

## Prediabetes

1 contact hour -- \$10.00

Lauren Robertson, BA, MPT and Jo Ann O'Toole, RN, BSN

**Course Expires:** Mar 1, 2011

ATrain Education is an approved provider of continuing nursing education by the Arizona State Nurses Association, an accredited approver by the American Nurses Credentialing Center's Commission on Accreditation.

AzNA and ANCC Commission on Accreditation do not approve or endorse any commercial products displayed.

## Instructions

1. Read the course material and then complete the following forms:
  - A. Post Test
  - B. Evaluation Learning Activity
  - C. Registration Form
2. If you are not paying by credit card, prepare a check for the amount of the course made out to: *ATrain Education, Inc.*
3. Mail the completed forms and your payment to:  
ATrain Education, Inc  
5171 Ridgewood Rd  
Willits, CA 95490

Once we receive your forms and payment, we will mail (or email, at your request) your completion certificate. If you have any questions, please call or email [Info@ATrainCEU.com](mailto:Info@ATrainCEU.com).

## Course Objectives

When you finish this course, you will be able to:

- Define diabetes and differentiate type 2 diabetes it from other major subtypes.
- Identify detection and screening guidelines and risk factors for prediabetes.
- Describe the risk of converting from prediabetes to Type 2 diabetes.
- Outline recommended interventions including lifestyle and pharmacotherapeutic strategies.
- Discuss the cost-effectiveness of programs that slow or prevent the progression of prediabetes to Type 2 diabetes.
- Recite the American Diabetes Association's definition of prediabetes and the criteria for diabetes diagnosis.

## Definition of Diabetes and Its Subtypes

Diabetes is a group of diseases marked by high levels of blood glucose resulting from defects in insulin production, insulin action, or both. Diabetes can lead to serious complications and premature death, but people with diabetes can take steps to control the disease and lower the risk of complications (CDC, 2005).

In the United States, nearly 21 million individuals are currently diagnosed with diabetes and approximately one of every three persons born in 2000 will develop diabetes in his or her lifetime. The largest increase will occur among African Americans, American Indians, and Hispanic/Latino Americans (CDC, 2007).

To survive, people with type 1 diabetes must have insulin delivered by injection or a pump. Diabetes self-management education (DMSE) is an integral component of medical care. Many people with type 2 diabetes can control their blood glucose by following a healthy meal plan and exercise program, losing excess weight, and taking oral medication. Many people with diabetes also need to take medications to control their cholesterol and blood pressure. Among adults with diagnosed diabetes, 16% take insulin only, 12% take both insulin and oral medication, 57% take oral medication only, and 15% do not take either insulin or oral medications (CDC, 2005).

### Type 1 Diabetes

**Type 1 diabetes** was previously called insulin-dependent diabetes mellitus (IDDM) or juvenile-onset diabetes. Type 1 diabetes develops when the body's immune system destroys pancreatic beta cells, the only cells in the body that make the hormone insulin that regulates blood glucose. To survive, people with type 1 diabetes must have insulin delivered by injection or a pump. This form of diabetes usually strikes children and young adults, although disease onset can occur at any age. Type 1 diabetes accounts for 5% to 10% of all diagnosed cases of diabetes. Risk factors for type 1 diabetes may be autoimmune, genetic, or environmental. There is no known way to prevent type 1 diabetes. Several clinical trials of methods to prevent type 1 diabetes are currently in progress or are being planned (CDC, 2005).

### Type 2 Diabetes

**Type 2 diabetes** was previously called non-insulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes. Type 2 diabetes accounts for about 90% to 95% of all diagnosed cases of diabetes. It usually begins as insulin resistance, a disorder in which the cells do not use insulin properly. As the need for insulin rises, the pancreas gradually loses its ability to produce it. Type 2 diabetes is associated with:

- Older age
- Obesity
- Family history of diabetes
- History of gestational diabetes
- Impaired glucose metabolism
- Physical inactivity
- Race / ethnicity (CDC, 2005)

African Americans, Hispanic/Latino Americans, American Indians, and some Asian Americans and Native Hawaiians or other Pacific Islanders are at particularly high risk for type 2 diabetes and its complications. Clinically-based reports and regional studies suggest that type 2 diabetes in children and adolescents, although still rare, is being diagnosed more frequently, particularly in American Indians, African Americans, and Hispanic/Latino Americans (CDC, 2005).

