & Casey, 2000; Morgan, 1988). We used focus groups to gain insight into students’ experiences with the Diabetes Certificate Program.
Sample. Qualitative research is different from statistically driven research, which relies on randomness to generalize findings from a small sample to a larger population (Morse, 1995). The logic of qualitative sampling rests not on generalizability or representativeness, but on the notion of saturation, that is, the point at which no new information is obtained (Morse, 1995). Thus, sample size and statistical analyses are not criteria for evaluating the quality or rigor of qualitative research, but rather, for evaluating the adequacy and the comprehensiveness of the study findings (Morse, 1995).

We employed purposive sampling (Morse, 1995) to recruit English-speaking adults who completed the Diabetes Certificate Program and were currently enrolled in an undergraduate or graduate degree program at the university. Participants were recruited via the Diabetes Certificate Program enrollment list. We contacted potential participants via email and word of mouth. The Ohio University Institutional Review Board approved the study. All participants provided written informed consent prior to participation and received compensation for their time.

Data collection. We devised a structured discussion guide and field-tested it for flow and clarity of the questions with a group of three participants. Once the discussion guide was finalized, we began data collection. Focus groups were conducted at university sites (conference rooms and classrooms). A trained moderator asked participants broad, open-ended questions about their impression of the program, experiences with each certificate course, and perceived strengths and weaknesses of the program. All focus group discussions were audio-recorded and transcribed verbatim; participants’ names and
identifiers were removed to protect their confidentiality. Participants also completed a brief demographic form.

Data analysis. The multidisciplinary research team consisted of a health behaviorist and qualitative methodologist, two nutrition graduate students, and a basic scientist and registered dietitian. Three researchers analyzed the data using standard qualitative techniques (Krueger & Casey, 2000). Specifically, the researchers performed content analysis by independently marking and categorizing key words, phrases, and texts to identify codes to describe the overarching themes (Krippendorf, 2004). Transcripts were coded and then reviewed to resolve discrepancies. This process continued until saturation was reached; that is, until no new codes emerged. After all transcripts were coded and reviewed, one member of the research team entered the coded transcripts in NVivo 10 software (QSR International, Victoria, Australia) to organize the data to support thematic analysis.

Rigor. To support credibility (validity), we conducted member checks with three participants to confirm participant corroboration (Denzin, 1978; Trochim, Donnelly, & Arora, 2016). To support transferability (external validity), we described in detail specifics of the certificate program, our research questions, and the evaluation methodology so that the findings are comparable to other programs (Trochim et al., 2016). To support dependability (reliability) of the data, we tracked the decision-making process using an audit trail (Miles & Huberman, 1994). The audit trail is a detailed description of the research steps conducted from the development of the project to the presentation of findings (Miles & Huberman, 1994). Finally, to support confirmability
(objectivity), two external researchers not involved in the data collection or analysis reviewed the findings to achieve researcher corroboration (Trochim et al., 2016).

**Results**

Ohio University students who completed the requirements of the 17 credit-hour Diabetes Certificate Program were recruited for voluntary participation in structured focus group discussions. Twenty-one total students participated in six focus group, lasting between 60 to 90 minutes each. The mean age of the students was 24.3 ± 7.1 years, 67.7% (n = 14) were female, 95.2% (n = 20) were white, and 71.4% (n = 15) were undergraduate students. The majority of students were exercise physiology (42.9%, n = 9) and nutrition (38.1%, n = 8) majors. Upon graduation, 57.1% (n = 12) of the participants planned to pursue a health professional degree (see Table 4).
Table 4

Demographic Characteristics of Study Participants (n = 21)

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>24.3 ± 7.1</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Undergraduate Student</td>
<td>15 (71.4)</td>
</tr>
<tr>
<td>Graduate Student</td>
<td>6 (28.6)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>14 (66.7)</td>
</tr>
<tr>
<td>Male</td>
<td>7 (33.3)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>20 (95.2)</td>
</tr>
<tr>
<td>Mixed Race</td>
<td>1 (4.8)</td>
</tr>
<tr>
<td>Current Major</td>
<td></td>
</tr>
<tr>
<td>Exercise Physiology</td>
<td>9 (42.9)</td>
</tr>
<tr>
<td>Nutrition</td>
<td>8 (38.1)</td>
</tr>
<tr>
<td>Biological Sciences</td>
<td>3 (14.3)</td>
</tr>
<tr>
<td>Nursing</td>
<td>1 (4.8)</td>
</tr>
<tr>
<td>Careers Plans</td>
<td></td>
</tr>
<tr>
<td>Health Professional Degree</td>
<td>12 (57.1)</td>
</tr>
<tr>
<td>Graduate Degree</td>
<td>6 (28.6)</td>
</tr>
<tr>
<td>Undecided</td>
<td>3 (14.3)</td>
</tr>
</tbody>
</table>

The following sections will attempt to summarize feedback on the Diabetes Certificate Program that was obtained from students during the focus groups. Data from the focus groups revealed three overarching themes: strengths and successes, challenges and areas for growth that were identified, and recommendations for improvement and future directions suggested by students. The three themes are comprised of a total of eight sub-themes.
Early successes with the Diabetes Certificate Program. Three main themes related to overall successes of the program emerged upon analysis of the data including the opportunity to listen to and learn from experts in the field, the diversity in learning methods employed, and preparation for graduate and/or professional school. Below and in Appendix E, these themes are articulated in greater detail with reference to student remarks.

Listening to experts in the field. Students communicated that they valued listening to healthcare providers’ experiences with treating diabetes patients and learning about new diabetes technologies. Professionals whom they heard from include endocrinologists, nurse practitioners, physicians, registered dietitians, certified diabetes educators, and researchers. In the online course, Diabetes: Bench to Bedside, many of the lectures were prerecorded by these professionals, through which they were able to shed light on the curricular content from their personal experiences. Later, in Trend in Diabetes, students were exposed to many of these same professionals among others during guest lectures. Reflecting on their experience in Trends, one student commented:

I liked how we had different people come in and talk about what they deal with diabetes, with diabetes patients, diabetic care, diabetes equipment – all that stuff I liked how generally they’d bring in things for us to see too, like the pumps or the monitors and meters, the pens, so we could actually like look at them and kind of play around with them a little bit. Because I’ve seen a diabetic needle like twice maybe. So need to see those things; I did like that a lot. (Focus group 3)
One student reflected on how inspired she was by one of the physician guest lectures that she pursued her independent study with him:

[Physician] did a couple of guest lectures for the online course but, of course it was his voice recording . . . When he came into the seminar course, I was like he’s really interesting and obviously, I mean, I felt like he really wanted us to learn the information . . . I asked [Certificate Advisor] like can I do my independent study with [Physician] because he’s really cool and so I did. I got to do research. (Focus Group 1)

In a region where the prevalence of diabetes is an astounding 11.3% compared with the 7.2% national average, Southeastern Appalachian Ohio attracts a number of professionals working to combat the diabetes epidemic (Schwartz et al., 2009). Because of this, students are in an ideal location to learn from some of the best. As one student explained: “[It was] interesting to have a physician talk about it, a physician working with diabetes patients . . . he has been like the leading physician for diabetes and other endocrine issues in Southeastern Ohio and West Virginia for the last 30 years.” (Focus Group 1)

*Diversity in learning methods.* The three primary components of the Diabetes Certificate Program provide students with distinct techniques and environments in which to learn about diabetes. Students appreciated the diversity in learning methods that included online instruction, traditional classroom instruction, and experiences through service learning, clinical, and research opportunities.
The first requirement of the Diabetes Certificate Program is a 3 credit-hour course that is offered online called Diabetes: Bench to Bedside. This is a comprehensive course which provides a broad foundation for understanding the complex and multifaceted nature of diabetes. Most students felt positively about the fact that Diabetes: Bench to Bedside is offered online. Participants expressed that the online offering provided them with greater flexibility than a course that meets in person. They also liked that it can be completed on their own time and simultaneously with other commitments that may require a significant amount of time. Students articulate these sentiments in the following two quotations: “. . . it was an online class so we could review it and look it over at our own discretion, which is really nice” (Focus Group 2) and:

I actually really like that it’s online, because I feel like it gave me time. Like when I didn’t have time I could catch-up later, and I feel like it gives you the flexibility as an added course especially as a grad student just because I’m like so busy and it’s hard to like come down to campus all the time to go to class. It sounds silly but that’s just the truth when you’re trying to do research and stuff. (Focus Group 6)

Overall, the online course offering was preferred by participants for this class because of its flexible and convenient nature.

