Reversing the Diabetes Epidemic: A Role for Primary Care in Identifying Pre-Diabetes and Referral to an Evidence-Based Program

Karyl T. Rattay, MD, MS¹ and Mike Rosenthal, MD²

Abstract

In 2012, 8.2 percent (or about 52,000) of adults in Delaware reported being advised by their medical provider they have pre-diabetes. Many additional Delawareans have undiagnosed pre-diabetes. Lifestyle changes such as increasing physical activity, modest weight loss and healthier eating can prevent or delay the development of type 2 diabetes. Evidence-based programs have been developed to reduce the prevalence of the disease by providing interventions at the stage of pre-diabetes detection and are cost-effective or provide cost-savings. One such evidence-based preventive service is the Diabetes Prevention Program (DPP), developed by U.S. Department of Health and Human Services. Delaware is fortunate to be one of two states with statewide implementation of the DPP program. Increasing the identification of pre-diabetes in primary care is an important first step in preventing diabetes. Enhancing successful referrals to the DPP is also critically important to decrease the burden of diabetes. Many partners are working together in Delaware to support these improvements.

CME available and post test questions are on page 317.

BACKGROUND

Diabetes is a devastating disease. The public health implications of diabetes and the high-risk state of pre-diabetes is enormous, with an estimated national prevalence of ~29 and ~86 million (aged 20 years or older), respectively.¹ The prevalence of diabetes is increasing rapidly in Delaware, as in the nation. In 2013, the prevalence of Delaware adults diagnosed with diabetes had more than doubled, from 4.9 percent in 1991 to 11.1 percent in 2013.² The diabetes and obesity epidemics are closely related. Obesity among Delaware adults also doubled during the nearly two decades from 1990 (14.4 percent) to 2013 (31.0 percent).² Low income adults with lower educational levels are more likely to be obese and more likely to have diabetes. Regardless of income or educational level, obesity is significantly higher among Africa-American adults, who also have the highest rate of diabetes. Additionally, diabetes is the main cause of kidney failure, limb amputations, and new onset blindness in adults and a major cause of heart disease and stroke. Likewise, the associated morbidity and health care costs are also increasing rapidly.

Approximately 52,000 (or 8.2 percent) of Delawareans reported being told they have pre-diabetes.³ The real number could be nearly ten times that according to a recent National Health and Nutrition Examination Survey study that found only approximately 11 percent of those with pre-diabetes were aware of their status.¹

People with pre-diabetes are at high risk for developing type 2 diabetes, but they can significantly reduce that risk by increasing physical activity, eating a healthier diet, and achieving and maintaining a healthy weight. The Diabetes Prevention Program (DPP), developed by

¹ Karyl Rattay, MD, MS is the Director of the Delaware Division of Public Health.
² Mike Rosenthal, MD is the Chair of the Department of Family and Community Medicine at Christiana Care Health System in Newark, Del.
the U.S. Department of Health and Human Services, has been shown to decrease the risk for developing diabetes by nearly 60 percent.\textsuperscript{4}

**DIAGNOSING PRE-DIABETES**

Pre-diabetes can be diagnosed using the American Diabetes Association’s Standard of Care, which include:

- Hemoglobin A1C 5.7% - 6.4%,
- fasting plasma glucose of 100-125mg/dl or
- 2-hour plasma glucose of 140-199 mg/dl.

**DIAGNOSING PRE-DIABETES**

In pre-diabetes, blood glucose levels are higher than normal but not high enough for a diagnosis of diabetes. Pre-diabetes is also called impaired glucose tolerance (IGT) or impaired fasting glucose (IFG), depending on the test used to measure blood glucose levels. A person with pre-diabetes is at increased risk for developing type 2 diabetes, as well as for heart disease and stroke. Without lifestyle changes, each year 11 percent of people with pre-diabetes develop type 2 diabetes so early diagnosis is very important.\textsuperscript{3}

The American Diabetes Association provides guidelines for screening, diagnosing and monitoring pre-diabetes.\textsuperscript{5} Blood tests are needed to diagnosis diabetes and pre-diabetes, especially because individuals are typically asymptomatic early in the disease. Lab analysis of blood is needed to ensure test results are accurate. Glucose measuring devices, such as fingerstick devices, are not accurate enough for diagnosis but may be used as a quick indicator of high blood glucose. Any one of the following tests can be used for diagnosis: A1C or glycohemoglobin; FPG or fasting plasma glucose; OGTT or oral glucose tolerance.