## Gestational Diabetes

**Gestational diabetes** is a form of glucose intolerance diagnosed in some women during pregnancy. Gestational diabetes occurs more frequently among African Americans, Hispanic/Latino Americans, and American Indians. It is also more common among obese women and women with a family history of diabetes. During pregnancy, gestational diabetes requires treatment to normalize maternal blood glucose levels to avoid complications in the infant. After pregnancy, 5% to 10% of women with gestational diabetes are found to have type 2 diabetes. Women who have had gestational diabetes have a 20% to 50% chance of developing diabetes in the next 5–10 years (CDC, 2005).

Other types of diabetes result from specific genetic conditions (such as maturity-onset diabetes of youth), surgery, drugs, malnutrition, infections, and other illnesses. Such types of diabetes account for 1% to 5% of all diagnosed cases (CDC, 2005).

## Prediabetes

Pre-diabetes is the term that has been adopted to describe those states that occur when a person's blood glucose levels are higher than normal but not high enough for a diagnosis of diabetes (NDEP, 2004). About 54 million individuals in the United States aged 21 years and older have prediabetes, 12 million of whom are overweight and between the ages of 45–74. Prediabetes raises the risk of developing type 2 diabetes, heart disease, stroke, and eye disease. People with prediabetes have impaired fasting glucose (IFG), impaired glucose tolerance (IGT), or both—conditions where blood glucose levels are higher than normal but not high enough to be classified as diabetes (CDC, 2007).

People with prediabetes are 5–15 times more likely to develop type 2 diabetes than are people with normal glucose values although progression to diabetes among those with prediabetes is not inevitable. Studies show that people with prediabetes who lose at least 7% of their body weight and engage in moderate physical activity at least 150 minutes per week can prevent or delay diabetes and even return their blood glucose levels to normal. Clinical research shows intensive lifestyle interventions are the most effective way to prevent or delay type 2 diabetes (CDC, 2007).

Prediabetes is sometimes called impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), depending on the test used to diagnose it. Insulin resistance and prediabetes usually have no symptoms. You may have one or both conditions for several years without noticing anything (CDC, 2007). Terms such as “a touch of diabetes” or “sugar’s a little high” are confusing and should not be used. People with diabetes should know what type of diabetes they have (NDEP, 2004).

### Detection of Prediabetes

At present, the fasting plasma glucose (FPG) and the 2-h oral glucose tolerance test (OGTT) are the tests of choice to identify all states of hyperglycemia. Either test is suitable and each has advantages and disadvantages—such as convenience, cost, and reproducibility. Identification of individuals with IGT can be made only with a 2-hour OGTT; the fasting plasma glucose (FPG) alone will miss approximately 30% of patients with isolated IGT (CDC, 2007).

A recent consensus statement issued by the American Diabetes Association has recommended that if pharmacotherapy is used, both IFG and IGT should be documented. If only lifestyle modification is planned, a confirmatory test is not required. Impaired glucose tolerance (IGT) is detected when blood glucose levels are elevated (140–199 mg/dL) two hours after an Oral Glucose Tolerance Test is administered (CDC, 2007).

Impaired fasting glucose (IFG) is detected when blood glucose levels are elevated (100–125 mg/dL) after a fast of at least eight hours (CDC, 2007). See Table 1 for the tests and corresponding glucose values used to identify IGT and IFG (CDC, 2007).