The majority of students reported having had very positive experiences during the Independent Study component of the curriculum. The Independent Study is the final requirement for completion of the Certificate and includes hands-on experiences related to diabetes in the students’ choice of research, clinical and/or service learning settings.
Ideally, this provides an opportunity to see various professionals working firsthand with diabetes and allows students to draw from their lecture-based knowledge to put theory into practice so to speak. The following quotation confirms that students did in fact experience the Independent Study as intended, as described in this student’s experience with a local program, which strives to teach individuals with T2DM the importance of a healthy lifestyle:

For me, I would agree that the independent study I did was really helpful. I helped with Diabetes Boot Camp [local diabetes education program] this semester, so helping with that was a really good way to find out how best to apply what you’ve learned through the program into a more specific field of work. (Focus Group 2)

Another student shared about her experience with the CHIP Program (Complete Health Improvement Program), which is a lifestyle intervention program that serves to help reduce risk factors, prevent onset and manage chronic diseases while promoting lasting lifestyle change. She explained that her experience was extremely enjoyable seeing individuals making incredible strides to improve their health.

... it’s just amazing seeing the weight loss, the energy increases. People are getting off some of their medication. For me, that’s just gratifying because it’s like oh, I remember you from week 1 and you were just so unhappy and now you’re completely evolved and still changing, so that’s what I like about it. (Focus Group 2).

After learning about how debilitating diabetes can be and learning of its growing prevalence, being exposed to and inspired by success stories and effective interventions,
is an ideal way for these students to culminate their experience with the Diabetes Certificate Program.

The diversity of learning methods that the Diabetes Certificate Program employs have proven to be beneficial and desirable to the student participants. Not only does this allow students to see diabetes through different lenses in a variety of environments with a range of professionals, but it also caters to students with different learning orientations because the Certificate includes online instruction, traditional classroom instruction, and hands-on experiences through service learning, clinical and research opportunities. Overall, students thoroughly enjoyed the different methods of learning about diabetes.

**Preparation for graduate and/or professional school.** During the focus groups, many students noted that the in-depth knowledge gained from the Diabetes Certificate Program helped to prepare them for advanced degrees. Further, students stated that listing the Certificate on their resume/curriculum vitae would give them an advantage over other students on graduate or professional degree applications as well as future jobs. After completing the Certificate, students felt much more knowledgeable about diabetes, allowing them to enter confidently into their respective career fields or degree programs and support the needs of family, friends and coworkers with diabetes with greater sensitivity and understanding.

One student commented on how they recognized the need to be more informed about diabetes in their future line of work, as it is a growing public health concern. When asked why they sought of the certificate, the student commented: “I saw it as an opportunity to learn more about diabetes. I figured it would help my career wherever I
work since diabetes is so prevalent now, and that it would look good on a resume as well.” (Focus Group 3)

A dietetics major shared her experience with the Certificate Program and its relevance to her future career as a registered dietitian. To practice as a registered dietitian, in addition to their degree, students must also complete an extensive internship experience, which is known to have a very competitive application and acceptance process. This student explained:

I’ll be honest; I feel like it’s going to help me get jobs. I feel like for dietetics, like the match rate for internships is less than 50 percent. I feel like that helped me stand out on my internship apps, and I feel like it’s going to help me stand out from however many grads there are looking for jobs later. Any little thing you can get; it’s going to help you get a job. (Focus Group 3)

Lastly, two students shared that the Diabetes Certificate Program provided inspiration for discernment of a diabetes-related career direction as highlighted in these quotations:

It’s just increasing employability and if we have a certificate, then it’s helped me develop more of a passion for diabetes and want to learn more about it through a master’s degree and work with those patients. (Focus Group 1)

Possibly I don’t know I think I want to continue research so whether that means getting Ph.D. in a couple of years or something, continue doing something related to diabetes. (Focus Group 6)
Ongoing challenges with the Diabetes Certificate Program. As with any newly developed program, there will inevitably be some bumps in the road. One of the primary objectives in conducting the focus groups was to gain insight on the aspects of the Certificate students felt could be improved or changed to meet their needs and to optimize program implementation. Two themes in particular materialized from student feedback: (a) logistical difficulties including the overall time commitment and independent study arrangements and (b) feelings that assignments were inconsistent or impractical.

Logistical difficulties. Because the Diabetes Certificate Program is independent of specific degree programs, it requires an extra commitment on the part of students who choose to pursue it. In total, students must complete 17 credit hours to earn the Certificate, which equates to a full semester of coursework, thus necessitating a significant time investment. Several students mentioned that competing college courses and extracurricular activities were barriers to completing the online modules for Diabetes: Bench to Bedside and completing the 84 hours required for the Independent Study.

Diabetes: Bench to Bedside, which is offered online, requires students to budget time in their weekly schedule to complete necessary modules and assignments at their own pace. One student reported feeling a bit overwhelmed by all of the material included in this course. She stated:

There was like a lot of supplementary material. It was like, “This is what you need to know,” but there was also like these “12 extra uploads in case you have
free time and want to watch these videos.” . . . It’s just like I can’t watch all – I’ve already watched like 12 lectures a week, like can we stop adding supplementary material? [Laughing] It’s just too much information for me.” (Focus Group 4)

This feedback suggests that perhaps the course seemed intimidating to some students with the amount of information and material that is presented, indicating that perhaps some components could be trimmed back and/or clearer explanations of what students are expected to learn could be provided.

Some students openly discussed their frustration with the number of hours required for the Independent Study course. One student expressed their feelings about this by saying:

I had a lot of issues actually getting my hours in; so maybe having some sort of way to work it out, because I ended up having to take like two semesters. I didn’t finish my hours during fall, so I had to finish them in the spring. And so just finding a way to like make accommodations, because you’re participating in these programs, like Diabetes Prevention Program or Live Healthy Kids [regional education program]; but you’re signing up to like, “Yes, I’ll do 84 hours of this throughout the semester.” But then later you find out, “Oh, none of these times fit my schedule. Like how am I supposed to get these hours in if I don’t know how it’s going to fit into my schedule ahead of time?” Like I volunteered for every single thing that could fit into my schedule and I still couldn’t get my hours in.” (Focus Group 3)
This student’s feedback also supports comments made about logistical issues they faced when it came to making arrangements for the 84-hour Independent Study.