Note: Although random plasma glucose (RPG) may be used to screen for diabetes it is not recommended for the diagnosis of pre-diabetes.

**A1C**

In the past, the A1C test was used to monitor blood glucose levels but not for diagnosis. The A1C test has now been standardized, and in 2009, an international expert committee recommended it be used for diagnosis of type 2 diabetes and pre-diabetes.\textsuperscript{5} When the A1C test is used for diagnosis, the blood sample must be sent to a laboratory using a method that is certified by the National Glycohemoglobin Standardization Program (NGSP) to ensure the results are standardized. Blood samples analyzed in provider offices, or point-of-care tests, are not standardized for diagnosing diabetes or pre-diabetes and are not considered reliable.

The A1C test can also be unreliable for diagnosing or monitoring diabetes in people with certain conditions known to interfere with the results. Interference should be suspected when A1C results seem very different from the results of a blood glucose test. People of African, Mediterranean, or Southeast Asian descent or people with family members with sickle cell anemia or a thalassemia are particularly at risk of interference. False A1C test results may also occur in people with other problems that affect their blood or hemoglobin such as chronic kidney disease, liver disease, or anemia.

An A1C of 5.7 to 6.4 percent indicates pre-diabetes. People diagnosed with pre-diabetes should be retested in one year. People with an A1C below 5.7 percent may still be at risk for diabetes, depending on the presence of other characteristics that put them at risk, also known as risk factors. People with an A1C above 6.0 percent should be considered at very high risk of developing diabetes. A level of 6.5 percent or above meets the diagnostic criteria for diabetes.

**Fasting Plasma Glucose Test**

The FPG test is also used to detect diabetes and pre-diabetes. The FPG test has been the most common test used for diagnosing diabetes because it is more convenient than the OGTT and less expensive. The FPG test measures blood glucose in a person who has fasted for at least 8 hours and is most reliable when given in the morning.

People with a fasting glucose level of 100 to 125 mg/dL have impaired fasting glucose (IFG), or pre-diabetes. A level of 126 mg/dL or above, confirmed by repeating the test on another day, means a person has diabetes.

**Oral Glucose Tolerance Test**

The OGTT can be used to diagnose diabetes, pre-diabetes, and gestational diabetes. OGTT is more
sensitive than the FPG test, but it is less convenient to administer. An OGTT level between 140 and 199 mg/dL, meets the criteria for pre-diabetes or more specifically – impaired glucose tolerance (IGT). If confirmed by a repeat test, a two-hour glucose level of 200 mg/dL or above is indicative of diabetes.

Although all these tests can be used to indicate diabetes or pre-diabetes, in some people one test will indicate a diagnosis of diabetes or pre-diabetes when another test does not. People with differing test results may be in an early stage of the disease, where blood glucose levels have not raised high enough to show on every test. Consider these variations when reviewing test results and repeat laboratory tests for confirmation. Diabetes develops over time, so even with variations in test results, you should be able to identify when overall blood glucose levels are becoming too high. And while the diagnosis of diabetes is important to make, understanding that effective treatment starts with weight loss, dietary adjustments, and exercise, irrespective of whether someone is considered “pre-diabetic” or “diabetic,” the most relevant next steps are management.

Who should be screened for diabetes, pre-diabetes?

Individuals should be tested for diabetes and pre-diabetes according to their risk factors.

Adults

Consider testing anyone age 45 or older for diabetes or pre-diabetes. Testing is strongly recommended for people older than age 45 who are overweight or obese. People younger than 45 should be tested if they are overweight or obese and have one or more of the following risk factors:
• physical inactivity
• parent, brother, or sister with diabetes
• family background that is African American, Alaska Native, American Indian, Asian American, Hispanic/Latino, or Pacific Islander American
• history of giving birth to at least one baby weighing more than 9 pounds
• history of gestational diabetes
• hypertension — 140/90 mmHg or higher
• HDL level below 35 mg/dL or a triglyceride level above 250 mg/dL
• polycystic ovary syndrome

• acanthosis nigricans
• history of cardiovascular disease

If results of testing for diabetes or pre-diabetes are normal, testing should be repeated at least every three years. Consider testing more frequently depending on initial results and risk status. People whose test results indicate they have pre-diabetes should be tested again in one year and steps should be taken to prevent or delay type 2 diabetes.