**Table 1. Detection of Diabetes and Prediabetes: IGT and IFG (CDC, 2007)**

Condition/Classification	Test Used and Diagnostic Values
Impaired Glucose Tolerance (IGT)	<ul style="list-style-type: none"> <li>• Oral Glucose Tolerance Test (OGTT), 75 grams of glucose</li> <li>• 2-hour plasma glucose = 140–199 mg/dL</li> </ul>
Impaired Fasting Glucose (IFG)	<ul style="list-style-type: none"> <li>• Fasting plasma glucose (FPG) after 8-hour fast</li> <li>• Fasting plasma glucose = 100–125mg/dL</li> </ul>

### Guidelines for Prediabetes Screening

Screening for prediabetes (IFG/IGT) is fundamentally no different from screening for diabetes because the same risk factors are associated with both conditions. See Table 2 for specific recommendations for prediabetes screening, as well as relevant prediabetes / type 2 diabetes risk factors (CDC, 2007).

**Table 2. Prediabetes Screening Guidelines (CDC, 2007)**

Recommending Body	Prediabetes Risk Factors and Screening Guidelines
<p>American Diabetes Association (ADA)</p>	<p><b>Recommended tests: FPG or 2-h OGTT</b></p> <p>1. All persons <math>\geq 45</math> years of age, particularly in those who are overweight (BMI <math>&gt; 25 \text{ kg/m}^2</math>), and repeated every three years</p> <p>2. Persons <math>&lt; 45</math> years of age who are overweight (BMI <math>&gt; 25 \text{ kg/m}^2</math>) with any one of the following risk factors:</p> <ul style="list-style-type: none"> <li>• Habitually physically inactive</li> <li>• High-density lipoprotein (HDL) cholesterol <math>&lt; 35 \text{ mg/dl}</math> and/or triglyceride level <math>&gt; 250 \text{ mg/dl}</math></li> <li>• First-degree relative with diabetes</li> <li>• Polycystic ovary syndrome (PCOS)</li> <li>• Member of high-risk ethnic population (e.g. African American, Latino, Native American, Asian American, Pacific Islander)</li> <li>• Impaired glucose tolerance (IGT) or impaired fasting glucose (IFG) on previous testing</li> <li>• Delivered a baby weighing <math>&gt; 9 \text{ lbs.}</math> or have been diagnosed with gestational diabetes</li> <li>• Other clinical conditions associated with insulin resistance (e.g., PCOS or acanthosis nigricans)</li> <li>• Hypertensive (blood pressure <math>\geq 140/90 \text{ mmHg}</math>)</li> <li>• History of vascular disease</li> </ul>
<p>Indian Health Services (IHS)</p>	<p><b>Recommended tests: FPG in the morning or 2-hr OGTT</b></p> <p>1. Annual testing of American Indian and Alaska Native adults aged 19 years and older with any of the following risk factors for diabetes:</p> <ul style="list-style-type: none"> <li>• BMI <math>\geq 25 \text{ kg/m}^2</math></li> <li>• Women with a history of gestational diabetes</li> <li>• Hypertension</li> <li>• Women with Polycystic Ovarian Syndrome (or Hyperandrogenic Chronic Anovulation)</li> <li>• High-density lipoprotein <math>&lt; 40 \text{ mg/dl}</math> in men or <math>&lt; 50 \text{ mg/dl}</math> in women</li> <li>• Family history of type 2 diabetes</li> <li>• Triglycerides <math>&gt; 150 \text{ mg/dl}</math></li> </ul> <p>2. Testing every three years beginning at age 35 for those without the above risk-factors</p>
<p>Note: The U.S Preventive Services Task Force also makes recommendations related to screening for diabetes and that recommendation can be found at: <a href="http://www.ahrq.gov/clinic/uspstf/uspsdiab.htm">http://www.ahrq.gov/clinic/uspstf/uspsdiab.htm</a>.</p>	

## Risk Factors for Prediabetes vs. Type 2 Diabetes

Risk factors for prediabetes do not differ from type 2 diabetes. Both conditions share the same risk factors, and prediabetes is itself a risk factor for type 2 diabetes. See Table 3 for prediabetes/type 2 diabetes risk factors (CDC, 2007).