A number of students suggested that finding independent study advisors and projects that aligned with their interests and met the course requirements proved somewhat difficult. Further, several students noted that they did not know what could or could not count for the Independent Study. This sentiment is highlighted by these two quotations:

I just really wasn't sure what I could do to count for it. They [Professor] gave you a list, but that list is relatively short – it's like two or three people. So you have to go out and find people to do your independent study with. (Focus Group 5)

I remember that list she [Professor] gave us and it was like some of them interested me, so I was like oh, I’ll email that person. But they just never got back to me. And then people were always discussing the Diabetes Boot Camp and Diabetes Prevention Program, but they could only take like four people or five so we were like there’s only so many students they could take. (Focus Group 1)

As suggested by the first student remark, a thorough list of opportunities with appropriate contacts in the area may help ease the trouble of finding an experience to meet the course requirements, support the students’ interests and aspirations, and ease their concerns about the feasibility of fitting the hours into their schedule.

**Dissatisfaction with assignments.** A second challenging theme arose from students’ dissatisfaction with certain assignments they had to complete, particularly for Diabetes: Bench to Bedside and Trends in Diabetes. Examples of assignments that students were not especially fond of include: Learning Management System (i.e.,
Blackboard) discussion boards, reflective journals, presentations, and muddiest points (in-class participation activities in which students identified content that was unclear or difficult to understand). One student commented on her distaste for the weekly discussion boards required for Diabetes: Bench to Bedside, implying that she felt they were not beneficial by saying:

. . . I wasn’t a big fan of the discussion board. Maybe it’s because I would go through the lectures; and to me, everything seemed to make sense usually. So when I was required to ask a question, I’d be like, “Well, I don’t really have a question.” (Focus Group 3)

As a form of attendance in Trends in Diabetes, students were asked to complete Muddiest Points, in which they wrote down questions, comments, and/or recommendations for the in-class presentations that they felt were unclear or could have been improved in some way and/or a question they felt was unanswered. This student’s comment reflects most of the feedback that students provided with respect to this assignment:

I had a little bit of a bad point with the muddiest points too, because if I have a question like – and this may be different for other people – but I’m not afraid to ask it. So if you have a questions, you want to ask the person. You want to ask the expert who’s right there in front of you, because there were times that I didn’t ask my questions because I thought to myself, “They’re going to get answered anyway.” Did I ever go back online to see what the answer to the muddiest point was? No, not once. (Focus Group 3)
Students also expressed their dissatisfaction with the final student presentations that were required for Trends in Diabetes. Feedback varied from student to student, but these two students elaborated on why they disliked student presentations:

To me the least helpful was having to sit – like some of the presentations were really great and it was like, wow, way to go! This is so interesting. Thank you for sharing this information about this topic with us and sometimes it was like oh, my god . . . So just having to sit through presentation that were not good. (Focus Group 1)

Yeah, I definitely think that letting the experts talk is the best. We’re not experts yet, so I think doing it that way is way better but I don’t know. The presentation this year – I don’t know. I felt like they were – because we only presented about three questions. (Focus Group 2)

This second quotation also supports student satisfaction with one of the previous themes that emerged: *listening to experts in the field.*

**Recommendations for the Diabetes Certificate Program.** In order to improve implementation and effectiveness of the Diabetes Certificate Program, student recommendations and areas of improvement noted by researchers should be considered. Two main themes emerged, which the researchers have since actively started acting on to improve student experience and program outcomes: a desire for more experiential learning opportunities and a strong interest in learning more about current research and technology trends in diabetes.
**Experiential learning.** One theme that researchers identified as an area for program improvement was the incorporation of more hands-on experiential learning opportunities, similar to what students experience in their Independent Study. Many students advocated for the incorporation of learning methods that allowed them to personally have hands-on experiences to better conceptualize life with diabetes and empathize with individuals living with the disease.

I really enjoyed the independent study part because I’m more of like hands-on and getting out in the field, so I really liked that part of it. And I’d say, too, in the trends part maybe getting more involved in the classroom. Instead of sitting there and watching people talk, get more involved with the students and doing counting carbs, for example, things like that and doing group work instead of just sitting there and watching. (Focus Group 2)

. . . like really encouraging people to get involved with more hands-on stud. You can’t force people to do it you know, but like the people who are on campus going to DI (Diabetes Institute) events and stud is helpful to give them – make it more real. (Focus Group 4)

Researchers recognized this desire for more experiential learning and have since developed and implemented content for Trends in Diabetes that was intended to fill this void in the curriculum and encourage the development of empathy and a better understanding of the challenges and complexities of living with diabetes.

**Focus on research and technology trends in diabetes.** Students also expressed a strong desire to have more exposure to current research and technology trends in
diabetes. By incorporating more up-to-date research and discoveries in diabetes care, students will have an even greater advantage when it comes to entering graduate/professional school or their careers. Two students elaborated on their desire for more research exposure commenting:

I think the basics of diabetes are pretty simple but it’s so vast. Like there’s just so much, so much different information, so many different things going on in current research and just different types. (Focus Group 1)

I know I keep coming back to it, but hearing about what’s going on in the world right now recently with research or published articles or studies being conducted. You just don’t – I just don’t feel like you hear that as often as you should in a classroom setting . . . Maybe get the students involved somehow just doing little things like filing or helping with small tasks for research. Just giving them that introduction to research, especially if they’re going into that setting. It’ll be important to see how they can transition into that. (Focus Group 2)

Moving forward, the incorporation of more current research topics throughout the curriculum is recommended to help keep students abreast of the most recent discoveries and best practices in diabetes care and management.

Discussion

The Diabetes Certificate Program aim is to expose students to the multifaceted condition of diabetes through an intensive educational experience. Originally, the Certificate was developed and implemented in 2012, out of a need to increase awareness about the diabetes epidemic in response to the exceedingly high and growing prevalence
of the disease. After 3 years of implementation, conducting a process evaluation was deemed appropriate to gain a better understanding of what was working and what was not. Thus, several focus groups were conducted with current undergraduate and graduate students who had completed the Certificate to inquire about their experiences with the program. Across student responses, several common themes emerged and allowed the researchers to identify areas of ongoing successes and challenges as well as recommendations for future program improvement. This evaluation represents an important step in understanding how to improve the Diabetes Certificate Program delivery to improve its effectiveness and continue to promote positive learning experiences related to diabetes.

The concept of implementing diabetes education earlier is supported by data that suggests college students do not have sufficient understanding of diabetes, both for the purposes of supporting their career development but also for their own personal awareness and ability to spread knowledge to family and friends about the high prevalence and social implications of the disease (Mongiello, Freudenberg, Jones, & Spark, 2016; Reyes-Velázquez & Hoffman, 2011; Shodunke, 2014). Research has demonstrated that college students’ understanding of diabetes does not extend much beyond identifying it as a disease related to blood sugar that has a hereditary link and can be prevented and managed with a healthy lifestyle (Reyes-Velázquez & Hoffman, 2011). Moreover, a significant number of college students who may present with risk factors for the development of type 2 diabetes do not perceive themselves to be at risk (Mongiello et al., 2016; Shodunke, 2014). The creators of the Diabetes Certificate Program at Ohio
University recognized the significance of this knowledge deficit among the majority of students, pre-professional healthcare providers included, and sought to fill this void with the implementation of the Certificate. Students at other universities could also benefit from similar programs that proactively promote awareness of the growing problem of diabetes.