Pregnant Women

Women who develop gestational diabetes should have follow-up testing 6 to 12 weeks after the baby is born to find out if they have developed type 2 diabetes or pre-diabetes. If results of testing are normal, testing should be repeated at least every three years. Blood glucose tests, rather than the A1C test, should be used for testing within 12 weeks of delivery.

Children and Teens

Type 2 diabetes has become increasingly common in children and teens. Children are at high risk for developing pre-diabetes or type 2 diabetes and should be tested if they are:
• overweight or obese and have other risk factors, such as a family history of diabetes and are;
• older than age 10 or have already gone through puberty.

THE DIABETES PREVENTION PROGRAM

Evidence-based programs have been developed to reduce the incidence of diabetes by providing interventions at the stage of pre-diabetes detection. These programs have been found to be cost-effective or provide cost-savings. One such evidence-based preventive service is the Diabetes Prevention Program (DPP).7

The Diabetes Prevention Program (DPP) was a major multicenter clinical research study aimed at discovering whether modest weight loss through dietary changes and increased physical activity or treatment with metformin could prevent or delay the onset of type 2 diabetes in study participants. All 3,234 study participants were overweight and had pre-diabetes. In addition, 45 percent of the participants were from
minority groups – African American, Alaska Native, American Indian, Asian American, Hispanic/Latino, or Pacific Islander at increased risk of developing diabetes.

In the DPP, participants from 27 clinical centers around the U.S. were randomly divided into different treatment groups. The first group, called the lifestyle intervention group, received intensive training in diet, physical activity, and behavior modification. By eating less fat and fewer calories and exercising for a total of 150 minutes a week, they aimed to lose 7 percent of their body weight and maintain that loss. The second group took 850 mg of metformin twice a day. The third group received placebo. The metformin and placebo groups also received information about diet and exercise but no intensive motivational counseling. A fourth group was treated with the drug troglitazone (Rezulin), but this part of the study was discontinued after researchers discovered that troglitazone can cause severe hepatic damage. The participants in this group were followed but not included as one of the intervention groups.

Participants in the lifestyle intervention group reduced their risk of developing diabetes by 58 percent. This finding was true across all participating ethnic groups and for both men and women. Lifestyle changes worked particularly well for participants aged 60 and older, reducing their risk by 71 percent. About 5 percent of the lifestyle intervention group developed diabetes each year during the study period, compared with 11 percent of those in the placebo group. Participants taking metformin reduced their risk of developing diabetes by 31 percent. Metformin was effective for both men and women, but it was least effective in people aged 45 and older. Metformin was most effective in people 25 to 44 years old and in those with a body mass index of 35 or higher. About 7.8 percent of the metformin group developed diabetes each year during the study, compared with 11 percent of the group receiving the placebo. The DPP resolved its research questions earlier than projected and, following the recommendation of an external monitoring board, the study was halted a year early. The researchers published their findings in the February 7, 2002, issue of the New England Journal of Medicine.  

In the years since the DPP was completed, further analyses of DPP data continue to yield important insights into the value of lifestyle changes in helping people prevent type 2 diabetes and associated conditions. For example, one analysis found that weight loss was the main predictor of reduced risk for developing diabetes in DPP lifestyle intervention group participants. The authors concluded that diabetes risk reduction efforts should focus on weight loss, which is helped by increased exercise. Analyses of DPP data have added to the evidence that changes in diet and physical activity leading to weight loss are effective in helping reduce risk factors associated with both diabetes and cardiovascular disease, including high blood pressure and metabolic syndrome. One analysis found that DPP participants in the lifestyle intervention group who did not have metabolic syndrome at the beginning of the study – about half of the participants were less likely to develop it than those in the other groups. Another analysis of DPP data found that blood pressure, triglycerides, and HDL cholesterol levels improved significantly more in the lifestyle intervention group. A third analysis found that levels of C-reactive protein and fibrinogen were lower in the metformin and lifestyle intervention groups, with a larger reduction in the lifestyle group. In addition, one study focused on urinary incontinence in women who participated in the DPP. Women in the lifestyle intervention group who lost 5 to 7 percent of their body weight through dietary changes and exercise had fewer problems with urinary incontinence than women in the other study groups.