While prediabetes and type 2 diabetes share the same risk factors, persons with prediabetes can reduce their blood glucose levels to normal values and reduce their risk for developing type 2 diabetes. Currently, there is not enough information to warrant distinguishing prediabetes and diabetes' risk factors. As we learn more about the differing pathophysiologies of IGT and IFG and their relation to the onset of type 2 diabetes, as well as preventive interventions, distinguishing prediabetes and type 2 diabetes risk factors might become possible (CDC, 2007).

**Table 3. Risk Factors for Pre-Diabetes And Diabetes (NDEP, 2004)**

Factor	Increase Risk
Age	45 and older
Overweight	Body mass index $\geq 25$ kg/m <sup>2</sup> ( $\geq 23$ if Asian American or $\geq 26$ if Pacific Islander)
Ethnicity	African American, American Indian, Asian American, Hispanic and Latino American, or Pacific Islander heritage
Family history	Have a first-degree relative with diabetes
Gestational diabetes	History of gestational diabetes or gave birth to a baby weighing $>9$ lbs
Hypertension	Blood pressure $>140/90$
Abnormal lipid levels	HDL cholesterol level $<40$ mg/dl for men and $<50$ mg/dl for women; triglyceride level $>250$ mg/dl
IGT / IFG	IGT or IFG on previous testing
Other	Polycystic ovary syndrome or acanthosis nigricans
Vascular disease	History of vascular disease
Inactive lifestyle	Exercises less than three times a week

## Risk of Converting from Prediabetes to Type 2 Diabetes

The risk of progressing to diabetes depends on the type of prediabetes that a person has (IFG only, IGT only, or both), as well as other diabetes risk factors. Individuals with prediabetes who are older, overweight, and have a family history of diabetes and gestational diabetes are more likely to progress to diabetes. Individuals with prediabetes are 5–15 times more likely to develop type 2 diabetes than are people with normal glucose values. Individuals with both IFG and IGT develop diabetes approximately twice as often as individuals with just one of the two conditions (CDC, 2007).

### Annual Progression to Diabetes

Studies in the United States and abroad show that, for persons with IGT, between 2% and 34% will develop type 2 diabetes annually; for persons with IFG, between 1.5% and 23% will develop diabetes annually. Two randomized controlled trials of diabetes prevention, the Diabetes Prevention Program (DPP) and the Finish Diabetes Prevention Study, demonstrated that 3–5% of individuals with IGT who lost weight and engaged in moderate physical activity progressed to diabetes annually. For persons with prediabetes who did not lose weight and engage in moderate physical activity, 11% progressed to diabetes annually (CDC, 2007).

## **Prolonged Progression to Diabetes**

The natural history of prediabetes (both IGT and IFG) indicates that about 25% of persons with prediabetes progress to diabetes within three to five years. With longer observation, the majority of individuals with IFG or IGT go on to develop diabetes within about 10 years, unless they lose weight through moderate changes in diet and physical activity.

Over the course of a lifetime, as many as 83% of persons with prediabetes (IGT) who neither lose weight nor engage in moderate physical activity will develop diabetes. Over the course of a lifetime, approximately 65% of persons with prediabetes who lose weight and engage in moderate physical activity will go on to develop diabetes (CDC, 2007).

## **Progression to Diabetes among the General Population**

The annual risk of developing diabetes for the average person living in the United States with normal glucose levels is about 0.7% per year. For individuals born in the United States in 2000, the estimated lifetime risk of being diagnosed with diabetes is roughly 1 of 3 for males and 2 of 5 for females. The lifetime risk of diabetes is even greater for ethnic minorities: 2 of 5 African Americans and Hispanics, and 1 of 2 Hispanic females, will develop the disease. With lifestyle changes, this course can be changed (CDC, 2007).

## **Children and Prediabetes**

The Diabetes Prevention Program (DPP) and other studies have focused on diabetes prevention in adults. There is no firm evidence that type 2 diabetes can be prevented or delayed in children at risk for the disease. However, a study of extremely obese youth (with a body mass index greater than the 95th percentile for age and sex) found that 25 percent of the 55 children and 21 percent of the 112 adolescents studied had IGT (NDEP, 2004).

