Prevention of Diabetes and Early Detection of Prediabetes

by

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Abstract

Background: Prediabetes is a state of elevated blood glucose that is typically found prior to a diagnosis of diabetes. Diabetes is a serious health condition that can lead to many health problems and even death. Prediabetes can often be corrected through lifestyle changes; the first step in making these lifestyle changes is to be aware of the risks**.** **Purpose:** 1) To develop resources that will increase awareness in the general population regarding prediabetes, 2) to provide information to those who are newly diagnosed with the condition, and 3) to support those who care for individuals with prediabetes. **Methods:** Three methods were used; a literature review was conducted to identify best practices for prediabetes care. Experts and key stakeholders were consulted, and an environmental scan was completed to determine what was known about prediabetes and resources available. In addition, suggestions for: educating the public, supporting healthcare providers who care for individuals with prediabetes, and resource development were gathered. Resources in the form of two pamphlets, one PowerPoint presentation, and a local resource list were developed based on the methods used. **Conclusion:** The two pamphlets and PowerPoint summarized key information regarding the condition of prediabetes and how to manage the condition. The resource list provides local contact information for services or facilities that can assist with lifestyle changes needed to manage prediabetes. The pamphlets and resource list will be available throughout Green Bay while the PowerPoint will be displayed in waiting rooms throughout the health region. All tools can increase awareness of prediabetes and has the potential to prevent diabetes.

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According to the Canadian Diabetes Association (CDA) (2013), there are three main types of diabetes. **Type 1 diabetes** is usually diagnosed in children and adolescents and approximately 10 percent of the population has this type. The remaining 90 percent have **Type 2 diabetes** which usually develops in adulthood, although increasing numbers of children in high-risk populations are being diagnosed. The costs associated with Type 2 diabetes for treatment and complication management are tremendous. These human and financial costs cause diabetes to be a very important concern for healthcare organizations and society as a whole. Costs associated with diabetes are estimated to rise to $16.9 billion by 2020 (CDA, 2009). A third type of diabetes, **gestational diabetes**, is a temporary condition that occurs during pregnancy. It affects approximately 2 to 4 percent of all pregnancies (in the non-Aboriginal population) and involves an increased risk of developing diabetes in the future, for both mother and child. Diabetes can cause a large number of complications for those affected by the disease and can even cause early death. Since diabetes is a progressive state, interventions aimed at prevention are essential for halting progression of this disease.

In the Central Health region in 2012, 9.9% of the population reported that they have diabetes. This was the highest rate in Newfoundland, where the provincial rate was 7.7%, and was higher than Canada overall (6.5%) (Statistics Canada, 2012). The latest data available for Zone 11 presented a rate of 14.7% for those aged 12 and older having been diagnosed with diabetes (Statistics Canada, 2007-08). Zone 11 includes Green Bay, the local area in which I work, and will be the main area of focus.

The rate of diagnosis of diabetes increases dramatically with age; 13.9% of the population within the Central Region ages 45-64, and 26.3% of those 65 years of age or older had a diagnosis of diabetes (Statistics Canada, 2012). The CDA (2009) estimates that by 2020, 3.7 million Canadians will have diabetes; an aging population, a population increase and increasing incidence rates will account for this increase. In 2010, it was estimated that 21.8% of the population of Canada had prediabetes and 1 million people had undiagnosed diabetes (CDA, 2010).

Prediabetes is a condition where "blood glucose levels are higher than normal but are not yet high enough to be classified as Type 2 diabetes" (CDA, 2013). While not everyone who has prediabetes will progress to Type 2 diabetes, the risk is high and at this stage damage to the heart and other organs may begin. Murphy & Winmill (2013) stated that each year 11% of those with prediabetes will progress to Type 2 diabetes and the majority of individuals with prediabetes will progress within 10 years. Early identification and intervention for prediabetes have been shown to delay or prevent Type 2 diabetes.

There are three levels of prevention: primary, secondary, and tertiary. Primary prevention includes actions preventing the initial occurrence of disorders/diseases by focusing on the risk factors and risk conditions which are associated with, or cause increased susceptibility to, specific diseases. Secondary prevention means stopping or slowing down the progress of a disease or disorder as soon as possible before medical

treatment is required, and tertiary prevention attempts to reduce the occurrence of relapses of a chronic disease or disorder (Central Health, 2010).

The target of my project was primary prevention. Scientists believe that lifestyle changes can help prevent or delay the onset of Type 2 diabetes. A healthy meal plan, weight control and physical activity are important prevention steps. Being age 40 or over puts an individual at risk for prediabetes and diabetes, thus people of this age should be tested at least every three years (CDA, 2013). Since the population is aging, there will be an increasing number of persons in the population who will be at risk. This project's goal was to identify best practices in prediabetes care. This information was then used to develop tools to assist in educating those at risk for prediabetes and diabetes, and to assist with early diagnosis of prediabetes.

Diabetes prevention and management has been the initial focus of the Chronic Diabetes Prevention and Management Lead Team of Green Bay, which is one region of the Central Health Authority, and is the local area in which I work. The work that has been done thus far to address diabetes has mainly focused on treatment and education of those already diagnosed with diabetes, education of staff regarding treatments, and the development of policies for care of those with diabetes. The need for prevention tools remains great; in consultation with this team, local physicians, the local Community Advisory Committee, and the Chronic Disease Consultant, prevention tools were developed. The learning needs of those at risk were addressed, as well as the learning needs of healthcare professionals, especially regarding support for those who have

prediabetes and are therefore at risk of diabetes.

GOAL AND OBJECTIVES

GOAL: To provide information and tools for those with, or at risk for, prediabetes regarding prevention of diabetes, and to support early diagnosis of prediabetes.

- **Objective 1**: To identify best practice for diabetes prevention and early diagnosis of prediabetes.
- **Objective 2**: To identify local needs and to identify what is currently available in my local health region (Green Bay) and also the health region as a whole (Central Health) regarding prevention of diabetes and prediabetes.
- **Objective 3**: To develop tools (e.g., PowerPoint presentation, pamphlets and a local resource list) that will be useful and suitable for the target population. These will aim to provide information and skills to prevent diabetes and promote early diagnosis of prediabetes, and provide knowledge of local resources available that may assist with lifestyle changes and interventions.
- **Objective 4**: To demonstrate the competencies of an advanced practice nurse by promoting prevention and wellness care, developing educational materials based on population needs and client characteristics, and using critical inquiry and consultation to contribute to improved health.

METHODS

A variety of methods were used to collect data that directed the development of the resources created. The data collection aimed to collect data for the local health region

where possible but also included some data from provincial sources as well as national sources where necessary. The methods that were utilized were:

1) Literature review: CINAHL, PubMed, EBSCO Host, and Medline were used to gather data regarding best practices for diabetes prevention. Search terms included diabetes, diabetes prevention, borderline diabetes, impaired glucose tolerance, impaired fasting glucose, and prediabetes. Statistics Canada, Community Accounts, Newfoundland and Labrador Institute for Health Information (NIHI), and Canadian Institute for Health Information (CIHI) were also utilized to gather statistical data related to diabetes and prediabetes.
2) Consultations and environmental scan: local and regional experts were consulted to gather data regarding needs for diabetes prevention. The consultation groups did contain some individuals who have prediabetes (i.e., the target population). The purpose of the consultations was to generate ideas regarding development, evaluation, and implementation of any resources developed. An environmental scan (i.e., a scan of the local health region for resources currently available regarding prediabetes and diabetes prevention) was done in conjunction with a telephone interview with the Chronic Disease Consultant.
3) Resource Development: resources were developed for use in the community based on results of the literature review, the consultations, and the environmental scan.

The methods and their results are discussed further in the following sections.

Literature Review Summary

The complete literature review can be found in Appendix A. A brief summary will be provided in the following section.

Method

The literature review included a search of databases such as PubMed, CINAHL, EBSCO Host and Medline, as well as websites such as Statistics Canada, Newfoundland and Labrador Community Accounts and the Canadian Diabetes Association (CDA). Search terms included prediabetes, borderline diabetes, impaired glucose tolerance, impaired fasting glucose, diabetes and diabetes prevention. Articles were limited to those of the English language that were published within the last 15 years, as the term prediabetes has only been used to describe prediabetes since 2002 (Eldin, Emara & Shoker, 2008).

The specific focus of the literature review was prediabetes and articles used were limited to those that addressed prevention or treatment of this health condition. The purpose of the review was to discover best practice guidelines and recommendations that would assist in development of resources to prevent prediabetes or progression to diabetes.

Results

Prediabetes is a condition in which there is a higher than normal blood glucose level. This level is not high enough to be classified as diabetes but is serious enough to need intervention (CDA, 2013). From the literature review it was learned that prediabetes

is a precursor to diabetes and can exist for many years before progressing to diabetes. Diabetes can lead to many health complications such as heart disease, stroke, blindness, kidney disease, amputations, and even death (Yates, Davies & Khunti, 2009). The good news is that prediabetes does not have to progress to diabetes; lifestyle changes can be made that can reduce risk of diabetes and may even help individuals revert back to normal blood glucose levels. By 2016, it is expected that 6.3 million individuals over the age of 20 will have prediabetes with those between 40 and 74 years of age accounting for 4.3 of the 6.3 million (Public Health Agency of Canada, 2008).

There are three blood tests that can be used to diagnose prediabetes: fasting blood glucose, oral glucose tolerance test, and hemoglobin A1C (HbA1C). An elevated result on either of the three tests can diagnose prediabetes. A fasting blood glucose level is normally less than 6.0 mmol/L; prediabetes levels are 6.1-6.9 mmol/L. Normal oral glucose tolerance test results are less than 7.8 mmol/L but are 7.8-11.0 mmol/L in prediabetes. HbA1C is normally less than 6% but prediabetes levels are 6.0-6.4%. Any values above those described for prediabetes would classify an individual as having diabetes (CDA, 2013).

There are many risk factors identified for prediabetes. These include: age 40 or older, being a member of a high risk group such as Aboriginal, Asian, African or Hispanic, being overweight, or being physically inactive. Other risk factors include having a history of: a first degree relative with Type 2 diabetes, gestational diabetes and delivery of a baby greater than 9 pounds, hypertension, obesity (body mass index > 25

kg/m^2), hyperlipidemia, polycystic ovary syndrome or acanthosis nigricans, or a previous elevated blood glucose test (CDA, 2013).

In Canada, the recommendation for prediabetes screening is to begin initial screening at age 40 and to continue every 3 years thereafter, unless there are risk factors other than age. In this case, screening should begin earlier and occur more frequently. Often individuals with prediabetes are asymptomatic; therefore awareness of risk needs to be made early so that complications can be averted. In addition, once those who are at risk for prediabetes are identified and diagnosed, lifestyle changes can be made to correct the condition or prevent progression to diabetes.

Studies have shown that lifestyle changes are the most effective way to treat prediabetes. These lifestyle changes include weight loss and increased physical activity (Cole, Boyer, Spanbauer, Sprague & Bingham, 2013; Critchley, Hardie & Moore, 2012; Khaodhiar, Cummings & Apovian, 2009) and have been shown to be more effective than medications (Knowler et al., 2002). The 2013 CDA guidelines recommend at least 5-10 percent weight loss in those who are overweight and to increase exercise levels to at least 150 minutes per week, in order to attain health benefits, such as improved physical and mental health (Sigal et al., 2013).

Some approaches to help with weight loss goals include monitoring of caloric intake and output, eating healthy foods, avoiding high fat, high sugar foods, and increasing fibre. Mechanick et al. (2012) reported that for individuals to understand diet recommendations, specific examples must be given rather than describing foods by

composition (e.g., individuals should be told to cut back on burgers, fries and soda rather than being told to cut out refined carbohydrates, fats and sugars).

To improve physical activity, a gradual, phased in approach is recommended (Musto, Jacobs, Nash, DelRossi & Perry, 2010), as this will assist in the success of reaching target goals and in sustainability. For those individuals in which physical activity is limited (e.g., unable to walk), resistance training (e.g., theraband exercises) is recommended as it has been shown to improve glycemic control, decrease fat, improve physical function, and muscle mass (Traustadottir & Tsitouras, 2010).

While researching management and support for prediabetes, it was discovered that little is known about the most effective ways to help individuals understand their condition and how to change or manage the condition, or how to improve compliance to lifestyle changes (Evans, Greaves, Winder, Fearn-Smith & Campbell, 2007). Both individuals and healthcare professionals need increased knowledge of prediabetes with individuals wanting knowledge specifically in the areas of cause and risk, progression of the condition, monitoring and treatments, as well as specifics on exercise recommendations, diet changes, medications, and prevention of complications.

There was no strategy noted to be superior to another in educating clients about monitoring and prevention (CDA, 2013); a study by Parikh et al. (2010) stated that effective and sustainable prevention efforts are slow to appear and occur sporadically. There is no "one size fits all" program to prevent and manage prediabetes, thus individual factors must be considered when providing care for those with prediabetes. Through the

literature review it was found that older individuals (e.g., 60 years and older) will need extra support and reinforcement to make lifestyle changes. They often view exercise as a leisure activity rather than as an activity for health (Bouchard et al., 2012a) and also have lifelong eating habits that they are resistant to change.

Some studies have demonstrated that many individuals would prefer group sessions for learning, while others would not. Regardless, support for individuals is needed whether it comes in the form of group sessions or through individual support persons. While group support has been shown to provide many benefits (Critchley et al., 2012), Ali, Echouffo-Tcheugui & Williamson (2012) identified that lay persons can be as effective as healthcare professionals in offering support if they are educated about the condition. Despite this, a study by Bouchard, Baillargeon, Gagnon, Brown and Langlois (2012b) concluded that frequency of contact with health care professionals, regardless of the type of healthcare professional, improved efforts in weight loss, and decreased body mass index and waist circumference in those at risk for diabetes. This is especially true for the older adult population.

While medications may be utilized for treatment and management of prediabetes, there was no specific recommendation for this. As discussed previously, lifestyle modification is the treatment of choice for prediabetes. Oral antidiabetic medication should only be used when lifestyle modifications are not effective or when the condition is progressing. Metformin would then be the drug of choice as it has low risk and few side effects associated with it (Phung, Baker, Tongbram, Bhardwaj & Coleman, 2012). It

is important to note though that this drug can only be used in those individuals who are of good health (e.g., no problems with kidneys, heart or liver).