The Diabetes Certificate Program employs several teaching methods including online instruction, traditional lecture-based classroom instruction and hands-on learning through clinical, research and service learning opportunities. The focus group data indicated that students found these different methods to be very valuable and desirable. Students felt that the different instructional styles allowed them to develop an understanding of diabetes and strategically approach the content from different learning orientations. This aligns with the work of Cavanagh and Coffin (1994), which posited that inclusion of various teaching styles and a diversity of methods to deliver educational materials is encouraged and is generally considered beneficial to student learning outcomes. Students appreciated the online course, Diabetes: Bench to Bedside, because it allowed for greater flexibility in the midst of their busy schedules. They also reported that despite the online setting, they felt they were able to learn and retain a great deal of information from the course. Prior research conducted on the integration of e-learning technologies into interprofessional health sciences coursework revealed that inclusion of online instruction, creating a blended learning environment, does not compromise pedagogy or student learning outcomes, contrary to what one might believe (Carbonaro et al., 2008). In addition, students found great value in the experiential learning aspects of
the program, namely the Independent Study, and expressed a desire to have more hands-on learning experiences akin to this. Research findings suggest that experiential learning may foster students’ ability to connect with the subject material at a deeper level than is achieved through books and a traditional lecture format (Wright, 2000). These findings provide support for the incorporation of diverse instructional methods in similar diabetes education curricula to support student learning.

Many students communicated that they felt their involvement in the Diabetes Certificate Program would be beneficial to them in their future graduate/professional school endeavors as well as their future career paths. A number of the student participants even went so far as to say that the Certificate inspired them to pursue a career path specifically related to diabetes, one which they had not previously considered. Exposure to the work of various professionals through guest lectures in Trends in Diabetes and through clinical, research and service learning opportunities during the Independent Study contributed greatly to students’ enthusiasm. Consistent with prior work, this feedback revealed that interaction with role models and professionals in the field can strongly influence an individual’s perceptions and reasonable expectations of the work, and inform future career choices (Price, 2009). By continuing to provide students with the opportunity to learn from a variety of professionals, additional students may also be inspired to follow a career track that involves the study of diabetes, provision of care for those with diabetes, and/or the opportunity to disseminate knowledge on the disease. A full program evaluation is necessary to assess the impact of the Diabetes Certificate
Program on increasing diabetes knowledge and decisions to pursue careers in diabetes and related fields.

With respect to the ongoing challenges identified, these aspects of the Diabetes Certificate Program are more logistical in nature, and thus may be more easily navigated. Competing demands are ultimately unavoidable, but to support students in balancing their schedules while allowing time to commit to the Certificate, course instruction may be reviewed to identify areas of improvement that could streamline the amount of material, methods with which materials are delivered, and the amount of time necessary to successfully complete the required components of the program. To support students in identifying viable independent study opportunities, a database containing feasible programs and projects, primary contacts, and the number of students each program will accept, could be developed to avoid unnecessary confusion. Better yet, this could be presented to students when they begin the Certificate so they are able to plan accordingly and make arrangements far in advance to when they will be completing their Independent Study. Lastly, the dissatisfaction with assignments can be addressed by consideration of feedback that was received, making amendments where the instructors feel it is appropriate. For example, students were dissatisfied with the muddiest points activity in Trends in Diabetes, so other Classroom Assessment Techniques, such as a minute paper, (quick check to see how student perceptions of material compare with the intended outcomes of the content delivered) designed to provide useful feedback to both students and instructors and assess students’ learning, may be more well received by students (Angelo & Cross, 1993). Information obtained through process evaluations may be used
to adapt and improve the curriculum based on the reported experience of the participants (Hulscher, Laurant, & Grol, 2003). So by conducting these regular program evaluations, the course instructors can identify areas of the program that are lacking or not meeting students’ expectations and make changes accordingly.

In the future, we hope to gain more insight from students on their experiences with the Diabetes Certificate Program by conducting additional program evaluations to assess outcomes for students who have completed the Certificate. These evaluations could be delivered in a survey format sent via email, alternatively, other focus groups or individual interviews could be conducted to gain further insight. Another interesting addition to the research study would be to conduct pre- and post-evaluations to learn how students’ attitudes toward and perceptions of diabetes may have evolved over the course of the Certificate. This would allow the researchers to understand if participation in the program supports a shift in student attitudes. It would also be fascinating to learn more about the students’ futures and to discern how many attended graduate/professional school, how many pursued careers directly or indirectly related to diabetes, and how many felt they used their knowledge from the Certificate in their personal and/or professional lives. These program evaluations would provide greater understanding about the effectiveness and impact of the Diabetes Certificate Program, both short- and long-term and support the case for implementation of similar educational programs elsewhere.

Limitations

Study limitations include the homogeneity of the study sample with regards to participant self-selection and self-reported data. Students who volunteered to participate
in the study may have been more willing or motivated to answer questions about the program (e.g., more positive experiences) compared to the students who did not participate, possibly leading to selection bias. Although authors employed standard qualitative techniques and continued data collection until saturation was reached, the sample may not sufficiently represent the experiences of all Diabetes Certificate students. Finally, quantitative research is needed to confirm the qualitative findings and document outcomes over time (e.g., academic performance, attainment of professional and graduate degrees, career choices, relevance of Diabetes Certificate training to career choice).

**Conclusion**

As a rapidly growing public health concern, increasing awareness and understanding of diabetes is an effective way to combat the epidemic. From the findings of this study, we believe the Diabetes Certificate Program has provided many Ohio University students with this opportunity to broaden their knowledge of the disease. Student participants indicated that they valued the opportunity to learn from professionals in the field, they enjoyed learning in different environments and through a variety of teaching methods, and also appreciated the inspiration and preparation for graduate/professional school they experienced through their involvement in the Certificate. Taking into consideration the ongoing challenges as well as recommended modifications/additions noted in the focus groups, the Diabetes Certificate Program can be improved to meet students’ expectations of the program and the effectiveness with which it is delivered. Moving forward, we hope to gauge diabetes knowledge and attitudes pre- and postcertificate and to conduct evaluations to learn how graduates of the
Certificate who are in graduate/professional school or in the workforce have utilized their knowledge of diabetes and incorporated it in their work and/or daily lives. In conclusion, we believe programs similar to the Diabetes Certificate Program have the potential to be a beacon of information for students at other universities and hope this research can support effective implementation of such opportunities elsewhere.

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https://doi.org/10.2337/diaclin.33.1.32

https://doi.org/10.1136/qhc.12.1.40

https://doi.org/10.2337/dc12-1801


Chapter 5: Conclusion

Results of this research study suggest that the Diabetes Certificate Program appears to have successfully provided a unique educational opportunity to its student participants to become better informed about diabetes. Facing the diabetes epidemic head-on is an undertaking, which requires the efforts of many. Modern diabetes care and management is effectively carried out with the support of a committed interprofessional healthcare team, which relies on evidenced-based practice, and also necessitates patient understanding and a desire to change with the backing of a support network. This requires that all participants, patients included, appreciate their role in the process, suggesting that provision of education and awareness efforts is necessary for optimization. This need was recognized at Ohio University and inspired the development of the Certificate, which has been reaching students on campus for 5 years now. Findings from this study will be used to shape future directions of the program in an effort to better meet the changing needs of its students and provide the most up-to-date, accurate, and relevant information about diabetes.

It was requested by students in the focus groups that additional experiential learning opportunities may be of value. In response to this, recent modifications have been made to the Trends in Diabetes curriculum to accommodate more hands-on learning, with the specific purpose of instilling empathy in students with regard to individuals with diabetes. Empathy is generally accepted as a pillar of patient-centered care, as it necessitates being in tune with the patient’s needs and goals as well as thoughts, experiences, and feelings (Irving & Dickson, 2004). Exercising empathic care
has been documented as an effective tool in achieving positive health outcomes among a number of different health professionals (Brunero, Lamont, & Coates, 2009) and has also been found to increase patient satisfaction (Zachariae et al., 2003). To address this concern, I developed the following assignments to be incorporated in the Trends in Diabetes course: (a) a blood glucose record, in which students tracked and recorded their blood glucose levels three times daily for five days, (b) a traveling with diabetes assignment, in which students were to investigate insurance coverage for individuals with diabetes in a destination of their choice, and (c) a potluck activity, in which students prepared dishes for a class potluck and were put into a situation that simulated a social setting with food and challenged them to test their carbohydrate counting skills (see Appendix F). After year one of implementation, initial student feedback was generally very positive. We hope that these assignments address their request for additional experiential learning opportunities and continue to provide a space for students to gain insight into the complex realities of living with diabetes.