THE DIABETES PREVENTION PROGRAM IN DELAWARE

Delaware is one of two states currently implementing the DPP statewide. The YMCA of Delaware is part of a 17-community demonstration project to show that an evidence-based prevention program delivered by a community-based organization can lower incidence of type 2 diabetes and reduce medical costs incurred by Medicare. The project is funded through a Health Care Innovation Award from the Center for Medicare and Medicaid Innovation (CMMI). The program is being made available throughout the state in a variety of different locations such as churches, community centers, as well as the YMCA facilities.

To qualify for the program an individual must:
- Be 18 years or older;
• Have a BMI greater or equal to 25;
• Have been diagnosed with pre-diabetes or have two or more of the following risk factors:
  o Blood pressure 140/90 or higher
  o Abnormal cholesterol levels
  o Inactive (physically active less than two times each week)
  o A parent or sibling with diabetes
  o A history of gestational diabetes or birth to a baby weighing more than 9 pounds
  o Be 45 years of age or older

Since implementation of the Delaware YMCA’s DPP and as of June 2014, the retention rate of those who attended the weekly portion of the program was 89.9 percent. Of the participants, 505 attended one or more sessions, 476 attended four or more sessions and 428 attended nine or more program sessions. Of those participants who completed the weekly portion of the program, average weight loss was 5.1 percent, and for those who continued on through the year-long monthly maintenance session the average weight loss was 6.1 percent (both findings are above the national average). Of the 505 participants, 51 percent or almost half were referred by a health care provider. Enrolled participants continue to double each year with an estimated 1,000 participants to be served before the end of 2014.

BRIDGING THE GAP BETWEEN PRIMARY CARE AND THE DPP PROGRAM

Assessment for and identification of pre-diabetes as well as referral to the DPP by a primary care providers is likely to be very beneficial in reversing this diabetes epidemic. Additionally, creating linkages between primary care and community resources has the potential to benefit both patients and clinicians and to lessen the burden on the U.S. healthcare system. Infrastructure support and communication systems must be developed to foster sustainable linkages between practices and local diabetes education and prevention resources.13

Electronic Health Records (EHR) can be used to ensure screening for diabetes or pre-diabetes as recommended. Reminder cues such as prompts, flagging abnormal or missing tests/exams, and the use of vital sign stamps are helpful. This is especially important for follow up of abnormal tests. Also, the EHR can be used to directly refer patients to the YMCA’s DPP program. To minimize provider effort, the EHR referral should be developed so that only a single keystroke is required to indicate a referral to the DPP classes.

The primary care team plays a vital role in successfully linking patients to community resources. Patient communication can happen by a variety of health team personnel and through in-person counseling, reminder post cards, health emails, phone prompts, or actual phone calls. To integrate the DPP into clinical practice, medical staff need to be alerted to the upcoming classes and fliers made available electronically or in hard copy. Automatically generated weekly reports can be developed containing names of all patients referred and other pertinent information. This report can provide useful information on referrals including the names of referred patients collected so that reminder calls can be made. The names of all referred patients can be compared to attendees at the classes. This information should be provided back to the practice team. Medical staff should document attendance in the patient’s EHR. Non-attending patients can be contacted and referred to the next available DPP class. Patient follow-up and evaluation to assess clinical measures and lifestyle changes that occurred for the patient who attended the DPP is important to reinforce progress.