Self-management of prediabetes is crucial to prediabetes treatment. In order for self-management to transpire, individuals must be aware of their prediabetes condition and learn what they must do to control and manage the condition, and to prevent progression to diabetes. Awareness of prediabetes was discovered to be a motivator for changing lifestyle practices. A study by Parikh et al. (2010) demonstrated that when control participants (i.e., those who did not take part in interventions) were made aware of their prediabetes status, they lost approximately 2 pounds per year. In addition to this, individuals who were aware of their condition reported increased weight control and physical activity, and a reduction of intake of fatty foods and calories (Okosun & Lyn, 2010). This supports the need for screening programs and awareness campaigns for prediabetes as there are usually no signs and symptoms of prediabetes until complications occur. This generally indicates that progression to diabetes is already occurring.

The final area addressed by the literature review related to the needs healthcare professionals have in supporting individuals with prediabetes. It was found that health professionals need extra training and education regarding physical activity recommendations and counselling skills, and knowledge of resources to support clients (Bouchard et al., 2012b). Interestingly, it was found that about a third of clients with prediabetes were not provided advice from their healthcare provider regarding lifestyle changes to improve their health (Dorsey & Songer, 2011) and less than half (44%) were

informed that prediabetes puts them at risk for diabetes (Okosun & Lyn, 2010). Reasons for this lack of information are not known and further study is recommended to address these reasons; the factors mentioned above may be some reasons to consider.

In summary, the literature review demonstrated that awareness of prediabetes is needed, especially regarding risk and early screening. Early intervention through lifestyle changes including weight loss, diet changes, and increased physical activity is the most effective way to improve or maintain prediabetes status and prevent diabetes. There was no method found to be more effective than others in educating individuals about management of prediabetes but written materials are the preferred method by both clients and health professionals.

Self-management is the crux of prediabetes care but support is needed for prediabetes clients to set goals and to meet these goals. This support can be provided by families, healthcare professionals, or other individuals who have a relationship with the client. While individuals have much to learn about their condition, healthcare professionals who interact with these clients have learning needs as well to help support them.

Consultations and Environmental Scan Summary

The complete report of the consultations and environment scan can be found in Appendix B. A brief summary is provided in the following section.

Consultation Method

The consultations occurred over several weeks through four separate sessions. These consultations occurred with the local Chronic Disease Prevention and Management Lead Team, the local Community Advisory Committee, the local physicians, and the regional Chronic Disease Consultant. Three sessions were conducted as in-person, focus groups, while the consultation with the Chronic Disease Consultant occurred via a telephone interview.

The goal of the consultations was to discover if there are learning needs for those at risk for prediabetes or diabetes and for those who support clients with prediabetes or diabetes (e.g., dietician, physicians and nurse practitioner), and also to discover what those needs may be. Other goals included assessing current resources available for prediabetes clients, and gathering ideas for the development of resources. The consultations included 19 participants in total with only one participant who was younger than 40 and/or did not have experience working with prediabetes clients. The remainder of the participants either worked in health care, had prediabetes or diabetes, or were over the age of 40. Therefore, these participants were appropriate for the consultations conducted.

There were pre-developed questions asked at all four sessions. The questions can be found in Appendix B in the final consultation report as well as a summary of the responses to the questions. Data gathered were analyzed for themes and common answers. These helped narrow the type of resources the student would develop and the

content of the resources. Many of the other ideas suggested will be taken to the Chronic Disease Prevention and Management Lead Team for future work in diabetes care (e.g., targeting school aged children to educate them early about diabetes). Ideas were also gathered on how materials developed could be easily and widely distributed.

The specific questions addressed included the learning needs of the general population, as well as for those who already have prediabetes. The participants were also questioned regarding their opinions on the importance of education of prediabetes separately from diabetes. Suggestions for most effective ways to educate were gathered. In addition, the participants were asked to identify any existing resources that specifically address prediabetes. In the focus group with the physicians, an additional question was asked regarding what they felt their needs are to support individuals with prediabetes.

Consultation Results

There were few resources known to participants specifically about prediabetes. While those who work in health care were aware of the CDA website and clinical practice guidelines, many of those who do not work in health care had never heard of prediabetes. Some examples of the resources the participants felt could be useful in prediabetes education included use of social media, posters, newspaper articles, handouts, workshops, visual presentations, group programs, and support groups. The participants also felt that written materials need to be colorful and not crowded with information. Take home materials were viewed as very useful tools, as individuals can review the material on their own time, at their own pace. The physician participants felt that

educational materials specific to prediabetes are needed as there is a reliance on existing diabetes materials for education. Diabetes tools address issues that occur when individuals have already been diagnosed with diabetes but prevention of diabetes is what is needed.

One of the suggested items for the physician group to support individuals with prediabetes was a local resource list. The list would assist the physicians in directing newly diagnosed, prediabetes clients to services and facilities that can support lifestyle change (e.g., exercise classes or facilities). While a resource list will be useful for the physician group, it has potential to be distributed more widely than at physician clinics (e.g., drugstores, nurse practitioner office, public health clinics, etc.).

The Environmental Scan

Through the consultation with the Chronic Disease Consultant, an environmental scan was also conducted to find out the resources currently available to support clients in the local health region regarding prediabetes. One of the mandates of the consultant is to approve tools used by the health authority regarding chronic disease. The consultant identified that there is a PowerPoint presentation available regarding impaired fasting glucose and impaired glucose tolerance but that it requires review and updating. There is also a PowerPoint presentation available regarding healthy eating but review of this PowerPoint presentation identified that it mainly addresses heart disease. No other materials were found locally regarding prediabetes. The next section will discuss the resources developed in greater detail.

Developed Resources Summary

Method

The developed resources for this practicum project consisted of two pamphlets, a PowerPoint presentation and a local resource list (Appendix C). The resources developed were chosen based on the findings of the literature review and the consultations. Consideration was also given to what the student felt could be developed without needing much financial support, and also what would reach the widest population (e.g., pamphlets, PowerPoint presentation). The content of the resources reflected the suggested topics that the participants felt were the most important needs of the general public and those with prediabetes specifically. Examples include: how to be tested; values for normal blood glucose, prediabetes, and diabetes; risk factors; complications; prevention and management. Since there were some participants who had prediabetes and their suggestions reflected the topics identified in the literature review, the student considered the suggested topics to be appropriate.

The colors used for the pamphlets were kept consistent with the standard colors used to represent the local health authority as the student hopes that it will be accepted for use by the health authority. The pamphlet layout considered the suggestions of the consultation groups (e.g., eye catching, not too crowded with words, and information on where to go for more assistance).

The PowerPoint presentation was developed for use on teleprompters throughout the health authority. Teleprompters are normally found in waiting rooms of health centres and health clinics. These provide an opportunity for individuals waiting for appointments to gain knowledge on a variety of health topics. Throughout the health region teleprompters are being used in this manner; once approval from the health authority is gained for the prediabetes PowerPoint presentation, it can be added to the existing databank of health presentations currently being displayed to the public. The PowerPoint presentation was kept as condensed as possible without sacrificing crucial data as the recommended format for PowerPoint presentations on the teleprompter is 12-15 slides. This is due to size constraints of the equipment and technical issues.

The final tool to be developed was a local resource list. This resource list was developed in a bookmark format that can easily be distributed. The original intent was to develop it for use by the physicians and nurse practitioner. The goal was for these health practitioners to provide the list to newly diagnosed prediabetes clients to help them access resources. These resources can assist in making lifestyle changes and possibly prevent diabetes. However, the list is useful for other prediabetes and diabetes clients so it will also be made available at places other than the doctor or nurse practitioner offices. Some examples include the diabetes clinic, lifestyle clinics, diabetes awareness days, senior centres, etc.

Results

The first pamphlet titled, *What Is Prediabetes* (Appendix C) was developed for use by the general public. The aim of the pamphlet is to bring awareness to the health condition of prediabetes. The content of the first pamphlet is brief and was limited to the most immediate knowledge needed to learn about prediabetes. The content includes a description of the condition, information regarding why it is important to know about prediabetes, who is at risk, and how to find out if an individual has prediabetes. Finally, a section on where to go to find out more about prediabetes is provided.

The second pamphlet titled, *Living With Prediabetes* (Appendix C) was developed specifically for those who have recently learned that they have prediabetes. The content of the second pamphlet also provides a definition of prediabetes and reasons why awareness of the condition is of importance but then provides specific sections regarding follow-up and management of prediabetes. Specific goals for weight loss and exercise are provided which are based on the Canadian Diabetes Association 2013 clinical guidelines. Resource information regarding extra knowledge of prediabetes is provided in this pamphlet as well.

The PowerPoint presentation is a compilation of the data presented in the two pamphlets with the addition of some extra information on the specific testing that may be done to diagnose prediabetes. Since the clientele that may review the PowerPoint presentation may either be someone at risk, or someone who has already been diagnosed, the information was put together to create one PowerPoint presentation that would

address prediabetes as a whole. This PowerPoint presentation can be viewed in Appendix C.

The content of the resource list (Appendix C) includes local gyms or other community exercise spaces, exercise classes (e.g., Moving for Health), self-management programs, foot care services, diabetes clinic (e.g., dietician led), and the Canadian Diabetes Association information. The resources listed can either provide information on weight loss, exercise, foot care specifically, or general information about prediabetes or diabetes. They can also provide assistance in meeting goals or in receiving health services (e.g., foot care assessment).

The draft versions of the pamphlet and PowerPoint presentation were reviewed by the Community Advisory Committee, The Chronic Disease Prevention and Management Lead Team and the Chronic Disease Consultant. Suggestions for change were accepted and have been completed (e.g., adding the website for CDA rather than just the phone number, separating the risk factors into smaller sections, writing blood sugar rather than blood glucose). The next step is to have the Chronic Disease Prevention and Management Lead Team and the consultant review the documents and give final acceptance for use. A meeting date has been set for early fall 2014 as many members are on vacation over the summer months. The documents will then be sent to Corporate Communications for approval to use the documents under the health authority's name. In the meantime, the resource list was sent to the physicians, nurse practitioner and members of the Chronic Disease Prevention and Management Lead Team via email for review and feedback on

whether they would find it useful, and also for suggestions for change or addition. Feedback received thus far was positive and only one suggestion was provided to add the local monthly drop in health check clinic that is normally offered to seniors but can be accessed by the general public if they desire. This suggestion was added to the local resource list.

Advanced Nursing Practice Competencies

Through this practicum my aim was to develop my own personal expertise and skills, and also to contribute to the clinical practice of other health care providers who care for clients with prediabetes. Through my work as a community development public health nurse, I work with the many age groups in the population. Chronic diseases (e.g. diabetes, heart disease, stroke, etc.) are seen abundantly in the communities where I work, thus my interest to focus my practicum on one of these diseases was easily decided. I chose to focus on diabetes prevention as it is a major burden for healthcare facilities and is a topic of many committees in which I am a member. Often times the focus is diabetes treatment instead of prevention, therefore I chose to concentrate on prevention.

Hamric (2009) defined advanced nursing practice (ANP) as practice that has advanced knowledge and skills in nursing. An advanced practice nurse demonstrates autonomy, leadership, knowledge exchange, diversity, and advanced judgment, as well as a desire for lifelong learning. The competencies identified by the Canadian Nurses Association (2008) include: clinical competencies such as developing, coordinating and evaluating plans of care to optimize health and quality of life for the individuals, groups,

communities and populations, in partnership with clients and other members of a healthcare team; research competencies such as those shown while interpreting, synthesizing, utilizing and disseminating evidence in clinical practice, quality improvement and safety; leadership competencies such as seeking new ways to practice or improve delivery of care, or influence change ; and consultation and collaboration competencies such as working with other colleagues to improve quality of care or develop risk management strategies. Through this practicum project, the student demonstrated many of the competencies of the advanced practice nurse including research, leadership, and consultation and collaboration. Each of these will be addressed separately over the next few paragraphs.

Nursing research is research that provides evidence used to support nursing practice. This competency includes interpretation and use of the findings, evaluation of practice, and collaboration with current practice (DePalma, 2009). While a research project was not conducted, research methodology was utilized to complete this practicum project. Through a literature review and data collection via consultations, the student identified what is currently available and where the gaps are regarding prediabetes and diabetes prevention, as well as best practices for prediabetes care. The data gathered was then used to develop resources (i.e., pamphlets, PowerPoint presentation and local resource list) to improve care of those who have prediabetes, or are at risk of prediabetes, with a long term goal of diabetes prevention.

Spross & Hanson (2009) stated that ANP leadership involves mentoring and empowerment, innovation and change, and activism. Of these, empowerment, innovation and change were the main components of leadership portrayed through this practicum. My long term goal is to empower individuals to take ownership for their health and to adopt a healthy lifestyle to prevent prediabetes and diabetes. Through resource development, I feel this is one step in empowering clients to make change and improve health. This will promote change at the individual level but will also promote change at the systemic level by advocating for Central Health to adopt the use of the developed resources.

One component of the CNA (2008) leadership competency is to identify the needs of nurses or other healthcare professionals and find or develop resources to address the need. The local resource list was initially developed with the healthcare professionals in mind to help them refer clients diagnosed with prediabetes to resources that can help with lifestyle change. Advocating for access is also identified as a component of leadership. Through this project, the student is advocating for increased awareness and screening of prediabetes to assist in diabetes prevention.

The final competencies demonstrated by the student through this practicum project are consultation and collaboration. Consultation is the seeking of additional information or the provision of information to enhance practice (Barron & White, 2009) whereas collaboration means to work together (Hanson & Spross, 2009). During this practicum the student consulted with the local Chronic Disease Prevention and

Management Lead Team, the Chronic Disease Consultant, the Community Advisory Committee, and local physicians to determine need and gaps. Findings from the literature review regarding best practices were shared with participants. The consultations provided an avenue for collaboration regarding development and evaluation of tools for acceptability and functionality in the target group before the publishing or use of the tools. Feedback was also received on draft versions of the resources and changes were made as necessary.

Summary

To stop the continuous increase in the rates of diabetes, a greater focus must be placed on prevention efforts rather than treatment. Many individuals live in a state of elevated glucose for many years before progressing to diabetes. This state of prediabetes is correctable but needs lifestyle change in order to correct it. The first step in making this change is to be aware of risk so that progression to diabetes can be prevented, as diabetes can lead to many health complications and even death. Increasing age is a major risk factor for both prediabetes and diabetes thus screening protocols need to be in place to support early diagnosis. While screening alone will not create lifestyle change, awareness of prediabetes can motivate change for many individuals.