One could contend that all diseases may warrant a certificate program of sorts and question why diabetes is special. Certainly at Ohio University, a Diabetes Certificate Program was feasible in large part because of the support of the Diabetes Institute and appropriate because of the higher than average rates of diabetes in the Appalachian region. However, we would argue that diabetes is a very important topic of conversation that warrants increased education and awareness for several reasons. For one, diabetes is a disease that is largely preventable with appropriate lifestyle modifications including a healthy diet, regular physical activity, and smoking cessation, to name a few. Raising
awareness about these modifiable risk factors could positively impact the rates of diabetes. Additionally, creating a space for this education and intervening at a younger age may be especially beneficial because often people have not cemented lifelong habits and are still open to change during this period of development. The lifetime risk of developing diabetes is outstanding at about 32% in males and 38% in females born around the year 2000, which applies to this college-aged population (Narayan, Boyle, Thompson, Sorensen, & Williamson, 2003). Diabetes is also strongly correlated with other chronic conditions such as hypertension, cardiovascular disease, and chronic kidney disease, so increasing awareness about these ties may also positively impact the rates of these other health complications. Another point that may be of interest is the fact that the common thread among the various types of diabetes is abnormal blood glucose levels. This provides an inherent sense of direction as it pertains to providing education, whereas diseases such as cancer have immensely varied risk factors as well as manifestations, which may prove difficult in the context of a certificate program that is intended for a wide audience. Lastly, diabetes is a disease that touches all of us. Because of this, it is crucial that we all take our part in finding solutions to reverse the diabetes epidemic, which we believe may be made more probable by offering programming similar to the Diabetes Certificate Program.

The qualitative nature of the process evaluation conducted allowed for a comprehensive understanding of the successes and challenges identified in the implementation of the Diabetes Certificate Program. We are confident the information that was gleaned will be beneficial to the continued improvement of the Ohio University
Diabetes Certificate. Additionally, we hope the results of the study serve to influence individuals including educators, healthcare professionals, researchers, and students alike, to appreciate the significance of diabetes and realize the positive outcomes of implementing such a program.

Moving forward, we would like to expand on this research to continue to optimize the student experience with the Diabetes Certificate Program and to expand its reach. One worthwhile direction for future research may be to administer the Diabetes Attitude Scale (DAS-3) to students to evaluate the Certificate’s impact on their diabetes-related attitudes before and after completion of the program. It could also be interesting to conduct the Jefferson Scale of Empathy to determine if the desired learning outcomes of the newly added empathy curriculum were achieved by participants. Lastly, future research could focus on the development of pilot experiences/assignments to expose students to more current research and trends in the prevention, management and treatment of diabetes, as was expressly requested by several students.
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Teachers College, Columbia University, Department of Health and Behavior Studies.


Appendix A: Diabetes Certificate Program Overview

Program Overview

The College of Health Sciences and Professions sponsors the Undergraduate Diabetes Certificate. This program educates and prepares students to better understand the multifaceted and complex condition of diabetes. The program offers a unique opportunity for students to obtain interdisciplinary education and training opportunities as well as service learning, clinical and/or research opportunities guided by experts in diabetes. The need for this diabetes program is underscored by the high prevalence of this condition locally and nationwide, as well as by the vibrant diabetes-related infrastructure currently available at Ohio University.

Students interested in pursuing the diabetes certificate (CTDIAB) can obtain an application form from their college’s student services office. After completing the application and obtaining the certificate coordinator’s signature, they should return the form to their college’s student services office. Each academic period on the student’s DARS (Degree Audit Reporting System) Report, students can track their progress in the certificate program. Students must receive a C or better in both core and elective courses in order to receive the certificate. The undergraduate Diabetes Certificate will be awarded upon graduation if the student has successfully completed the requirements and a notation of the certificate will be recorded on the student’s transcript.

Opportunities Upon Graduation

The diabetes certificate offers a unique opportunity for students to obtain interdisciplinary education and training opportunities as well as service learning, clinical and/or research opportunities guided by experts in diabetes. This certificate will educate and prepare students to better understand this multifaceted and complex condition. This certificate can be applied to a variety of careers as diabetes interfaces with many disciplines.

Requirements

Diabetes Core

Must have a C or better in the following courses:

- NUTR 4320 – Diabetes From Bench to Bedside Credit Hours: 3.0
  This is a comprehensive online course offering an exploration for the underlying genetics and physiology of diabetes and clinically relevant issues surrounding diabetes from medical, self-management, and prevention perspectives.
- NUTR 4960 – Trends in Diabetes Credit Hours: 2.0
This course includes a clinical preceptorship as well as a weekly seminar discussing the latest trends in diabetes clinical care, novel discoveries in diabetes research and experiences gained on preceptor sites.

- **NUTR 4932 – Independent Study in Diabetes**  
  *Credit Hours: 3.0-8.0*  
  This is a capstone course with emphasis on research, clinical, or service learning experience related to diabetes. This course allows students to use “experiences” to count towards credit hours.

**Electives**

Choose 6-9 semester credit hours of additional coursework to meet the 17-semester-hour requirement, **including at least one course outside the nutrition program.** Select from:

- **ANTH 3550 - Medical Anthropology**  
  *Credit Hours: 3.0*  
  - **BIOS 2250 - Genetics in Human Society**  
    *Credit Hours: 3.0*  
  - **BIOS 3100 - General Genetics**  
    *Credit Hours: 3.0*  
  - **BIOS 3450 - Human Physiology**  
    *Credit Hours: 3.0*  
  - **BIOS 4450 - Physiology of Exercise**  
    *Credit Hours: 3.0*  
  - **BIOS 4500 - Principles of Endocrinology**  
    *Credit Hours: 3.0*  
  - **BIOS 4630 - Biological Chemistry**  
    *Credit Hours: 3.0*  
  - **CFS 3800 - Death, Dying and Bereavement**  
    *Credit Hours: 3.0*  
  - **CHEM 4890 - Basic Biochemistry**  
    *Credit Hours: 3.0*  
  - **COMS 2020 - Communication and Persuasion**  
    *Credit Hours: 3.0*  
  - **COMS 3400 - Introduction to Health Communication**  
    *Credit Hours: 3.0*  
  - **EXPH 2290 - Exercise Testing and Prescription**  
    *Credit Hours: 3.0*  
  - **EXPH 4140 - Physiology of Exercise**  
    *Credit Hours: 3.0*  
  - **EXPH 4495 - Exercise Testing and Prescription for Special Populations**  
    *Credit Hours: 3.0*  
  - **HLTH 2300 - Medical Terminology**  
    *Credit Hours: 3.0*  
  - **HLTH 2700 - Family and Consumer Health**  
    *Credit Hours: 3.0*  
  - **HLTH 2901 - Health Aspects of Aging**  
    *Credit Hours: 3.0*  
  - **HLTH 3100 - Health Behavior Theory in Public and Community Health**  
    *Credit Hours: 3.0*  
  - **HLTH 3300 - Community Health Epidemiology**  
    *Credit Hours: 3.0*  
  - **HLTH 3450 - School Health**  
    *Credit Hours: 3.0*  
  - **HLTH 4070 - Interprofessional Gerontology**  
    *Credit Hours: 3.0*  
  - **HLTH 4100 - Program Planning and Implementation in Community Health**  
    *Credit Hours: 3.0*  
  - **HLTH 4300 - Health Issues: U.S. Underserved Populations**  
    *Credit Hours: 3.0*  
  - **HLTH 4800 - Applied Service Learning in Rural Community Health**  
    *Credit Hours: 3.0*  
  - **NUTR 2000 - Lifespan Nutrition**  
    *Credit Hours: 3.0*  
  - **NUTR 3000 - Nutrient Metabolism**  
    *Credit Hours: 3.0*
- NUTR 3100 - Medical Nutrition Therapy I Credit Hours: 3.0
- NUTR 4000 - Nutrition in the Community Credit Hours: 3.0
- PSY 3250 - Psychology of Health and Illness Credit Hours: 3.0
- SW 3283 - Social Work in Health Care Credit Hours: 3.0
Appendix B: Informed Consent Form