The American Medical Association (AMA) is also committing its resources, expertise, and outreach to prevent type 2 diabetes. It is beginning this effort by focusing on pre-diabetes, creating and offering resources that can help physicians, care teams, and patients address pre-diabetes by: screening patients using accurate measurements; taking action by referring patients at risk to evidence-based programs in communities; and engaging with the patient in shared decision-making and self-management.
A key component of this work is creating clinical-community linkages that support the patient’s care plan. To this end the AMA is focusing on the linkage between the physician practice and the local YMCA that offers the DPP. While the AMA’s long-term goal is to prevent type 2 diabetes in all adults, it is starting with the Medicare population. The AMA is also participating in the Center for Medicare and Medicaid Innovation (CMMI) Health Care Innovation award which allows Medicare-eligible adults in 17 communities to attend the YMCA’s Diabetes Prevention Program at no cost until June 2015 (participants must be enrolled in the program by March of 2015). The goal of this collaboration is to increase the number of Medicare-eligible adults enrolled in the YMCA DPP. By leveraging the trusted physician-patient relationship, the AMA believes it can increase participation by, and improve outcomes for, Medicare beneficiaries who have pre-diabetes.

The AMA has chosen pilot locations from among the CMMI/YMCA identified communities including the state of Delaware, and the cities of Indianapolis, Minneapolis/St. Paul, and Venice, Fla. The four provider practices in Delaware that initially instituted the AMA/YMCA pilot include the Christiana Care Family Medicine Center, Family Practice Associates in Wilmington, Lewes Family Practice, and Family Practice Center in Lewes. Other practices are now referring patients to the DPP program and organizations, such as the Medical Society of Delaware and the Delaware Academy of Family Physicians, have produced provider education/CME programs highlighting this work. Physician practices are being engaged to test a physician referral model and feedback loop. Input from pilot sites will help the AMA evolve its model, so that it aligns with practices’ workflow. Once the pilot phase is complete later this year, the AMA will work with state and local medical societies to expand to more physician practices and communities, creating more clinical-community linkages.

Quality Insights of Delaware (QID), the state’s Medicare Quality Improvement Network (QIN) and the Regional Extension Center (REC), developed a methodology for collecting, identifying and tracking National Quality Forum (NQF) measures related to hypertension and diabetes control. The REC utilizes its Customer Relationship Management (CRM) system and other project tracking tools to create and design reports to identify primary care practices currently addressing and reporting on quality improvement measures. Through the REC provider membership, work is being implemented to promote Electronic Health Record utilization, development of dashboards and use of the operational re-design approaches for early identification, referral and treatment of pre-diabetes. A "Best Practice" plan was developed by reviewing and comparing tools utilized by provider practices (e.g. written protocols, utilization of treatment guidelines, defined procedures or policies, prompts, referrals) utilized for early identification, diagnoses, treatment and management of pre-diabetes and diabetes.

In addition, the Medical Society of Delaware (MSD) has played an integral role in implementing Delaware’s first statewide physician-led comprehensive Patient Centered Medical Home Initiative (PCMH), which includes assisting physicians with practice transformation that is needed to become a medical home. For long-term adoption and sustainability of medical home efforts in Delaware, a multi-stakeholder leadership team, called the Delaware Collaborative for PCMH (DC-PCMH), was formed consisting of key stakeholders in the healthcare industry. Enhanced work through the Delaware Valley Outcomes Research's Using Electronic Clinical Decision Support (CDS) in the Context of the Patient-Centered Medical Home To Improve Management of Diabetes Mellitus for Primary Care Offices in Delaware (DECIDE) study for management of pre-diabetes, including both point-of-care tools and retrospective tools, also supports the DPP program’s focus. The Point-of-Care CDS involves the generation of an individualized encounter form for each patient, to allow tracking of patients with pre-diabetes whose control is not optimal. They will provide recommendations for improved management, including self-monitoring, optimization of medications, and lifestyle changes. It will also promote the use of referrals to community-based programs such as the YMCA DPP. These recommendations will be based on evidence-based guidelines, as well as information from the EHR.

Retrospective reports will provide a population-based “dashboard” regarding quality of care for pre-diabetes. These reports will show patients in a practice whose lab values suggest pre-diabetes control is not optimal. These reports will then be used by care coordinators or other staff in the practice to contact
patients for office visits or referrals as indicated. The project teams work with clinicians and staff in the offices to implement the intervention in the practices and to train the staff on their optimal use.