Through this practicum project, my own personal goal was to develop expertise and skills and to contribute to clinical practice in prediabetes care. The specific goal of the practicum project was to provide knowledge and tools for those with, or at risk for, prediabetes regarding prevention of diabetes and to support early diagnosis. Through

literature review, consultations and resource development I feel I have met my personal goal as well as the goal set for this project. The four resources developed do provide knowledge of prediabetes and also provides knowledge of what can be done to correct or manage the condition and potentially prevent progression to diabetes. The tools will be available to all individuals in the local area who wish to learn more about prediabetes and are also available to be shared throughout the health region if other local areas are interested.

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Appendices

Appendix A-Literature Review and Summary Tables

Literature Review
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Prediabetes has been described as a gradual, progressive state that occurs prior to having diabetes (Eikenberg & Davy, 2013; Fonseca, 2007) and is often a state that goes unrecognized until complications or damages to organs have begun (Tabek, Herder, Rathmann, Brunna & Kivimaki, 2012). Despite this high risk state, this condition can be modified and does not always progress to diabetes. According to Tabak, Herder, Rathmann, Brunner, and Kivimaki (2012), 5-10% of those with prediabetes progress to diabetes annually but the same rate may also revert back to normal glucose levels. However, Murphy and Winmill (2013) stated that the majority of those with prediabetes will progress to diabetes within 10 years if lifestyle changes are not made by those diagnosed with prediabetes. Elevated glucose levels have been seen as early as 13 years prior to diagnosis of diabetes (Tabek et al., 2012), thus the lifestyle changes required to prevent diabetes must occur sooner rather than later.

While diabetes can cause a large number of complications for those affected and even early death, prevention of diabetes is possible. Since diabetes is a progressive state, interventions aimed at preventing progression are key. Through this literature review, I will present research findings that demonstrate the need for prevention, as well as interventions that may be effective in preventing diabetes, with a specific focus on the population who has prediabetes. For this literature review, the following data bases were searched: PubMed, CINAHL, EBSCO Host and Medline. In addition, relevant websites such as Statistics Canada, Newfoundland and Labrador Community Accounts, Newfoundland and Labrador Institute for Health Information (NIHI), Canadian Institute for Health Information (CIHI) and the Canadian Diabetes Association (CDA) were also

accessed and reviewed. Search terms included diabetes, diabetes prevention, borderline diabetes, impaired glucose tolerance, impaired fasting glucose, and prediabetes to discover best practice guidelines, magnitude of the disease, and interventions useful for prevention of diabetes. The literature search was limited to articles and research journals of the English language that were published within the last 15 years as prediabetes is a fairly new term. The CDA clinical guidelines were developed using the best available evidence reviewed by an expert panel. This evidence is used to determine guidelines for diabetes care, including prediabetes, and will be cited frequently throughout this document. These are guidelines only and must be used in conjunction with assessment of the needs, values and preferences of individuals (Canadian Diabetes Association, 2013).

Definition of Prediabetes

Prediabetes is a condition in which there is a higher than normal blood glucose level. This level is not high enough to be classified as diabetes but is serious enough to need intervention (CDA, 2013; Unger, 2007). Previously this condition was known as borderline diabetes, impaired glucose tolerance, or impaired fasting glucose but these terms are now collectively known as prediabetes and have been since 2002 (Eldin, Emara & Shoker, 2008).

There are three blood tests for assessing glucose levels. These are: fasting blood glucose, oral glucose tolerance test, and hemoglobin A1C (HbA1C). In Canada, prediabetes is diagnosed when an individual has an impaired fasting glucose level, an impaired glucose tolerance and/or elevated HbA1C. The fasting blood glucose level ranges from 6.1-6.9 mmol/L when an individual has prediabetes; normal glucose levels

are fasting plasma glucose < 6.0 mmol/L. Impaired glucose tolerance is obtained by measuring plasma glucose 2 hours after drinking a 75g glucose solution (oral glucose tolerance test); this level is 7.8-11.0 mmol/L in prediabetes which is less than 7.8 normally. HbA1C is a 3 month average of glucose levels rather than a single, random, fasting glucose level. In prediabetes, HbA1C is 6.0-6.4% which is less than 6% in normoglycemia (Goldenberg & Punthakee, 2013). The existence of any of these three alone or together classifies an individual as having prediabetes (CDA, 2013).

Risk and Screening

There are many factors that put an individual at risk for prediabetes and diabetes. These factors are common to both conditions, thus early screening can identify and diagnose prediabetes as well as diabetes. If individuals are aware that they are at risk then they can take action to seek identification and diagnosis of these conditions. The risk factors identified by CDA (2013) include: age 40 or older, being a member of a high risk group such as Aboriginal, Asian, African or Hispanic, being overweight or is physically inactive. Other risk factors include having a history of: a first degree relative with Type 2 diabetes, gestational diabetes and delivery of a baby greater than 9 pounds, hypertension, obesity (body mass index > 25 kg/m^2), hyperlipidemia, polycystic ovary syndrome or acanthosis nigricans, or a previous elevated blood glucose test. While risk factors are the same throughout the world, the age criteria for screening is now slightly lower in Canada than in previous years and also lower than in other countries such as the United States (e.g., 40 years in Canada versus 45 years in the United States).

CDA (2013) recommends screening for prediabetes or diabetes every 3 years for those over the age of 40 but screening may begin earlier and more frequently if an individual has additional risk factors. If an individual has an elevated glucose level upon screening with one specific test (i.e., fasting plasma glucose, oral glucose tolerance test or HbA1C) but is asymptomatic for signs of hyperglycemia, the recommended protocol is to repeat the screening on another day, preferably with the same test. If two different tests were administered, no repeat testing is necessary as this will be considered a confirmed diagnosis (Ekoe, Punthakee, Ransom, Prebtani, & Goldenberg, 2013). Individuals whose glucose levels do not meet the criteria for diabetes will be termed prediabetes if they have either an elevated impaired fasting glucose, impaired glucose tolerance, both, or elevated HbA1C. While impaired glucose tolerance is thought to be more prevalent than impaired fasting glucose, impaired fasting glucose is more commonly found among men while impaired glucose tolerance is more common in women (Wroe, 2005).

HbA1C is a convenient test done with a single blood withdrawal and shows a 3 month average rather than a single, random, fasting glucose level. It does not require individuals to fast for testing thus is well received by individuals. HbA1C can be used for diabetes screening and diagnosis but is not generally the method used, as it is typically used to monitor management of those already diagnosed with elevated glucose (Kenealy, Elley & Arroll, 2007).

Fasting plasma glucose requires fasting overnight which makes it somewhat inconvenient for individuals but is widely accepted. This test will detect impaired fasting glucose but not impaired glucose tolerance (Kenealy et al., 2007); to detect impaired

glucose tolerance an oral glucose tolerance test will need to be administered. This test is the most burdensome for clients as they need to drink a 75g glucose solution and then wait 2 hours to have their glucose levels checked by a blood test to determine how well it is cleared from the blood. This is typically the test done after a fasting plasma glucose test has shown levels of 6.1-6.9 mmol/L or an HbA1C of 6.0-6.4% (Ekoe et al., 2013).

Is Prediabetes A Concern?

Since prediabetes is typically seen many years before a diagnosis, recognition of this condition and prevention of progression to diabetes is an important health concern. Prediabetes rates continue to increase in Canada as well as throughout the world. It is estimated that 9% of the world's population will have prediabetes by 2025 (472 million individuals). Through a literature review by the Public Health Agency of Canada (PHAC), it was estimated in 2008 that approximately 5 million individuals, in Canada, over the age of 20 had prediabetes. By 2016, this number will be expected to exceed 6.3 million. Of these 6.3 million it is predicted that those between 40 and 74 years of age will have an increased rate of 43%, and will represent approximately 4.3 million of the 6.3 million, over the age of 20, who will be affected. In 2005, PHAC also stated that 20% of the total 40-75 year old age group in Atlantic Canada had prediabetes. This suggests that prediabetes increases with age which therefore supports the need for prediabetes screening after the age of 40.

Impact and Complications of Prediabetes

While individuals with diabetes will have a greater risk of complications such as heart disease, stroke, blindness, kidney disease, and amputations, persons with prediabetes will also have risk of these complications. Life expectancy of those who have diabetes can also be shortened by up to 15 years with 75% of these dying from cardiovascular disease (Yates, Davies and Khunti, 2009). Murphy and Winmill (2013) stated that by the time a person with prediabetes progresses to diabetes, the affected individual will already have microvascular complications, and have a 50% higher risk of heart disease and stroke than an individual with normal glucose levels. Since many individuals with prediabetes are asymptomatic, they will be unaware that they are at risk until they begin to show signs and symptoms of diabetes. Therefore, the need to halt the progression of prediabetes to diabetes early is immense.

The costs of healthcare for prediabetes and diabetes in terms of treatments and services are tremendous. In 2010, costs were estimated to be 12.2 billion dollars for diabetes care and are expected to rise to 16.9 billion dollars by 2020 (Cheng, 2013). Economic burden for prediabetes may not be as excessive as for diabetes but Zhang et al. (2009) indicated that having prediabetes creates increased medical costs especially for use of ambulatory services for co-morbidities similar to what is seen in diabetes. These co-morbidities include hypertension, renal problems and peripheral vascular disease. The data utilized to draw this conclusion was based on a review of medical claims between 2004 and 2006 to determine resources used in healthcare by those who have prediabetes.

Interventions

While many clients with prediabetes progress to diabetes annually, lifestyle changes and/or medications may prevent or delay this progression from happening. In a randomized, controlled trial by **Critchley, Hardie and Moore** (2012), 307 participants with prediabetes were assessed before and after an intervention program to determine if there were any changes in diet and exercise self-efficacy, motivation to change, mood, knowledge, activity level, weight, waist circumference, and healthy eating practices. The results demonstrated improvements in all variables and suggest that improvements create a reduced risk of diabetes in those with prediabetes. Despite this, in a non-randomized controlled pilot study by **Parikh et al.** (2010) it was stated that prevention efforts that are effective and sustainable are slow and sporadic. The most effective strategies thus far include identifying those with prediabetes to assist with awareness and screening, and lifestyle modification that will create weight loss. In a literature review by Sherr and Lipman (2013), it was reported that 33-68% reduction of progression to diabetes has been observed in prediabetes clients with a 5-10% reduction in weight.

Bouchard et al. (2012a) stated that 44% of clients with prediabetes will develop Type 2 diabetes within 4-6 years of diagnosis if intervention is not implemented. This conclusion was based on the work of Weyer, Tataranni, Bogardus and Pratley (2004) in which a longitudinal study of Pima Indians studied the pathogenesis of Type 2 diabetes. Cole, Boyer, Spanbauer, Sprague and Bingham (2013) identified in a randomized, controlled trial that changes in health behavior is the main focus of prediabetes education and intervention, and targeting obesity and improving physical activity are the main ways

to prevent progression to diabetes. The study compared health outcomes of 94 patients with prediabetes who were randomized into either a shared medical appointment intervention group or an individualized counselling group (controls). Results of this study demonstrated that both interventions were effective in weight loss, a decrease in fasting blood glucose, and improvements in blood pressure and cholesterol levels. In the next sections, specific interventions will be discussed but note that these interventions are not exclusive as they are often implemented jointly in prediabetes care and treatment.

Diet and Weight Loss

Increasing prediabetes and diabetes rates are paired with increasing rates of obesity**.** Obesity causes insulin resistance, thus interventions that create weight loss improves insulin sensitivity (Khaodhiar, Cummings & Apovian, 2009). In a study by Knowler et al. (2002), 3234 nondiabetic persons with elevated fasting and post-load plasma glucose concentrations were randomly assigned to placebo, 850 mg of metformin twice a day, or a lifestyle-modification program with goals of at least a 7 percent weight loss and at least 150 minutes of physical activity per week. With a 95% confidence interval, it was concluded that 58% of Type 2 diabetes could be prevented in clients with prediabetes, if they sustain weight loss through diet changes and participation in physical activity when compared to the placebo group. This was a statistically significant finding as only a 31% reduction was seen in the metformin group when compared with the placebo group. Khaodhiar et al. (2009) supports this as these authors stated that weight loss can improve control of glucose levels and improve cardiovascular risk factors. In addition, the 2013 Canadian Diabetes Association guidelines suggest a minimum of 5-

10% of weight loss is needed to reduce risk factors associated with prediabetes (Wharton, Sharma & Lau, 2013).

For individuals of normal weight who have prediabetes, the goal is to maintain weight and improve other risk factors (Yates et al., 2009). For those who are overweight or obese, the goal is to lose weight. According to the well-known **Diabetes Prevention Program** study (2002) in which 3,234 study participants who were overweight and had impaired glucose tolerance were placed into one of three treatment groups, every 1 kilogram weight loss created a 16% risk reduction for diabetes. According to this same study, 7-10 years after participants completed an intensive lifestyle intervention, there was some weight regain but the prevention benefits persisted.

Healthy weight is affected by the balance of calories consumed with calories used by the body. In a review of clinical practice guidelines, Mechanick et al. (2012) stated that for diet recommendations, specific examples must be given so clients understand rather than describing foods by their composition (e.g., individuals should be told to cut back on burgers, fries and soda rather than being told to cut out refined carbohydrates, fats and sugars). This conclusion was based on data compiled by an expert task force to guide the development of a nutritional algorithm for those with prediabetes or diabetes. The Public Health Agency of Canada (2011) reported that risk of prediabetes and diabetes is increased when overconsumption of unhealthy food choices lead to overweight and obesity. Soluble fibre is noted as an important part of any individual's diet as it helps to regulate and control glucose (PHAC, 2011).

Physical Activity

When trying to lose weight, calorie restriction is normally the first action of choice rather than physical activity. In a cross-sectional study by Bouchard et al. (2012a) it was found that many people, especially those who are older, see exercise or physical activity as an activity done for leisure rather than an intervention for health. This study compared the readiness of 84 participants with prediabetes to change eating habits and increase physical activity over a 12 month period and found that these differed between those under the age of 60 and those older than 60. Those under the age of 60 had a greater readiness and greater confidence that they could change their eating habits and improve their physical activity levels. Due to these results, the authors suggest that age be considered when developing lifestyle programs that aim to improve physical activity levels and healthy eating habits.

Taylor et al. (2010) conducted a cross-sectional survey study of 232 individuals with prediabetes to assess whether there were differences in quality of life in those with prediabetes that are physically active (i.e., achieving 150 minutes of physical activity per week) compared to those who are physically inactive. The results of this study demonstrated that those who are physically active reported better physical and mental health when assessed by a health related quality of life scale. Physical activity can improve cardio respiratory fitness, vigor, glycemic control, lipid profile, blood pressure, reduction and maintenance of weight loss and decreased insulin resistance (Sigal et al., 2013).