Title of Research: The Diabetes Certificate Program for Ohio University Students

Researchers: Elizabeth A. Beverly, PhD, Darlene E. Berryman, PhD, Jay Shubrook, DO, Karen T. Coschigano, PhD, and Cheryl Howe, PhD

You are being asked to participate in research. For you to be able to decide whether you want to participate in this project, you should understand what the project is about, as well as the possible risks and benefits in order to make an informed decision. This process is known as informed consent. This form describes the purpose, procedures, possible benefits, and risks. It also explains how your personal information will be used and protected. Once you have read this form and your questions about the study are answered, you will be asked to sign it. This will allow your participation in this study. You should receive a copy of this document to take with you.

Explanation of Study
This study is being done because we want to better understand undergraduate students’ experiences with the Diabetes Certificate program.

If you agree to participate, you will be asked to complete a short demographic form. Then you will participate in a focus group discussion with other students who participated in the Diabetes Certificate program. The focus group will take approximately 45 to 60 minutes. We will ask you questions about your overall experience with the Diabetes Certificate program and then several follow-up questions about the three courses: Diabetes: From Bench to Bedside, Trends in Diabetes, and Independent Study in Diabetes. The focus groups will be audiotaped.

You should not participate in this study if you are not an undergraduate student at Ohio University or if did not complete the Diabetes Certificate by May 2014.

Your participation in the study will last approximately 60 minutes.

Risks and Discomforts
Risks or discomforts that you might experience are that the audiotaping may cause some discomfort and distraction. Dr. Beverly is trained in the focus group process and will use her expertise to minimize any discomfort that may arise. You may withdraw from the study at any time for any reason. Such a decision will not adversely affect your standing as a graduate student at Ohio University.

Benefits
This study is important to science/society because the information and insights derived from this study may be useful to improve the effectiveness of the Diabetes Certificate program.
You may not benefit personally by participating in this study.

**Confidentiality and Records**
Records relating to your participation as a research subject will remain confidential. All of the information given by you will be identified by a code number rather than by name. Individual names will never be placed on any audio tapes or demographic forms. You will not be identified by name on any data that are produced from this study. You will receive a copy of this consent form for your reference. This study does not involve the use and/or disclosure of medical information.

Additionally, while every effort will be made to keep your study-related information confidential, there may be circumstances where this information must be shared with the representatives of the Ohio University Institutional Review Board as part of their responsibility to oversee research.

**Compensation**
As compensation for your time/effort, you will receive a $15 gift card (Amazon, Chipotle, Walmart or iTunes) after the completion of the focus group. In order to receive this compensation, you will need to provide your name and address. The study team keeps track of the compensation that was provided for the Ohio University Finance division’s records. Because the $15 gift cards are paid through University funds, the names and addresses will be shared with the Office of Finance, but Finance will not know your individual responses.

**Contact Information**
If you have any questions regarding this study, please contact Dr. Elizabeth A. Beverly at beverle1@ohio.edu or 740-593-4616.

If you have any questions regarding your rights as a research participant, please contact Jo Ellen Sherow, Director of Research Compliance, Ohio University, (740)593-0664.

By signing below, you are agreeing that:
- you have read this consent form (or it has been read to you) and have been given the opportunity to ask questions and have them answered
- you have been informed of potential risks and they have been explained to your satisfaction.
- you understand Ohio University has no funds set aside for any injuries you might receive as a result of participating in this study
- you are 18 years of age or older
- your participation in this research is completely voluntary
- you may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you and you will not lose any benefits to
which you are otherwise entitled.

Signature __________________________________ Date ___________

Printed Name ____________________________________________
Appendix C: Focus Group Discussion Guide

1. What attracted you to the Diabetes Certificate Program?
   **Probe:** How did you hear about the program?
2. What was your overall impression of the certificate program?
3. What about the Diabetes Certificate Program was most helpful to you?
   **Probe:** How did the program help you learn more about diabetes?
4. What about the program was least helpful to you?
   **Probe:** What would you change?

**Bench to Bedside Questions**
5. What was your experience with the online course Bench to Bedside?
   **Probe:** What about the online course was most helpful to you? Or, what did you learn?
   **Probe:** What about the online course was least helpful to you?
   **Probe:** What did you think about the quizzes, interview case study, and discussion boards? Please explain.
6. Was the online course easy to navigate? Please explain.
7. After completing the online course, did you have a clear understanding of what diabetes is and the many factors required to successfully manage it? Please explain.
8. What would you change about the Bench to Bedside course, if anything? Please explain.

**Trends in Diabetes Questions**
9. What was your experience with the Trends in Diabetes class?
   **Probe:** What about Trends was most helpful to you? Or, what did you learn?
   **Probe:** What about Trends was least helpful to you?
10. Did you find the guest lecturers’ presentations helpful and/or interesting?
    **Probe:** What presentations did you like/dislike?
    **Probe:** What topics would you like to have heard?
11. Did you like the presentation assignment? Please explain.
12. What would you change about the Trends class, if anything? Please explain.

**Independent Study Questions**
13. What was your experience with the independent study?
    **Probe:** Was it easy to find a project for an independent study?
    **Probe:** Did you feel prepared to conduct an independent study?
14. Were you able to apply what you learned from Bench to Bedside and the Trends in Diabetes class to your independent study project? Please explain.

**Post-Certificate Questions**
16. Do you have any specific questions that the certificate program did not answer for you? Please explain.

**Probe**: How do you propose we answer that question?

17. What are your plans after you complete the Diabetes Certificate program?

**Probe**: How do you plan to apply what you learned from your Diabetes Certificate?

**Probe**: What can you do now with the certificate that you could not do before earning it?

18. How do you think the Diabetes Certificate will help you in the future?

19. Have you heard about the Ohio University Diabetes Institute?

**Probe**: Have you gotten involved with any Diabetes Institute opportunities for students (seminars, symposiums, apprenticeships)? If yes, which one(s) best augmented your studies about diabetes?
Appendix D: Demographics Form

ID: ___________  Date: ___________

Demographics Form

1. Gender:       M       F

2. How old are you: __________

3. Do you consider yourself to be Hispanic or Latino?   Yes   No

4. What do you consider to be your race:
   Asian
   American Indian
   Pacific Islander
   Black/African American
   White/Caucasian
   Mixed
   Other: __________________________________________

5. In which of the following communities did you grow up in:
   Major Metropolitan Area (over a million people)
   Metropolitan Area (500,001-1,000,000 people)
   City (100,001-500,000 people)
   Small City (50,001-100,000 people)
   Town (2,500-50,000 people)
   Rural Area (fewer than 2500 people)

6. What year in school are you?
   Freshman
   Sophomore
   Junior
   Senior
   Other: __________________________

7. What is your undergraduate major? ____________________________

8. Do you plan on pursuing a graduate degree?   Yes   No
   If yes, in what field? ________________________________________
9. Do you plan on pursuing a professional degree (e.g., MD, DO, NP, PA)?  Yes   No
If yes, in what field?  ____________________________________________________
Appendix E: Focus Group Results