**DISCUSSION**

This is a critical time in our history where today’s young generation may be on track to have a lower life expectancy compared to their parents – if we are unable to get a handle on preventable chronic diseases. Building a culture of health, where the healthy lifestyle choices are the easy choices, takes many partners in many different settings. Primary health care providers have an important role to play in early identification of disease and coordinating care to make it easy for individuals to get services they need. Advice coming from a doctor can have a more meaningful impact compared to that advice coming from others.

Prioritizing the early identification of pre-diabetes offers a great opportunity to empower individuals to make changes before the disease becomes irreversible. Lack of referral services can be a barrier to screening for diseases. In Delaware, we are fortunate to have statewide access to an evidence and community-based program that can halt the progression of pre-diabetes on to diabetes. This program also has been demonstrated to address many other health risk factors. Using quality improvement tools and utilizing available technical assistance and support to modify office flow and practices will likely increase early identification and successful referral to life-changing programs such as the DPP. Although our current health care system poorly reimburses primary care for this work, ultimately, a pay-for-performance system that rewards the successful prevention of diabetes has great potential to assist with and sustain these system changes.

Successful prevention efforts will reduce disease, disability and improve quality of life for Delawareans at risk for developing type 2 diabetes. Importantly, efforts to prevent diabetes are both cost effective and provide a cost savings to the patients and the health care system. It is up to us, collectively, to change the trajectory of the diabetes epidemic in Delaware.

**REFERENCES**


**Acknowledgements:**

The authors would like to thank Don Post, Lisa Henry MSHA, Emily Knealr, MPA, from Delaware’s Division of Public Health Tricia Jefferson RD, LDN from the YMCA of Delaware, and the staff of MSD for their input on this paper and for all they do to help Delawareans be healthier.
CONTINUING MEDICAL EDUCATION
for Reversing the Diabetes Epidemic: A Role for Primary Care in
Identifying Pre-Diabetes and Referral to an Evidenced-Based Program

by Karyl T. Rattay, MD, MS and Mike Rosenthal, MD

CME POST TEST QUESTIONS

Educational Objectives
- Describe the importance of and how to identify pre-diabetes in the practice setting; and
- Describe how to utilize electronic health records to link patients with community services available through the YMCA Diabetes Prevention Program.

Publication Date: October 2014
Expiration Date: October 2016

Participants
This program is designed for physicians who wish to increase their identification of pre-diabetes and prevent diabetes among their patients by referring them to an evidence-based Diabetes Prevention Program using lifestyle changes.

Accreditation
The Medical Society of Delaware is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians. The Medical Society of Delaware designates this journal-based CME activity for a maximum of 1 AMA PRA Category 1 Credit™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Instructions
You may earn credit by reading the CME-designated article in this issue of the DMJ, completing the post test and claiming your credit. Fax (302-366-1354) or mail in the completed examination c/o MSD Journal CME, to the Medical Society of Delaware, 900 Prides Crossing, Newark, DE 19713. MSD members can claim up to 1 AMA PRA Category 1 Credit™ per examination. Credit will be awarded only if a score of at least 80 percent is achieved on the examination.

Circle the single best response for each question:

1. The number of persons in Delaware reporting that they were told they have pre-diabetes:
   A) 66,000
   B) 52,000
   C) 35,000
   D) 47,000

2. Pre-diabetes is diagnosed using one of the following:
   A) Hemoglobin A1c 5.7%-6.4%
   B) Hemoglobin A1c greater than 8
   C) Fasting Blood Glucose below 99
   D) Oral Glucose Tolerance Test 200 or above

3. Risk factors for diabetes include:
   A) Blood pressure 140/90 or higher
   B) Acanthosis nigricans
   C) Physical inactivity
   D) All of the above

4. Goals of the YMCA/DPP include:
   A) Reduce body weight by 7%
   B) Increase physical activity to 200 minutes per week
   C) Reduce body weight by 9%
   D) Increase physical activity to 250 minutes per week

5. Benefits to automatic referrals to DPP integrated into the office flow:
   A) Improved quality of life for the patient
   B) Reduction in disability for the patient
   C) Cost savings
   D) All of the above

☐ I claim 1 AMA PRA Category 1 Credit.™

Please provide the following information in order receive credit for this CME activity.
Please print.

NAME ____________________________

ADDRESS ____________________________

E-MAIL ____________________________