When beginning an exercise routine, clients will have to start slowly and work up to the recommended level. The CDA guidelines (2013) recommend 150 minutes of exercise a week (approximately 30 minutes, 5 days a week) and a 5-10% weight loss in order to reduce diabetes risk in those with prediabetes. These recommendations were based on an extensive review of evidence that demonstrated benefit in reaching these targets. For individuals who are not capable of physical activity, such as walking, resistance training alone can enhance glycemic control, decrease fat mass and improve muscle mass and physical function (Traustadottir & Tsitouras, 2010). In any client situation, a phased in, gradual approach to exercise has a better chance of being sustained. This was supported by a longitudinal quasi experimental study by Musto, Jacobs, Nash, DelRossi and Perry (2010) in which 77 sedentary (i.e., walked less than 5000 steps/day), female university employees wore a pedometer for 12 weeks to assess how gradual increases in step count would affect components of health such as blood pressure, fasting glucose level, waist circumference, resting heart rate, etc. Improved results were noted for these components when improvements in daily steps (i.e., 3000 steps/day) were achieved.

Management and Support

Evans, Greaves, Winder, Fearn-Smith and Campbell (2007) reported that clear messages for clients with prediabetes have not been established on how best to get clients to understand their condition, or changes required to alter or manage the condition, as well as how healthcare organizations can slow down or stop increasing diabetes prevalence rates. These authors used an action research framework with mixed

qualitative methods, such as key informant focus groups and discussions with an expert reference group, to identify key messages for prediabetes and to assist with the development of a toolkit to address these needs. Results of this study demonstrated that both clients and healthcare professionals need knowledge about prediabetes and it was noted that these groups prefer written materials to address this need. Topics desired included the nature of prediabetes, causes and risks.

Key components in management of prediabetes include messages provided at diagnosis such as lifestyle changes, possible progression to diabetes, cardiovascular risk, monitoring, and any necessary treatments. Regular follow-up, especially after diagnosis, was a concern for both clients and health care professionals. Providing information alone is not an effective way to promote change; practitioners must be engaged with clients to help them produce change. When recommending exercise, health care professionals must give a detailed description of recommendations such as frequency, intensity, duration and rate of expected progression (Evans et al., 2007).

From the CDA clinical guidelines, Jones, Berard, MacNeill, Whitham, and Yu (2013) reported that knowledge and skill development essential for self-management of prediabetes and diabetes include healthy eating, physical activity, pharmacotherapy, monitoring, and prevention and surveillance of complications. These authors also stated that there is no strategy that gives consistent positive outcomes (e.g., video based, face to face, web based, etc.). This means that the strategies are equally effective and that none is superior to the others. Strategies and materials must also be suitable for those who are of low literacy.

In a review and meta-analysis of 28 studies using the findings of the Diabetes Prevention Program, Ali, Echouffo-Tcheugui and Williamson (2012) reported that factors such as client concern for personal health, influence of a trusted person, results received from blood tests, available checkups, commitment contracts, group support and a sense of empowerment can affect participation in interventions to correct prediabetes or diabetes. These interventions include losing weight or participating in physical activity. This validates the idea that individuals who are attempting to make lifestyle changes to improve their health need to feel supported and that this support can come from a variety of sources. These authors also reported that lay people who are educated in lifestyle interventions can be as effective as healthcare professionals in motivating individuals to lose weight and to meet goals.

While lifestyle intervention programs using intensive behavior change strategies have been studied (e.g., Finnish Diabetes Prevention Study, Diabetes Prevention Program), interventions such as these may not be practical for many healthcare settings, especially rural sites, due to a lack of funding or availability of professionals who are trained to offer these interventions. Of greater benefit may be group education programs such as a 6 week program that promotes lifestyle changes offered by laypersons. In the CDA clinical practice guidelines, a review of research on self-management education was conducted by Jones et al. (2013) who recommended that self-management interventions be offered in either group based, or one on one sessions, as both have shown effectiveness. In Newfoundland and Labrador, a 6 week, 2.5 hour session per week program is already available that can provide this service (i.e., Stanford Chronic

Disease Self-Management Program, Stanford University, 2012), and one on one counselling is generally conducted by diabetes educators or dieticians.

In the study by Critchley et al. (2012) discussed previously, those who took part in a group program had greater decreases in weight, waist circumference, diastolic blood pressure, and fasting glucose levels, while at the same time had greater knowledge regarding diabetes, increased motivation to change, improved mood and self-efficacy, as well as healthier eating habits and improved physical activity levels. The work of **Chen and Lin** (2010) supports the findings regarding self-efficacy as a cross sectional design study by these researchers identified that having self-efficacy (i.e., confidence in their ability to adopt a health promoting lifestyle) exceeded all other variables of their study in predicting success of adopting a healthy lifestyle.

Evans et al. (2010) revealed that while some individuals felt group sessions or family sessions would be acceptable, others felt they would be reluctant to attend. This conclusion was based on the opinions voiced by the participants of the study. There were also some concerns about feasibility of having group sessions in small, rural areas. Either way, maintaining lifestyle change is difficult and challenging; therefore support needs to be obtained. Support can come from many sources but Sherr and Lipman (2013) reported that diabetes educators are just one example of those who can play an important role in supporting those with prediabetes. They can help individuals set goals, and address obstacles preventing him or her from meeting the goals. While healthcare professionals have a vital role to play in the care of clients with prediabetes, an analysis and commentary of prevention and control of Type 2 diabetes by Narayan, Echouffo-

Tcheugui, Mohan and Ali (2012) suggested that prevention of diabetes should not be confined to those in healthcare but also include patient participation, and public and private sector stakeholders. This means that health care professionals are partners in care of those with prediabetes and need to include all parties that may impact or influence the individual, rather than being the sole source of prediabetes or diabetes education.

In 2009, Yates et al. conducted an extensive literature review of diabetes prevention programs and suggested that population based interventions are the most appropriate way to prevent diabetes as individually focused programs only reach a few, whereas population based programs can impact many. This means that prevention programs (e.g., reduction of obesity and increasing physical activity) should target the entire population rather than focusing on treating specific individuals.

Medications

Many oral antidiabetic medications can help those with prediabetes revert back to normal glucose levels. In a meta-analysis by Phung, Baker, Tongbram, Bhardwaj and Coleman (2012), oral anti-diabetic medications doubled the odds of reverting back to normoglycemia when compared to placebo use. Despite this, the American Diabetes Association (2011) has no recommendations for treatment of prediabetes with oral anti-diabetic medications. Instead this organization recommends lifestyle modifications and suggests reserving the drug metformin for situations in which lifestyle modifications are not effective, and the disease is progressing.

Metformin is the drug of choice for prediabetes clients when it is necessary to be treated because it has a low risk of causing hypoglycemia, and has also been shown to

create weight loss in the prediabetes population (Phung et al., 2012). Yates et al. (2009) supports this as they stated that metformin is effective, relatively cheap, and lacks long term side effects, thus making it favorable to prediabetes clients if there is a need for them to utilize it. Based on a literature review, these authors support lifestyle modifications rather than medications, due to the risk factors that cause prediabetes and diabetes (e.g., poor diet, obesity, sedentary lifestyle, etc.) that cannot be treated with medication. In addition, Sharma and Garber (2009) also drew the same conclusions in a literature review as they stated that lifestyle intervention can slow the progression of diabetes more effectively than metformin. This drug is limited to those of fairly good health; a meta-analysis by Phung et al. (2012) to evaluate oral antidiabetic drugs for efficacy in reverting prediabetes to normoglycemia demonstrated that metformin is unsafe in those with renal disease or dysfunction, in those with metabolic acidosis, and in those with heart or liver dysfunction.

Yuen, Sugeng, Weiland and Jelinek conducted a systematic review of randomized, controlled trials for prevention of diabetes through lifestyle and medication interventions in 2009 and found that clients with prediabetes are likely asymptomatic. Therefore, these clients generally have a low tolerance for any adverse effects when taking medication. Gastrointestinal symptoms are often seen with the use of metformin, thus adherence may be difficult for this particular medication. The authors reviewed four studies which totaled 5, 196 participants and concluded that both interventions have adherence issues and proposed that more randomized, controlled trials are needed to determine ways to improve compliance.

Learning Needs of Individuals

Clients with prediabetes or diabetes require lifestyle advice that is regular, social support, behavior modification, and often face to face contact. The first step in receiving these is to be aware that they have prediabetes. Research has shown that awareness alone can be a motivator for individuals to make changes in their lives. In a randomized, controlled, pilot trial of 99 participants by Parikh et al. (2010), it was observed that participants in the control group who became aware that they had prediabetes obtained a mean loss of 2 pounds per year. This means that even though the control group participants did not undergo any intervention, awareness alone was a motivator to change**. Okosun and Lyn** (2010) also identified that individuals who were aware they have prediabetes were more likely than those with normal glucose levels to report increased weight control and physical activity, and a reduction in fat and calorie intake. These findings were the result of an investigative review of health surveys from 2005 through to 2008 in the United States. A multiple regression analysis was conducted to determine whether having an awareness of a prediabetes diagnosis impacted lifestyle change when compared to those who have normoglycemia. In addition, a cross sectional study of 260 participants to determine predictors of adopting healthy lifestyles at four worksites in Taiwan led Chen and Lin (2010) to conclude that if clients lack internal cues, such as symptoms, they tend to have a lower perception of threat of the disease and fail to take part in health promoting behaviors. This supports the need for early screening to diagnose prediabetes, and education for those who have the disease but are asymptomatic, regarding risk and prevention of diabetes.

One important factor that can affect the prediabetes learning needs of an individual is the age of the individual. In a Canadian study by Bouchard et al. (2012a), it was found that as age increased there was a lower expectation and a reduced readiness to modify lifestyle. Since this is the case, age of the client must be considered when interventions are suggested. Learning needs for older adults with prediabetes, especially regarding diet, can be different than that of a younger population as they have acquired lifelong eating habits, likes and dislikes. Bouchard et al. (2012a) calls this an entrenched lifestyle and clients will therefore need more information about benefits of eating healthier, types of food that are healthier, etc. Chen and Lin (2010) reported that the modification of habits acquired over an individuals' lifetime may be very difficult to change.

Management of one's condition is the foundation for prediabetes and diabetes care. Essentially, clients need to be aware that they are responsible for carrying out interventions to maintain or improve their health, and in prevention of diabetes. Self-monitoring is an awareness and observation of self that improves self-management (Rothenberger, 2011). Self-management is the underpinning of any strategy implemented and has been described as managing by one's own power, and a day to day responsibility (Rothenberger, 2011). In a literature review to assist in concept analysis of the concept of self-management in prediabetes, this author identified that improvements in self-management can be obtained if education, skill development and support is provided. It requires active engagement by the client and collaboration with health care providers.

Learning Needs of Health Care Professionals

Bouchard, Baillargeon, Gagnon, Brown and Langlois (2012b) conducted a randomized, controlled study in which 48 participants over the age of 18 were randomly assigned to one of two lifestyle interventions (i.e., individual counselling plus seminars or seminars alone) and concluded that frequency with health care professionals, regardless of the type of health care professional, improved efforts in weight loss, and decreased body mass index and waist circumference in those at risk for diabetes. These authors also concluded through a literature review that health professionals such as nurses, doctors and dietitians: poorly understand physical activity recommendations, have inadequate counseling skills, and lack resources to assist patients in improving physical activity levels.

In a cross sectional data review of the 2006 National Health surveys in the United States, **Dorsey and Songer** (2011) reviewed data of 2,005 overweight and obese men and women, over the age of 40, who had self-reported prediabetes or diabetes, and had seen a physician at least once in the previous year (1,442 had diabetes, 563 had prediabetes). The participants had reported that advice from a physician to increase physical activity made them more likely to do it. This was especially true of older adults whereby 40% began regular physical activity because their doctor recommended it. These authors also found that in the prediabetes population, approximately one third reported not receiving any advice from their physician regarding behavior changes such as reducing fat and calories, increasing physical activity or losing weight. The literature review conducted by Okosun and Lyn (2010) discussed earlier lends supports to this data

as it was found that only 44% of those with prediabetes were told by their physicians about the health risk of progression to diabetes. From these results, it is clear that health care professionals need to offer more education to those with prediabetes and further study needs to be conducted to address reasons for the lack of education for these conditions that can lead to detrimental effects. Some suggested reasons for this may include lack of time during visits, lack of training, or attitudes about weight (Dorsey & Songer, 2011).

Summary

Early intervention is critical to stop progression to diabetes in clients with prediabetes. One approach is to screen clients at risk to enable awareness of clients who can then in turn begin interventions and self-management of their condition. Healthcare organizations must support those with prediabetes through strategies such as early screening, education, and availability of employees and programs to support the prediabetes population.

Throughout this literature review it was discovered that prevention efforts are slow to develop, lifestyle intervention programs to improve physical activity and weight loss are more effective than medication for prediabetes, gradual improvements in physical activity are more likely to be sustained, and that an awareness of having prediabetes can be a motivator to change. In addition, as individuals age they require more support to change nutritional habits and to see physical activity as an intervention to treat prediabetes rather than a leisure activity. Self-management was seen to be the key for successful lifestyle intervention though confidence building and skill development is

instrumental to this success, by not only health professionals but also by laypersons and stakeholders.

Group intervention was seen to be effective for a variety of factors such as weight loss, improvements in glucose control, motivation to change, and physical activity but no specific strategy is superior for education clients (e.g., one on one counselling, video learning, etc.). Laypersons were noted to be as effective as health professionals to motivate individuals and in helping them meet their goals. Clients with prediabetes have education needs regarding risks, lifestyle changes, monitoring of the condition, as well as possible treatments, whereas health professionals have needs regarding counselling skills, recommendations for physical activity, and resources to assist clients to improve their physical activity.

Since Type 2 diabetes is a progressive disease that becomes more irreversible over time (Khaodhiar et al., 2009), prevention and early intervention is of the utmost importance and should be a priority for all healthcare organizations. As rates of diabetes and prediabetes continue to climb, the need for more healthcare dollars to treat complications of diabetes will climb as well.