Early Successes

<table>
<thead>
<tr>
<th>Theme</th>
<th>Representative Quotations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listening to experts in the field</td>
<td>“I liked how we had different people come in and talk about what they deal with diabetes, with diabetes patients, diabetic care, diabetes equipment – all that stuff I liked how generally they’d bring in things for us to see too, like the pumps or the monitors and meters, the pens, so we could actually like look at them and kind of play around with them a little bit. Because I’ve seen a diabetic needle like twice maybe. So need to see those things; I did like that a lot.” (Focus group 3)</td>
</tr>
<tr>
<td></td>
<td>“[Physician] did a couple of guest lectures for the online course but, of course it was his voice recording…When he came into the seminar course, I was like he’s really interesting and obviously, I mean, I felt like he really wanted us to learn the information…I asked [Certificate Advisor] like can I do my independent study with [Physician] because he’s really cool and so I did. I got to do research.” (Focus Group 1)</td>
</tr>
<tr>
<td></td>
<td>“[It was] interesting to have a physician talk about it, a physician working with diabetes patients…he has been like the leading physician for diabetes and other endocrine issues in Southeastern Ohio and West Virginia for the last 30 years.” (Focus Group 1)</td>
</tr>
<tr>
<td>Diversity in learning methods</td>
<td>“I actually really like that it’s online, because I feel like it gave me time. Like when I didn’t have time I could catch-up later, and I feel like it gives you the flexibility as an added course especially as a grad student just because I’m like so busy and it’s hard to like come down to campus all the time to go to class. It sounds silly but that’s just the truth when you’re trying to do research and stuff.” (Focus Group 6)</td>
</tr>
<tr>
<td></td>
<td>“…it was an online class so we could review it and look it over at our own discretion, which is really nice” (Focus Group 2)</td>
</tr>
<tr>
<td></td>
<td>“For me, I would agree that the independent study I did was really helpful. I helped with Diabetes Boot Camp [local diabetes education program] this semester, so helping with that was a really good way to find out how best to apply what you’ve learned through the program into a more specific field of work.” (Focus Group 2)</td>
</tr>
<tr>
<td>Preparation for graduate and/or professional school</td>
<td>“It’s just increasing employability if we have a certificate, then it’s helped me develop more of a passion for diabetes and want to learn more about it through a master’s degree and work with those patients.” (Focus Group 1)</td>
</tr>
<tr>
<td></td>
<td>“I saw it as an opportunity to learn more about diabetes. I figured”</td>
</tr>
</tbody>
</table>
it would help my career wherever I work since diabetes is so prevalent now, and that it would look good on a resume as well.”  
(Focus Group 3)

I’ll be honest; I feel like it’s going to help me get jobs. I feel like for dietetics, like the match rate for internships is less than 50 percent. I feel like that helped me stand out on my internship apps, and I feel like it’s going to help me stand out from however many grads there are looking for jobs later. Any little thing you can get; it’s going to help you get a job. (Focus Group 3)

“Possibly I don’t know I think I want to continue research so whether that means getting Ph.D. in a couple of years or something, continue doing something related to diabetes.”  
(Focus Group 6)

Ongoing Challenges

<table>
<thead>
<tr>
<th>Theme</th>
<th>Representative Quotations</th>
</tr>
</thead>
</table>
| Dissatisfaction with assignments | “…I wasn’t a big fan of the discussion board. Maybe it’s because I would go through the lectures; and to me, everything seemed to make sense usually. So when I was required to ask a question, I’d be like, ‘Well, I don’t really have a question.’”  
(Focus Group 3) |
|                              | “I had a little bit of a bad point with the muddiest points too, because if I have a question like – and this may be different for other people – but I’m not afraid to ask it. So if you have a questions, you want to ask the person. You want to ask the expert who’s right there in front of you, because there were times that I didn’t ask my questions because I thought to myself, ‘They’re going to get answered anyway.’ Did I ever go back online to see what the answer to the muddiest point was? No, not once.”  
(Focus Group 3) |
|                              | “To me the least helpful was having to sit – like some of the presentations were really great and it was like, wow, way to go! This is so interesting. Thank you for sharing this information about this topic with us and sometimes it was like oh, my god…So just having to sit through presentation that were not good.”  
(Focus Group 1) |
|                              | “Yeah, I definitely think that letting the experts talk is the best. We’re not experts yet, so I think doing it that way is way better but I don’t know. The presentation this year – I don’t know. I felt like they were – because we only presented about three questions.”  
(Focus Group 2) |
**Logistical difficulties**

There was like a lot of supplementary material. It was like, “This is what you need to know,” but there was also like these “12 extra uploads in case you have free time and want to watch these videos.”…It’s just like I can’t watch all – I’ve already watched like 12 lectures a week, like can we stop adding supplementary material? [Laughing] It’s just too much information for me.” (Focus Group 4)

“I had a lot of issues actually getting my hours in; so maybe having some sort of way to work it out, because I ended up having to take like two semesters. I didn’t finish my hours during fall, so I had to finish them in the spring. And so just finding a way to like make accommodations, because you’re participating in these programs, like Diabetes Prevention Program or Live Healthy Kids [regional education program]; but you’re signing up to like, ‘Yes, I’ll do 84 hours of this throughout the semester.’ But then later you find out, ‘Oh, none of these times fit my schedule. Like how am I supposed to get these hours in if I don’t know how it’s going to fit into my schedule ahead of time?’” Like I volunteered for every single thing that could fit into my schedule and I still couldn’t get my hours in.” (Focus Group 3)

“I just really wasn't sure what I could do to count for it. They [Professor] gave you a list, but that list is relatively short – it's like two or three people. So you have to go out and find people to do your independent study with.” (Focus Group 5)

“I remember that list she [Professor] gave us and it was like some of them interested me, so I was like oh, I’ll email that person. But they just never got back to me. And then people were always discussing the Diabetes Boot Camp and Diabetes Prevention Program, but they could only take like four people or five so we were like there’s only so many students they could take.” (Focus Group 1)

### Recommendations

<table>
<thead>
<tr>
<th>Theme</th>
<th>Representative Quotation</th>
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<tbody>
<tr>
<td>Focus on research and technology trends in diabetes</td>
<td>“I think the basics of diabetes are pretty simple but it’s so vast. Like there’s just so much, so much different information, so many different things going on in current research and just different types.” (Focus Group 1)</td>
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<tr>
<td></td>
<td>“The other student stated: I know I keep coming back to it, but hearing about what’s going on in the world right now recently with research or published</td>
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articles or studies being conducted. You just don’t – I just don’t feel like you hear that as often as you should in a classroom setting...Maybe get the students involved somehow just doing little things like filing or helping with small tasks for research. Just giving them that introduction to research, especially if they’re going into that setting. It’ll be important to see how they can transition into that.” (Focus Group 2)

**Experiential learning**

“I really enjoyed the independent study part because I’m more of like hands-on and getting out in the field, so I really liked that part of it. And I’d say, too, in the trends part maybe getting more involved in the classroom. Instead of sitting there and watching people talk, get more involved with the students and doing counting carbs, for example, things like that and doing group work instead of just sitting there and watching.” (Focus Group 2)

“...like really encouraging people to get involved with more hands-on stud. You can’t force people to do it you know, but like the people who are on campus going to DI (Diabetes Institute) events and stud is helpful to give them – make it more real.” (Focus Group 4)
Appendix F: Trends in Diabetes Experiential Learning Assignments

Traveling with Diabetes (30 pts)

Overview:
The purpose of this assignment is to provide you with an understanding of the realities of traveling with diabetes. When traveling, there are many things to take into consideration, particularly for someone with diabetes.