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Intervention Evidence Studies

Study	Methods	Results	Comments
Diabetes Prevention Program Research Group (2002) Randomized, controlled study design **Purpose**: to determine whether modest weight loss, increased physical activity or treatment with metformin could prevent or delay onset of Type 2 diabetes.	• 27 clinical centres around the USA randomly divided into different treatment groups. • 1st group (lifestyle group) received intensive training in diet, physical activity (150 minutes per week) and behavior modification. • 2nd group received 850mg metformin twice a day. • 3rd group received placebo pills. • The 2nd and 3rd groups received information about diet and exercise but no intensive counseling. • A 4th group received troglitazone but it was discontinued due to risk of liver damage. **Participants** • 3, 234 individuals who were overweight and had prediabetes.	• Group 1: Participants who lost moderate weight through diet changes and increased physical activity sharply reduced their risk of diabetes. Risk was reduced by 58% (mean) in this group with those participants over the age of 60 demonstrating a 71% risk reduction. • Group 2: Metformin reduced risk but less dramatically than diet and exercise intervention. Reduced risk was 31% (mean) and was least effective in those participants 45 years of age and older. It was most effective in the 25-44 year old age group with a BMI of 35kg/m^2 (mean of 44%). • Study was halted a year early due to obvious significance. • 5% of the lifestyle intervention group (Group 1) progressed to diabetes compared to the placebo group (Group 3) at 11% and the metformin group (Group 2) at 7.8%.	• Type 2 diabetes can be delayed or prevented through weight loss (5-7%), regular physical activity (150 minutes/week) and a diet low in fat and calories. • Main predictor of risk reduction is weight loss.
Study	**Methods**	**Results**	**Comments**
Critchley, Hardie & Moore (2012) Randomized, controlled trial	• Before and after assessment of motivation, diet, exercise, self-efficacy, mood, knowledge, waist circumference and weight	• Participation in group based sessions improved healthy eating, physical activity, weight loss and waist circumference reduction, and improvement in motivation, mood,	• Group based programs can be a cost effective way to improve lifestyle behaviors in those with prediabetes. • Peer support from group intervention may have improved some of the

Purpose: to test a relationship between behavior change and psychological variables (i.e., self-efficacy, motivation, and knowledge) after participation in group intervention.	(baseline and 6 months post intervention). • Six group based sessions to promote healthy living • 150 minute sessions in weeks 1, 2, 3, 4, 12 and 26 of the study period for those in the intervention group. • Control group were wait listed to receive the intervention program 6 months later. **Participants** • 307 voluntary participants (208 treatment group: 99 control group) who had prediabetes, aged 28-86 years (126 males: 181 females). • Retention rate was 89%.	self-efficacy and knowledge. • No difference between control and intervention group at baseline. • Improvements in knowledge significantly accounted for increase in physical activity, while participation alone improved eating habits.	outcomes.
Study	**Methods**	**Results**	**Comments**
Dorsey & Songer (2011) Cross sectional survey design **Purpose**: to identify prevalence of attempts to control weight and reduce fat and calories or increase physical activity, and to examine physician recommendations for the same factors in those with prediabetes or diabetes.	• Data obtained from the 2006 National Health Interview Survey to determine if there is an association between reported behaviors and advice for behavior change from physicians. Behaviors included weight loss attempts, increased physical activity and reduction of fat and calories.	• Physician advice for reduction of fat and calories and an increase in physical activity was associated with the behavior being observed. • Two thirds of the respondents had received advice to lose weight, reduce fat and calories, or increase physical activity.	• It was not possible to identify whether physician advice precipitated behavior. • Data were self-reported and may have been biased by ability to recall information.

	Participants • 2005 overweight or obese persons (BMI > 25 kg/m^2), 40 years or older (mean age: 57 years) with prediabetes or diabetes (563 prediabetes: 1442 diabetes), who had at least one physician visit within the last year.		
Study	**Methods**	**Results**	**Comments**
Bouchard, Langlois, Domingue, Brown, LeBrun & Baillargeon (2012) Cross sectional design study **Purpose**: to determine if expectations and readiness to modify eating habits differed among younger and older participants who had diabetes and had participated in a lifestyle modification program.	• Comparison between younger and older adults (i.e., <35 years, > 35 years) with prediabetes to determine whether readiness to modify eating habits and physical activity differ. • Variety of questionnaires used to assess readiness to change. • All participants took part in a lifestyle modification program over 12 months that aimed to reduce 5-10% of body weight by increasing physical activity and improving dietary habits. • Pedometers were worn to assess physical activity. **Participants** • 74 participants with an elevated glucose level (i.e., impaired fasting glucose	• Physical activity level and sedentary time did not differ between younger and older participants (> 60 years) but those in the younger group were more confident (88% versus 80%) and had greater intention (89% versus 81%) to increase physical activity within the next several months and had a higher intention to eat a healthier diet (90% versus 85%). • Younger participants had a greater expectation of acceptable weight loss. • Increasing age decreases confidence, conviction, and intention to modify physical activity level and intention to adopt healthy eating habits.	• Standard, one size fits all plan is not effective for all age groups thus age must be considered when developing intervention programs. • Cannot conclude how readiness and intention create actual lifestyle modifications.

	(IFG) > 7 mmol/L or oral glucose tolerance test (OGTT) > 7.8 mmol/L after 2 hours).		
Study	**Methods**	**Results**	**Comments**
Chen & Lin (2010) Cross sectional design study **Purpose**: to determine predictors of adopting a health promoting lifestyle.	• Structured questionnaire about prediabetes knowledge, health beliefs, self-efficacy and health promoting lifestyle. • Multiple stepwise regression analysis to determine predictors of implementing health promoting lifestyles. **Participants** • 260 male adults with impaired fasting glucose at four work sites in Taiwan. • Age range was 27-64 years.	• Age over 45 years and BMI > 25 kg/m^2 were found to be risk factors for prediabetes. • Statistically significant positive correlations were found between prediabetes knowledge and health promoting lifestyle, perceived benefit and health promoting lifestyle, and also self-efficacy and health promoting lifestyle. • Perceived threat had no statistically significant correlation with health promoting lifestyle.	• Health education for prediabetes can improve motivation to take part in healthy behaviors. • Study site does not allow generalization to the larger community or to the female population. • Work site health programs can help educate workers and provide strategies for prevention.
Study	**Methods**	**Results**	**Comments**
Parikh, Simon, Fei, Looker, Goytia & Horowitz (2010) Randomized, controlled pilot trial **Purpose**: to measure effectiveness of peer led	• 1.5 hour workshops over 10 weeks led by lay leaders. • Development of a tool kit with educational materials, fast facts card regarding glucose level and a referral card that was distributed to clinicians.	• Intervention group lost significantly more weight than the control group. At 12 months an average of 7.2 pounds was lost in the intervention group whereas the control group had nonsignificant weight loss (2.4 pounds). • Physical activity did not differ among the groups.	• Weight loss through peer led programs is achievable and is the most effective means of prevention of diabetes. • Awareness of prediabetes alone created weight loss in the control group. • Those with poor access to care and low skills for navigating the system

lifestyle intervention (Project HEED)	**Participants** • 178 individuals who were 18 or older, living in East Harlem, could speak English, were overweight, not pregnant, did not have diabetes or take medications for elevated glucose levels.	• Intervention group changed eating habits (e.g., ate more salad and cut out sugary drinks).	may be more accepting of peer led programs. • Peer led programs are less expensive and readily available.
Study	**Methods**	**Results**	**Comments**
Evans, Greaves, Winder, Fearn-Smith & Campbell (2007) Qualitative action study **Purpose**: 1) to identify key messages about prediabetes 2) to design, develop and pilot an educational toolkit to address information needs of patients and healthcare providers (WAKEUP study).	• Semi structured focus group interviews. • Key informants. • Formative feedback on toolkit. • Videotaped consultations. • Coding and themes developed. • Reflexive analysis (i.e., summary of findings sent to participants for feedback). **Participants** • Purposive sample of newly diagnosed prediabetes service users (10). • Purposive sample of healthcare providers (19); included nurses and GPs from 2 specific practices.	• Seriousness of condition, prevention of progression to diabetes, and lifestyle changes were key messages needed. • Acceptable and useful toolkit was developed and piloted. • Four themes identified for toolkit: 1) knowledge and information on prediabetes; 2) motivating change; 3) practice systems (follow up and support) and 4) role of healthcare professionals in prediabetes care.	• Participation in toolkit development improves relevance and acceptability. • Small participation group affects generalizability.
Study	**Methods**	**Results**	**Comments**
Taylor, Spence, Raine, Plotnikoff, Vallance & Sharma (2010)	• Self reported questionnaire on physical activity and quality of life. Quality of life was measured based on	• 38% of those with prediabetes were meeting recommended guidelines for physical activity. • Those who were meeting guidelines	• Results support the need for physical activity programs for those with prediabetes. • Recall bias and social desirability

Cross sectional survey design **Purpose**: to determine if there are differences in quality of life between prediabetes individuals who are physically active and those who are inactive.	the mental health assessment. **Participants** • 232 individuals with prediabetes living in Alberta, Canada, 18 years or older. Mean age: 58 years. • Identified through a registry.	reported higher physical and mental health ($p<.001$ for both). • 23% response rate.	may affect responses to the survey. • Data were self-reported and may therefore affect generalizability.
Study	**Methods**	**Results**	**Comments**
Okosun & Lyn (2010) Cross sectional sampling design **Purpose**: 1) to determine if individuals aware of prediabetes status were more likely to report lifestyle changes than those with normoglycemia and 2) effect of healthcare providers' advice on lifestyle change in prediabetes clients.	**Participants** • 4, 552 subjects who were 18-85 years old. Data on the survey included age, height, weight, waist circumference, cholesterol, OGTT and FPG results. Also included a morning fasting sample, data on blood pressure, education and household income.	• People who are aware that they have prediabetes are more likely to report increased weight control (OR 1.72) and increased physical activity (OR 1.28), and decreased fat and calorie intake OR 1.82, $p<.001$. • Persons who reported receiving advice from healthcare providers also had increased weight control (OR 1.87) and physical activity (OR 1.59) and decreased calorie and fat intake (OR 2.19, $p<.001$). • Rate of overall lifestyle change in subjects aware of their prediabetes status was 42.8% compared to those with normoglycemia (27.9%). • Only 70% of those with prediabetes were counseled to lose weight.	• Diabetes risk awareness and counseling of those at risk may be effective ways to prevent diabetes. • Surveys are representative of the national data therefore adding strength to the study. • Recall and social desirability may have affected survey results.

Appendix B-Consultation Report

Memorial University of Newfoundland
School of Nursing
Master of Nursing Program

PRACTICUM: Consultation with Colleagues Report

Student's Name: Karen M. Lilly **Student ID #:** 009303496

Course Names and Numbers: N6650 and N6651

Supervisor: Dr. Donna Moralejo

Title: Prevention of Diabetes and Early Detection of Prediabetes

Date: May 5, 2014

1. Brief overview of the project

This project aims to identify best practices in prediabetes care which will be used to develop tools to assist in educating those at risk for diabetes and to assist with early diagnosis of prediabetes. Early diagnosis of prediabetes can prevent or delay progression if lifestyle interventions are initiated and sustained. The learning needs of those at risk will be addressed as well as any learning needs of healthcare professionals, especially regarding support for those who have prediabetes and are therefore at risk of diabetes.

2. Specific objective(s) for the consultation

1) To determine the learning needs of those at risk for diabetes.
2) To determine what is currently available for those at risk of prediabetes or for those who currently have prediabetes.
3) To guide the development, implementation and evaluation of any developed tools.
4) To determine the needs of healthcare providers to support the prediabetes population.

3. Data Collection Methods

Data were collected through three in-person focus groups and one telephone interview. Two of these focus groups occurred at the meeting space normally used for the Chronic Disease Prevention and Management Lead Team (CDPMLT) meetings and the Community Advisory Committee (CAC) meetings. Respondents of the Chronic Disease Prevention and Management Lead Team included a manager of client service, a nurse practitioner, a primary health care facilitator, a dietitian and a public health nurse; two of

these participants self identified themselves as having prediabetes. Participants of the CAC included a clergy member, a high school student and six members who represent various communities in Green Bay. A third focus group was conducted with four local physicians and a medical student at the Green Bay Health Care Centre. The telephone interview was conducted between the student and the Chronic Disease (CD) Consultant. Focus group and telephone interview questions were pre-developed by the student and answers were recorded by the student's coworker when questions were posed to the CAC group but were recorded by the student herself during the CDPMLT and physician focus groups, and the telephone interview. Questions included those in Appendix A for the CDPMLT group, the CAC group and the Chronic Disease Consultant and Appendix B for the physician group. The student prompted the participants when needed by providing examples (e.g., learning needs- risks, treatments, etc.).

4. Results

Section A: Data were collected from 14 participants in total for questions found in Appendix A. Data collected were analyzed for themes and the results will be utilized to assist the student in development of material deemed useful for clients and healthcare professionals. The results will be presented separately for each question that was posed to the respondents as in Appendix A. Results for focus group 1 and 2 and the telephone interview were combined to protect the identity of individual respondents since the same questions were asked to all participants.

Q.1.Needs of the general population regarding diabetes:

- How to be tested
- Lab values for normal glucose, prediabetes and diabetes
- Complications of diabetes
- Awareness that diabetes can be prevented and that they don't have to accept that if they have prediabetes that it will progress to diabetes
- Risk factors for prediabetes or diabetes
- How to control blood sugars without medications

Note: one participant felt that the more the population knows, the greater the chance of prevention. Another felt that prevention must start with parents in order to establish good, healthy behaviors and lifestyle choices at a young age.

Q.2. Learning needs of those with prediabetes:

- Definition of prediabetes
- Risk of progression to diabetes
- Complications of diabetes
- How to reduce risk of diabetes
- Lifestyle changes to correct prediabetes or maintain state
- Signs and symptoms of the possible complications of diabetes
- Lifestyle changes and practical tips for healthy eating and active living
- Resources/supports available

Q.3. Importance of educating between prediabetes and diabetes:

All participants felt it was very important to educate individuals regarding the difference between prediabetes and diabetes. They felt it was very important to educate individuals about prediabetes as many people do not take this diagnosis seriously and that those with prediabetes are at the highest risk of diabetes; "prediabetes is a big red flag". Participants also felt education would serve to decrease the likelihood of a diagnosis of diabetes.

Q. 4. Most effective ways to educate (suggestions):

- Tools with short messages that can be provided often (e.g., advertisements)
- Pamphlets
- Social media
- Newspaper and newsletter messages
- Visual tools such as posters
- Real life stories/champions to show changes work
- A blood sugar level handout to allow participants to know where they stand in relation to the levels when there are tested (e.g., normal levels, prediabetes levels and diabetes levels)
- APPs for smart phones to assist with exercise, healthy eating and monitoring blood sugar levels
- Physician education that discusses risk of diabetes at every clinic visit for those at risk
- Community education sessions that piggyback off existing community group meetings (e.g., Women's weekly church group meetings)
- Workshops or question and answer sessions
- Waiting room visual presentations (e.g., teleprompters)
- Chronic Disease Self-Management Program specifically for those with prediabetes and diabetes
- Educational videos linked to the local Facebook page
- Support groups
- Clinics or workshops specific to screening for prediabetes and also those for monitoring of condition and action plans for lifestyle change.
- Referral to dietitian to review lifestyle practices and to make action plans (i.e., a targeted approach to correct prediabetes or maintain the state)
- Partner with Phone Med (this is an extension of the provincial health line that could possibly do check-ins with clients to assist with self-management goals and action plans). The use of Phone Med may help to motivate individuals to continue with action plans as people tend to have great desire to change in the early stages of diagnosis but lose interest over time and tend to slip back into old routines.
- Healthy public policy and healthy workplaces that model healthy behaviors.

Note: Participants suggested written materials that aren't too wordy and are colorful. They also suggested that written materials should include useful website addresses and local phone numbers to allow further information seeking if desired. Another suggestion was to provide information sessions to school age children so they are

educated early about diabetes, risk and prevention.

Q.5. Awareness of existing resources

- Most participants are aware of resources for diabetes but not for prediabetes specifically. Resources identified included:
    1. Canadian Diabetes Association web page
    2. Local diabetes clinic can address prediabetes
    3. Diabetes.ca website
    4. A clinical pathway tool from the Canadian Diabetes Association for those with impaired glucose.
- The Chronic Disease Consultant also had two PowerPoints on impaired fasting glucose and impaired glucose tolerance that she indicated needs updating. There is also another PowerPoint available on healthy eating but it focuses mainly on heart disease and cholesterol.

Note: Community CAC participants were not familiar with the term prediabetes at all.

Summary: the responses of the CD Consultant agreed with that of the focus groups. Awareness and prevention were the key factors identified and also that people don't see the seriousness of diabetes because it is very common. Participants felt good education with take home materials so information can be absorbed at the clients own pace is very important as, "a short talk with a doctor is not enough". Some participants also felt this population may be getting delayed diagnosis as they may be told their glucose is elevated and to return in 3 or 6 months for a repeat blood test, rather than taking action at the first elevated blood test.

Section B: Data were collected from 4 local physicians and 1 medical student via a focus group. While many of the questions asked (Appendix B) were similar to those asked the other focus groups and in the telephone interview, the student was specifically interested in the views of this medical group to determine if answers varied from the other participants, and also to specifically identify what tools are needed by this group to support those with prediabetes. The identity of individual respondents will not be disclosed.

Q.1.Needs of the general population regarding diabetes:

- Education regarding risk due to family history, diet, and other medical issues such as increased blood pressure, coronary heart disease and elevated weight.
- Simple measures for lifestyle modification
- Complications of diabetes

Note: This group felt that the major issues contributing to diabetes include motivation of individuals (" good preaching can't create change"); lack of resources in small towns for people to be active such as free gyms and organized exercise classes; stores that make big money on junk food thus having more of these types of food and less healthier options; costs of healthier food as opposed to cost of junk food; diabetes

diets that are very strict thus making adherence an issue; and lack of special sections in stores that offer diabetes foods.

Q.2. Learning needs of those with prediabetes:

- ► Lifestyle modifications
- ► Exercise
- ► Long term complications
- ► Self-monitoring of blood glucose

Note: participants felt special issues regarding glucose monitoring are very important and must be communicated. For example, clients who don't monitor their glucose because testing strips are too expensive; doctors can order an HbA1C to get a good picture of their average blood glucose rather than random checks. Participants also felt that there is a need for education materials specific to prediabetes as currently there is a reliance on diabetes materials for education.

Q.3. Importance of educating between prediabetes and diabetes:

All participants felt it was very important to educate individuals regarding the difference between prediabetes and diabetes.

Q. 4. Most effective ways to educate (suggestions):

- ► Standardized pamphlets
- ► Free exercise classes that would provide information on suggested amounts of activity needed to be healthy, how to exercise without injury, etc.
- ► Audiovisual tools such as PowerPoints inside the hospital waiting room would be more effective than written materials in the opinion of the participants
- ► Written materials at a Grade 6 or lower level.

Q.5. Awareness of existing resources

- ► None of the participants were able to identify any specific resource for prediabetes clients.

Q.6. Healthcare provider need to support individuals with prediabetes

- ► All healthcare providers felt pamphlets they could give to clients, specific to prediabetes, would be useful as clients could then read the materials at home at a time convenient for them and when they are ready to learn
- ► A list of useful websites/local resources.

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5. Ethical Considerations

All participants had the opportunity to opt out and there was no coercion placed on them to participate. A written agreement was signed if participants were willing to participate. Signed consents were filed in the student's locked filing cabinet behind two locked doors. No identifying data is found on data collected.

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6. Conclusion

Results of the consultations will be utilized to guide development of resources that are useful and applicable to the target population. Ideas regarding disbursement of resources were also collected to ensure that the resources reach those who need them. The resources that will be developed by the student will include those that will reach the greatest number of clients (e.g., pamphlets, PowerPoint and resource list) while other ideas presented by participants will be presented to the Chronic Disease Prevention and Management Lead Team for possible work in the future (e.g., classes, screening clinics, PhoneMed partnership, etc.). The student will aim to develop two pamphlets; the first will discuss prediabetes in general to educate the general public about what prediabetes is, who is at risk, and how to be screened. A second pamphlet will be specifically for those who have prediabetes and how to manage the condition. A PowerPoint will be developed that will encompass both screening and management of prediabetes. This will be presented to Central Health for use on waiting room teleprompters. A resource list will also be developed that health care providers can utilize in the local clinic to provide information to clients when needed for prediabetes education and management.

Appendix A

Questions for Focus Groups

Q.1. What do you think are the needs of the general population regarding diabetes prevention?

_____

_____

Q. 2. What do you think are the learning needs of individuals with prediabetes?

_____

_____

Q.3. Do you think it is important to educate individuals regarding prediabetes versus diabetes

____ YES _____ NO

Comments:

_____

_____

_____

Q.4. What do you think are the most effective ways to educate those with prediabetes about risk and prevention?

_____

_____

Q.5. Are you aware of any existing resources available that specifically address prediabetes? If so, please list -

_____

_____

Appendix B

Questions for Focus Group-Physicians

Q.1. What do you think are the needs of the general population regarding diabetes prevention?

_____

_____

Q.2. What do you think are the learning needs of individuals with prediabetes?

_____

_____

Q.3. Do you think it is important to educate individuals regarding prediabetes versus diabetes

____ YES _____ NO

Comments:

Q.4. What do you think are the most effective ways to educate those with prediabetes about risk and prevention?

_____

_____

Q.5. Are you aware of any existing resources available that specifically address prediabetes? If so, please list –

_____

Q.6. What would you as a healthcare provider need to support individuals with prediabetes?

_____

Letter of Intent

Dear Participant (Focus Groups):

My name is Karen Lilly and I am a student in the Master of Nursing program at Memorial University, School of Nursing. You are invited to participate in a voluntary focus group consultation that will assist in data collection regarding care of clients with prediabetes.

Prediabetes is a condition of great concern. Prediabetes is a risk factor for progression to diabetes which has many adverse consequences and creates a tremendous burden. Prediabetes rates continue to increase in Canada as well as worldwide. The Canadian Diabetes Association estimated that in 2010, 21.8% of the Canadian population had prediabetes and one million individuals had undiagnosed diabetes. 5-10% of those with prediabetes progress to diabetes annually but the same rate can also revert back to normal glucose levels.

Your participation in the consultation process will allow collection of data to determine what the needs may be of those with prediabetes and resources that may currently be available or known regarding prediabetes. There are no known risks to participation in this consultation process. Participation will take approximately 15 minutes of your time. Responses will be reported in a group format thus responses of individuals will not be identified. Responses will be used to guide develop of materials that will be useful for the target population or for those who support them.

If you wish further information regarding this research, contact Karen Lilly at 673-4316 or karenlilly74@hotmail.com. Thank you for your participation.

Sincerely,

Karen Lilly

Karen Lilly, B.N., R.N.

For participants: I understand that participation in the focus group regarding prediabetes, presented by the above student, is completely voluntary and there is no personal benefit or repercussion for participating.

Signature: _____

Appendix C - Developed Resources

How Do I Find Out More?

- See your health care provider.
- See your local dietitian.
- Call the Canadian Diabetes Society at 1-800-BANTING (226-8464).
- Visit the Canadian Diabetes Society Website at: http://www.diabetes.ca/about-diabetes/prediabetes

Educating yourself and becoming a good self-manager of your health is the most important thing you can do to prevent diabetes!

Central Health

What is Prediabetes?

What is Prediabetes?

- Prediabetes means that your blood sugar level is higher than normal, but is not yet high enough to be called diabetes.

Why is Prediabetes a Concern?

- Having prediabetes places a person at risk for diabetes.
- Prediabetes is likely to become Type 2 diabetes in 10 years or less if lifestyle and other changes are not made.
- Diabetes causes many complications that can affect a person's health or even cause death.

Who is at Risk for Prediabetes?

You are at risk for prediabetes if you are:

- age 40 or older
- a member of a high risk group such as Aboriginal, Asian, African or Hispanic
- overweight or physically inactive

You are also at risk if you have, or have had:

- previous gestational diabetes and/or delivered a baby greater than 9 pounds
- a first degree relative with a history of Type 2 diabetes
- a history of hypertension (high blood pressure),obesity or high cholesterol
- a history of polycystic ovary syndrome or acanthosis nigricans (darkening and thickening of the skin, especially in the skin folds)
- a previous elevated blood sugar test

How Do I Know if I Have Prediabetes?

- Prediabetes can be determined by a blood test. Only a healthcare provider, such as a doctor or nurse practitioner, can order this test.
- If you are over the age of 40 but do not have any other risk factors, you should have a blood test done every 3 years to check for normal blood sugar levels.
- If you have many of the risk factors, screening should begin earlier and occur more frequently.

How Do I Find Out More?

- See your health care provider.
- See your local dietitian.
- Call the Canadian Diabetes Society at 1-800-BANTING (226-8464).
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Educating yourself and becoming a good self-manager of your health is the most important thing you can do to prevent diabetes!

Central Health

Living With Prediabetes

I Have Prediabetes... What Does This Mean?

- Prediabetes means that your blood sugar level is higher than normal, but is not yet high enough to be called diabetes.

Why is Prediabetes a Concern?

- Having prediabetes places an individual at risk for diabetes.
- Prediabetes is likely to become Type 2 diabetes in 10 years or less if lifestyle and other changes are not made.
- Diabetes causes many complications that can affect a person's health or even cause death.

What Can I Expect?

- Once you have been told you have prediabetes, you can expect blood testing every 12 months unless you begin to show symptoms of diabetes.
- Regular follow up visits with your health care provider (doctor or nurse practitioner) may be necessary.
- A referral to the dietitian to discuss management is recommended.
- A change in lifestyle will be required.

You can also expect that you will need support from family and friends to help you set and meet your goals.

If you are unable to keep your blood sugar levels within the target range, medications may be needed.

What Can I Do To Manage Prediabetes?

- See your health care provider regularly to assist with monitoring of your condition.
- See your local dietitian to get information about changing your diet, setting goals and having an action plan.
- Change your diet (lower calories, unhealthy fats and sugars; increase fibre and protein).
- Lose weight (aim for 5-10% of your body weight).
- Exercise for at least 30 minutes, 5 times per week (start with 5-10 minute intervals and work up to this goal).
- Be sure to get enough sleep.
- If medications are needed, take as prescribed.
- Regularly monitor your condition to prevent complications or catch them early.

Resource List

Green Bay Prediabetes and Diabetes Resource List

Green Bay North

Body Works Fitness Centre
673-5494
Fitness for Women
673-5556
Moving for Health
673-2777
Little Bay Islands Fitness Room
626-4131
Chronic Disease Self- Management Program
673-4316
Monthly Health Check Clinic
673-2777
Feet First Program
673-4626/3281
Foot Care Nurses
673-4155 or 673-4360
Diabetes Clinic
673-5321

Canadian Diabetes Society
1-800-BANTING (226-8464).
Canadian Diabetes Society website at:
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Canadian Diabetes Society website at:
http://www.diabetes.ca/about-diabetes/prediabetes

Green Bay Prediabetes and Diabetes Resource List

Green Bay South

Robert's Arm Fitness Centre
652-3331
Moving for Health (Long Island)
264-3111
Moving for Health (Robert's Arm)
652-3031
Brighton Fitness Room
263-7391
Chronic Disease Self- Management Program
652-3666
Feet First Program
652-3410
Foot Care Nurse
293-7340
Diabetes Clinic
673-5321