Instructions:
Imagine you and your best friend are planning a week-long trip of a lifetime to a dream destination. Identify a country or foreign city you would like to visit. Answer the following questions as if you were an individual with diabetes.

1. Country/city of choice. Provide a brief explanation for your choice (2 pts)

2. Draft a packing list of all the things you feel are absolutely necessary for self-care and management of your diabetes while traveling abroad. Create a list for an individual with type 2 and type 1 diabetes. Include a minimum of 5 items in each list. (8 pts, 4 each)
   a. Type 2 Diabetes
   b. Type 1 Diabetes

3. Read this article from Diabetes Forecast and identify three travel tips that shocked you/thou had not considered before. (3 pts)
   (Copy and paste URL into browser:
   a. 
   b. 
   c. 
4. Health insurance coverage while traveling may be the difference between an unforgettable vacation with peace of mind and a vacation spent worrying what might happen if something goes wrong. Research Blue Cross Blue Shield and CIGNA, two of our nation’s largest health insurance providers. Compare and contrast the two companies, identifying what medical services and/or supplies are covered under each insurance for international travel (and in your country of choice if possible). (10 pts, 5 each)

5. Use this resource from the U.S. Department of State to identify the contact information for one English speaking hospital or physician you could go to while abroad, in the case that complications with your diabetes arise. (Another source may be referenced, but the citation should be included with your response.) Identify two emergency situations that might arise, which are unique to an individual with diabetes. (5 pts)
(copypaste URL into browser: https://travel.state.gov/content/passports/en/go/health/doctors.html)

6. After completing this activity, do you think personally having diabetes would deter you from traveling? Why or why not? (2 pts)
Blood Glucose Record (100 pts)

Point breakdown:
- Safe return of supplies – 10 pts
- Pre-Assignment Reflection – 12 pts
- Blood Glucose Log – 60 pts
- Post-Assignment Reflection – 18 pts

For a total of FIVE days, you will be tasked with tracking your blood glucose. Consistent tracking and maintaining a relatively steady blood glucose level are key component of effective diabetes management. The purpose of this assignment is to implement one of the AADE7 Self-Care Behaviors, blood glucose monitoring, with the intention of simulating a portion of the realities of living with diabetes.

The following are the basic requirements of this assignment:
1. Record blood glucose results for a total of FIVE days – this should include one weekend day at minimum.
2. Record blood glucose results a total of THREE times daily. Times should vary-don’t measure 3 back-to-back times at the end of the day. (ie: 11:40, 11:43, 11:50 pm)
3. Using the provided form, keep record of factors you think may have had an impact on your reading. This could include recent consumption of food, exercise, illness, stress, etc.
   *** For best results, you should try to switch up when you measure your blood glucose, as varying circumstances will have differing effects – this will allow you to understand how and why your levels may vary throughout the day and enable you to detect patterns and trends.
4. Record results in the tables provided. Each reading is worth TWO points, all or nothing.
5. Reflect on your experience with this activity and answer the follow-up questions with thorough and thoughtful answers.

The following supplies will be provided for your use with this assignment:
- ReliOn glucometer (glucose meter)
- User manual
- Lancing device
- Lancets
- Testing strips
- Alcohol swabs
   *** Dispose of sharps in non-permeable plastic or glass container. Bring to class on day 6 to dispose of sharps in class sharps container.
Follow the instructions that come with your glucose meter. The following is a basic overview of the process:

1. Wash and dry your hands well.
2. Insert a test strip into your meter.
3. Prick the side of your fingertip with the needle (lancet) provided with your test kit. (It may be best to use your non-dominant hand to avoid any discomfort from the test site. Also, switching fingers allows for quicker healing.)
4. Gently squeeze or massage your finger until a drop of blood forms.
5. Touch and hold the edge of the test strip to the drop of blood.
6. The meter will display your blood glucose level on a screen after a few seconds.
7. Record the date, time, blood glucose reading in mg/dL and any pertinent comments in the log.
8. Properly dispose of lancets in sharps container.

Watch this video for specific instructions on how to use the ReliOn Prime Glucometer: https://www.youtube.com/watch?v=ZDXBt9oy8_8

Pre-Assignment Reflection (12 pts)

1. What are some of your initial expectations going into this assignment? (4 pts)

2. What aspect(s) of the assignment do you think will be the most challenging for you? (4 pts)

3. Do you have any concerns about this activity? Explain. (4 pts)
Blood Glucose Log – 60 pts – 4 pts for each *complete row* (date, time, reading, comments)

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>READING (mg/dL)</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>1-20-17</td>
<td>8:52 am</td>
<td>128 mg/dL This reading was taken about 30 minutes after eating a breakfast consisting of 1 cup of oatmeal w/ 1 tbsp of peanut butter and a medium banana.</td>
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<td>Day 1</td>
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<td>Day 2</td>
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<td>Day 3</td>
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Post-Assignment Reflection (18 pts)

a. Compare your experience monitoring your blood glucose to your initial expectations. Were there any aspects of the activity that you were especially surprised by? Identify some specific thoughts/feelings you experienced. (5 pts)

b. Describe what aspect(s) of this exercise you personally found most challenging and why. (4 pts)
c. Were you surprised by any of your blood glucose readings? Explain. (2 pts)

d. Elaborate on your opinion of the activity. Do you believe it will be valuable in your future work/interactions with people with diabetes? Were there any aspects you particularly liked or disliked? (5 pts)

e. Provide any suggestions you may have for improving this activity. (2 pts)
**Potluck Activity (30 pts)**

In groups of two or three, select a food item from the list that you would like to prepare. On (selected day) we will have a potluck when everyone will bring in their dishes to share with the class. Coinciding with the potluck, we will have a discussion in which groups will have the opportunity to share about their dish and provide correct nutritional information. Each group should bring with them a copy of the recipe used, the nutrition facts for the dish and a small sign/label with the name of the dish that was prepared. (10 pts)

List of potential options (items should be homemade unless otherwise indicated):
- Fruit salad
- Hummus + (store-bought) pita
- Vegetable dip + chopped vegetables
- Salsa + (store-bought) tortilla chips
- Cowboy caviar
- Coleslaw
- Mozzarella sticks + marinara sauce
- Pasta salad
- Broccoli salad
- Chicken salad
- Baked beans
- Cheesy potatoes
- Cocktail meatballs
- Mini ham + cheese sandwiches/sliders
- Shredded chicken sandwiches (store-bought rolls)
- Chocolate chip cookies
- Black bean brownies
- Rice Krispy treats

The purpose of this activity is to provide you with an opportunity to test your carb counting skills in a real-life scenario. All food items will be labeled, but no nutritional information will be provided. As someone with diabetes who is trying to keep their blood sugar in check, you are tasked with navigating the party, trying to keep track of the number of carbs you are consuming, using the carb counting method. Use the table provided to track the food you consume. Points will be awarded for completion and relative accuracy. (15 pts)
<table>
<thead>
<tr>
<th>Food</th>
<th>Serving Size</th>
<th>Actual Serving Size</th>
<th>Grams of Carbs</th>
<th>Actual Grams of Carbs</th>
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Total:          
Total:
**Reflection (5 pts)**

1. How close were you in your initial estimates to the correct serving sizes and number of carbohydrates? (2 pts)

2. Put yourself in the shoes of an individual who lives with diabetes. How do you think you would feel about monitoring your carbs with everything you eat? Do you think this would deter you from attending parties/potlucks? Explain. (3 pts)