Canadian Diabetes Society
1-800-BANTING (226-8464).
Canadian Diabetes Society website at:
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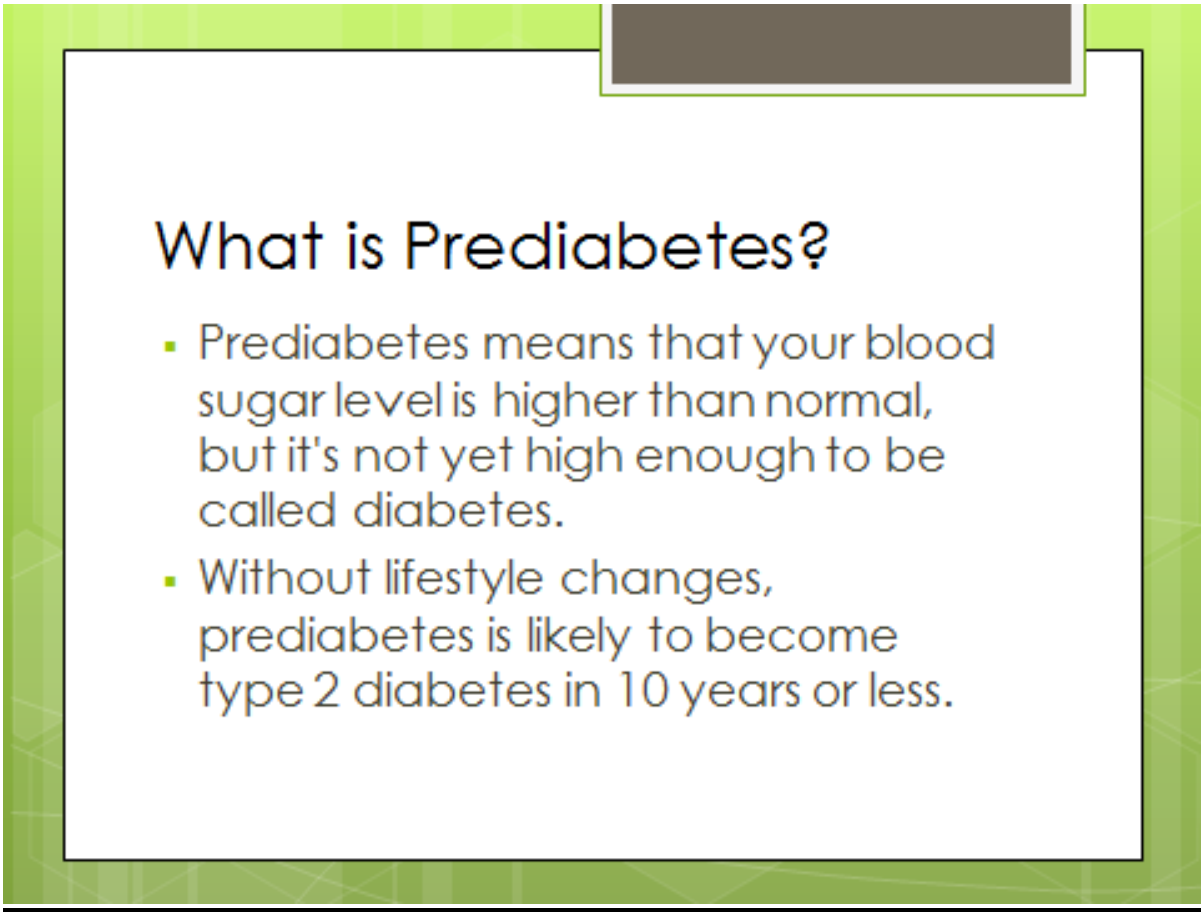
PowerPoint Presentation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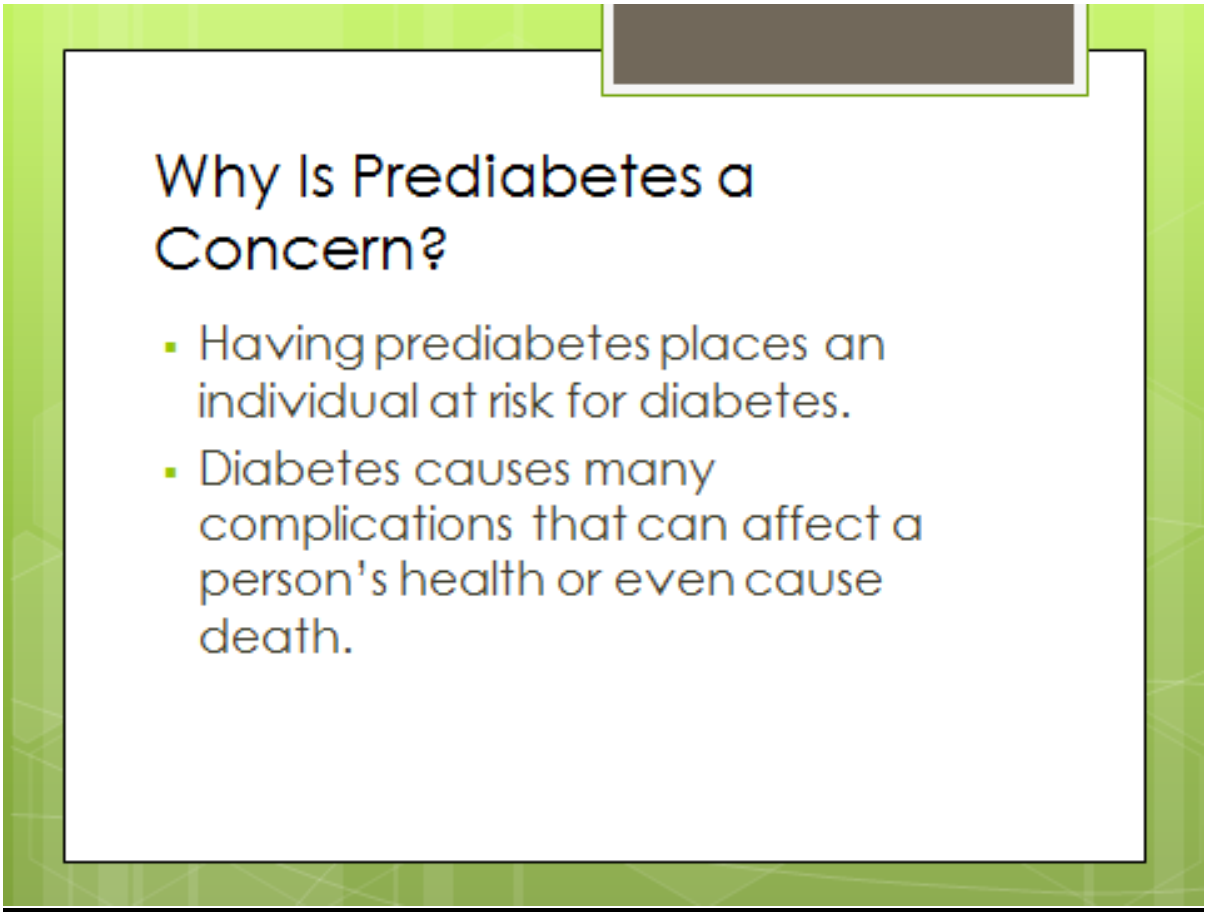
Prediabetes means that your blood sugar level is higher than normal, but it's not yet high enough to be called diabetes.
Without lifestyle changes, prediabetes is likely to become type 2 diabetes in 10 years or less.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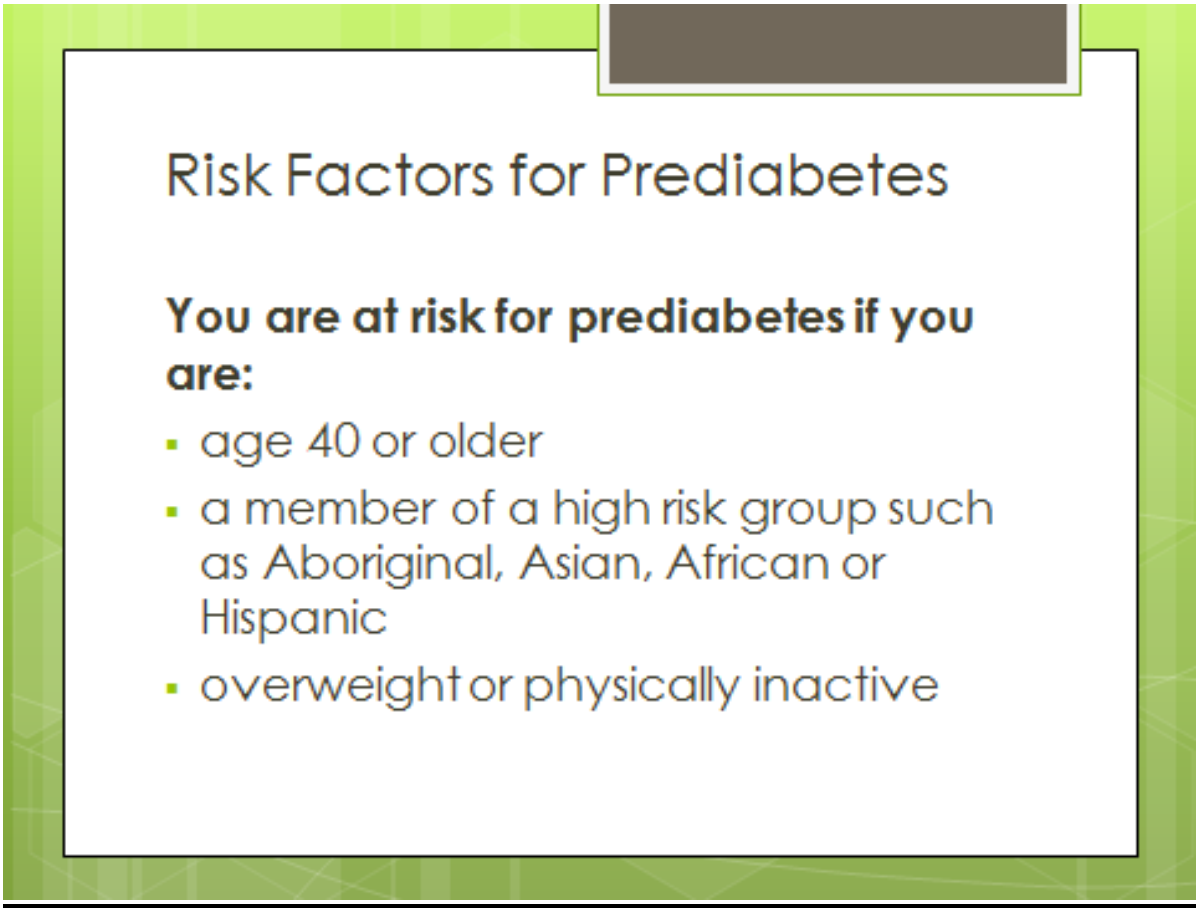
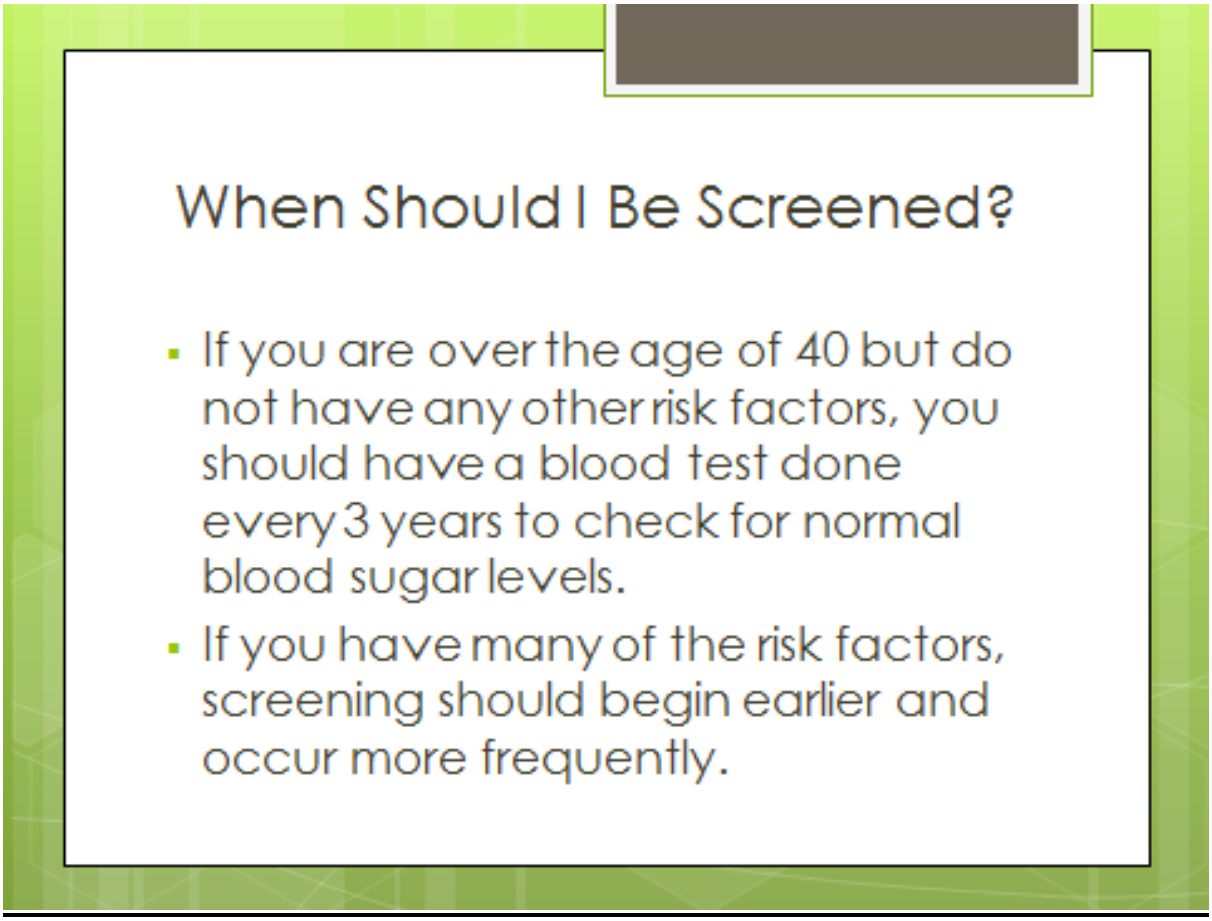

Risk Factors for Prediabetes
You are at risk for prediabetes if you are:
age 40 or older
a member of a high risk group such as Aboriginal, Asian, African or Hispanic
overweight or physically inactive

You are also at risk if you have, or have had:

- previous gestational diabetes and/or delivered a baby greater than 9 pounds
- a first degree relative with a history of Type 2 diabetes
- a history of high blood pressure, obesity or high cholesterol
- a history of polycystic ovary syndrome or acanthosis nigricans (darkening and thickening of the skin, especially in the skin folds)
- a previous high blood sugar test

How Do I Find Out if I Have Prediabetes?

- Prediabetes can be determined by a blood test. Only a healthcare provider, such as a doctor or nurse practitioner, can order this test.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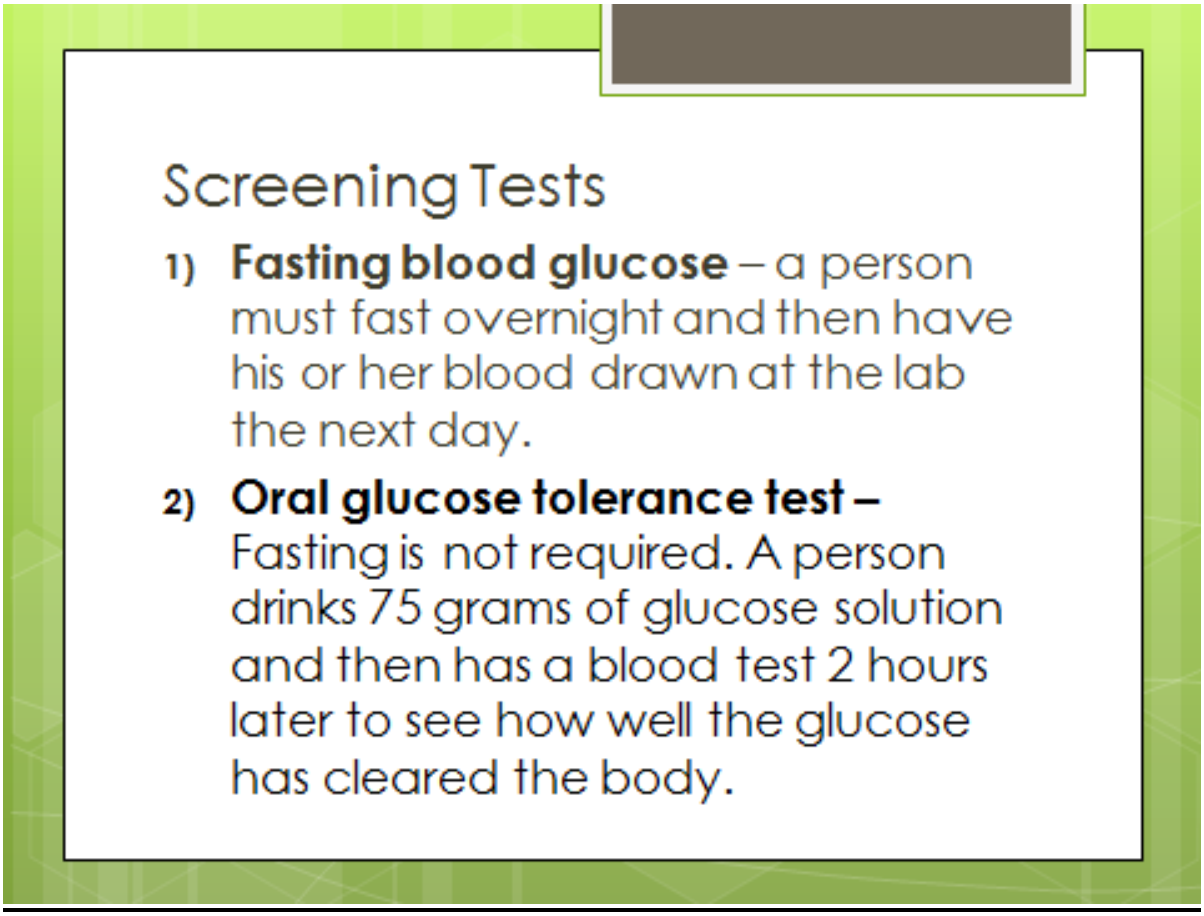
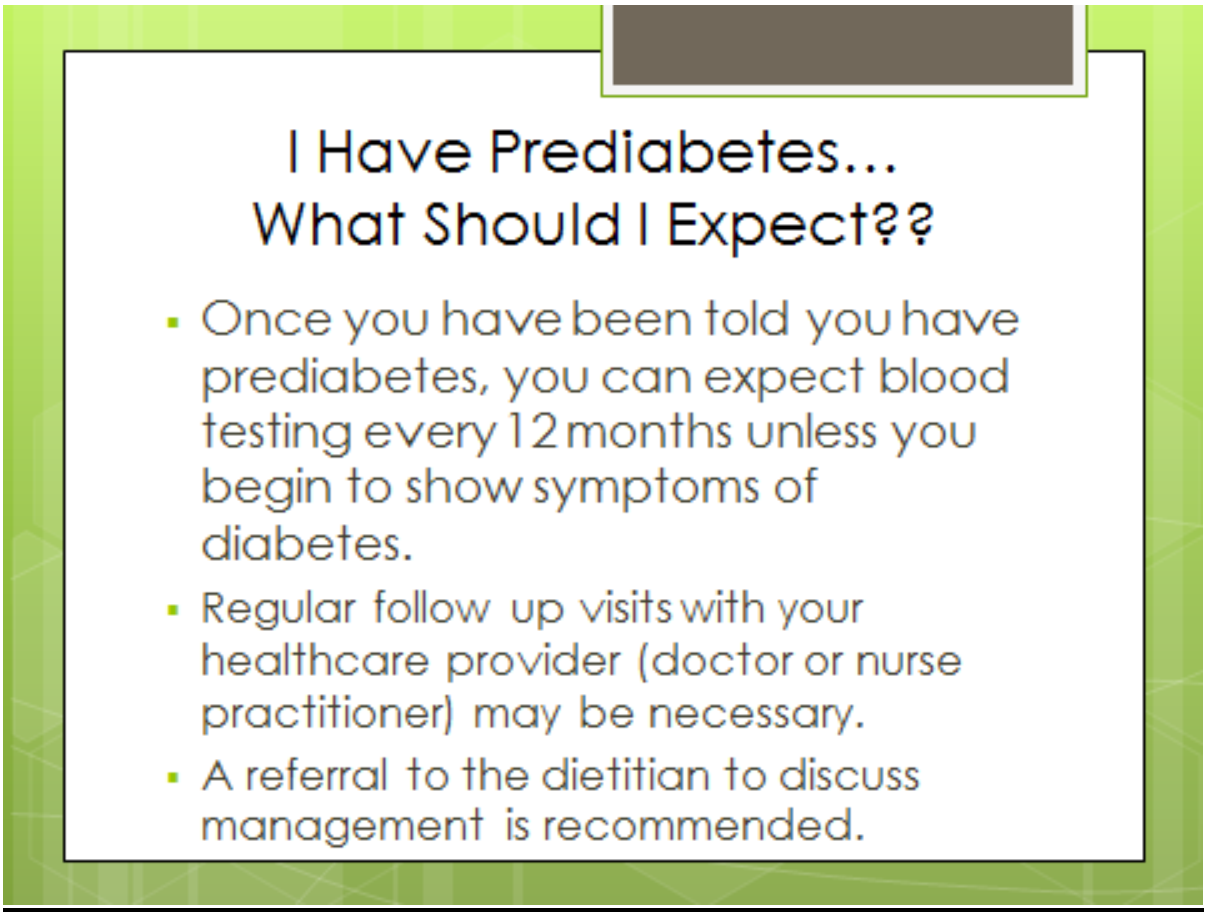
If you are over the age of 40 but do not have any other risk factors, you should have a blood test done every 3 years to check for normal blood sugar levels.
If you have many of the risk factors, screening should begin earlier and occur more frequently.


Screening Tests
1) Fasting blood glucose – a person must fast overnight and then have his or her blood drawn at the lab the next day.
2) Oral glucose tolerance test – Fasting is not required. A person drinks 75 grams of glucose solution and then has a blood test 2 hours later to see how well the glucose has cleared the body.

- **Hemoglobin A1c (HbA1C)** – not generally used for screening and diagnosis. This test is used for monitoring once a person has been diagnosed with elevated blood sugar levels.
- A HbA1C test shows a 3 month average of blood sugar levels. Fasting is not required for this test.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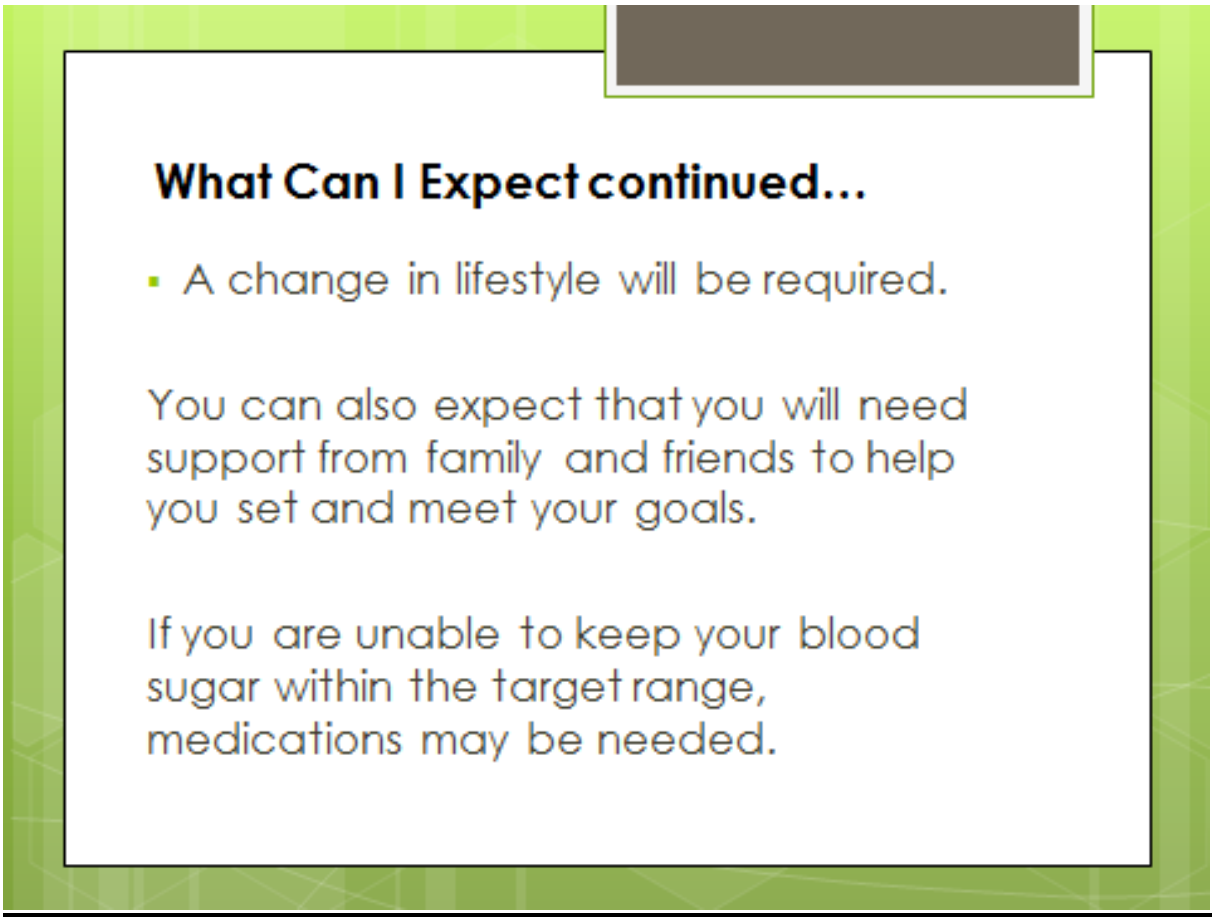
A referral to the dietitian to discuss management is recommended.

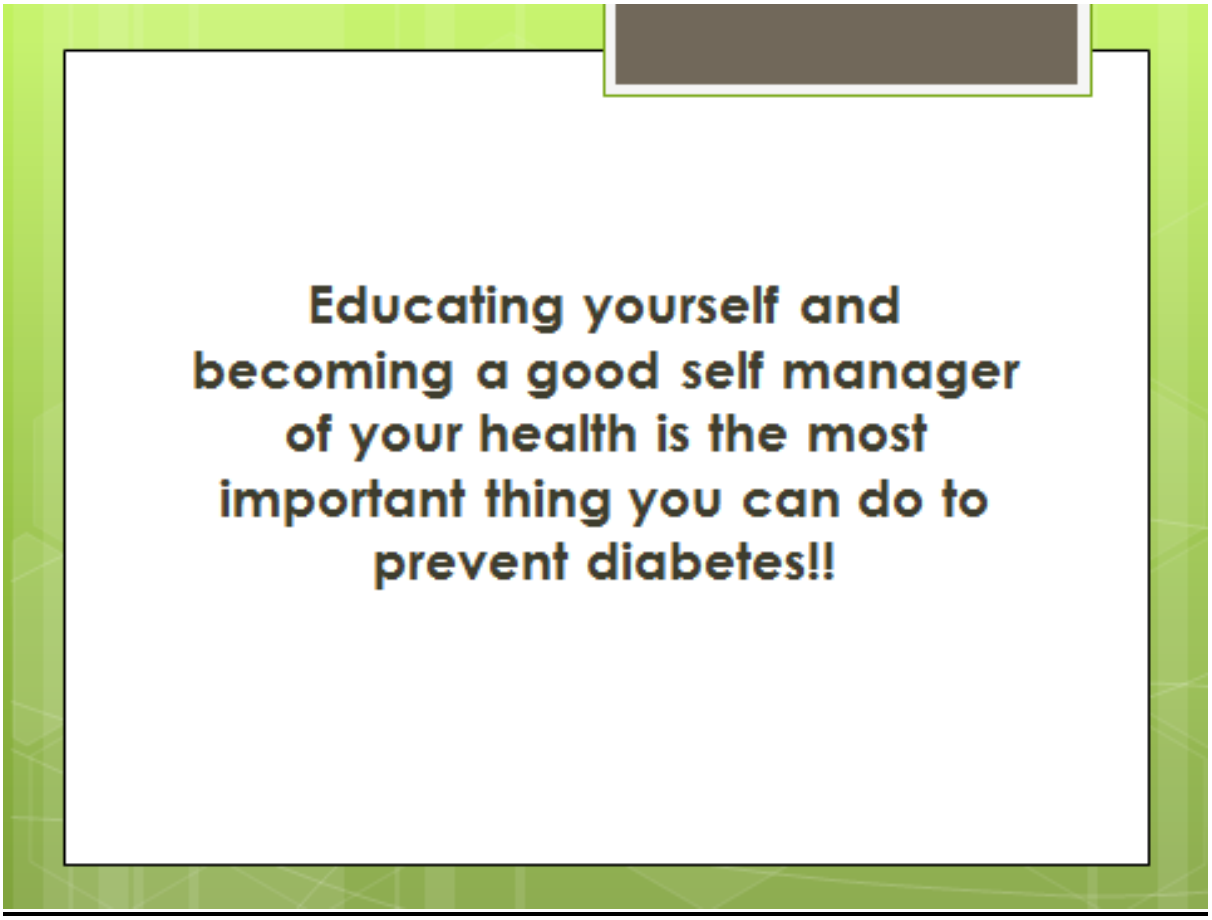

What Can I Expect continued...
A change in lifestyle will be required.
You can also expect that you will need support from family and friends to help you set and meet your goals.
If you are unable to keep your blood sugar within the target range, medications may be needed.

What Do I Do Now??

- See your healthcare provider
- See your local dietitian
- Change your diet: lower calories, unhealthy fats and sugars and increase fibre and protein
- Lose weight: aim for 5-10% of your body weight

What to do continued…

- Exercise(start with 5-10 minute intervals and work up to 30 minutes a day, 5 days a week)
- Get enough sleep
- Take any needed medications as prescribed
- Regularly monitor your condition to prevent complications or catch them early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