Given the significant increase in obesity and sedentary lifestyle among American children and adolescents (especially in high-risk ethnic populations), it may be reasonable to begin identifying children at risk for developing diabetes and initiating the appropriate therapy (lifestyle changes and counseling with parents) (NDEP, 2003).

## **Intervention Strategies**

Developing type 2 diabetes is not inevitable. Interventions to prevent or delay prediabetes from progressing to type 2 diabetes can be feasible and cost-effective, and many individuals in the United States could benefit from them, particularly those who are overweight or obese (CDC, 2007).

A variety of clinical trials demonstrate that individuals with prediabetes can prevent or delay the progression to diabetes through lifestyle and some pharmaceutical interventions. These studies demonstrate that persons at risk for diabetes can be identified early in the disease progression, before exhibiting blood glucose values indicative of diabetes. Those individuals who lose weight and increase their physical activity can prevent or delay the development of diabetes. Moderate-intensity lifestyle interventions can delay development of type 2 diabetes by an average of 11 years and reduce the number of new cases of type 2 diabetes by 20%. Pharmacological interventions has shown to delay the onset of type 2 diabetes by an average of three years while reducing the number of new cases of type 2 diabetes by 8% (CDC, 2007).

## **Lifestyle Intervention Strategies**

Lifestyle changes can prevent or delay the onset of type 2 diabetes among high-risk adults. This has been shown in studies that included people with IGT and other high-risk characteristics for developing diabetes. Lifestyle interventions included low fat diet and moderate-intensity physical activity (such as walking for 2 1/2 hours each week). In the Diabetes Prevention Program, a large NIH prevention study of people at high risk for diabetes, the development of diabetes was reduced by 58% over 3 years (CDC, 2007).

Lifestyle intervention worked in all of the groups, but it was extremely effective in people aged 60 and older, reducing the development of diabetes by 71 percent. This is an important and heartening discovery because as many as 20 percent of people aged 60 and older develop diabetes. Among those taking metformin, its effect in reducing diabetes risk was most pronounced in younger, heavier people—those 25 to 40 years old with a body mass index of 36 (about 50 to 80 pounds overweight) (NDEP, 2003).

See Table 4 for key aspects of the Diabetes Prevention Program lifestyle protocol. A comprehensive description of the DPP, including the lifestyle protocols, lifestyle manuals and an updated list of DPP-related publications can be found at <http://www.bsc.gwu.edu/dpp/index.htmlvdoc> (CDC, 2007).

Other studies have shown lifestyle education (dietary + exercise or dietary alone) can reduce 2-hour plasma glucose levels as well as the onset of type 2 diabetes among those at risk by as much as 50%. Following is a list of DPP lifestyle interventions (CDC, 2007).

- Clearly defined weight loss and physical activity goals
- Individual case managers or “lifestyle coaches”
- Intensive, ongoing interventionLocal and national network of training, feedback and clinical support
- A core curriculum
- A flexible maintenance program
- Culturally-appropriate materials and strategies
- Supervised exercise sessions at least twice weekly

Table 4 describes lifestyle interventions and their corresponding supporting education interventions (CDC, 2007).

**Table 4. Lifestyle education interventions for type 2 diabetes prevention (CDC, 2007)**

Type of Intervention	Dietary Education	Exercise Education
Dietary + exercise	Reducing energy intake	Increase leisure physical exercise by one of more of the following examples: 30 extra minutes per day of slow walking; 20 extra minutes per day of brisk walking; 10 extra minutes per day of jogging; 5 extra minutes per day of jumping rope, playing basketball or swimming.
Dietary + exercise	Standard diet advice sheet with telephone contact (three per month)	Emphasizing need for regular exercise
Dietary + exercise	Low-fat, high-fiber diet	Regular exercise with a program implemented during a 1-month stay at a wellness center that included intense dietary learning sessions
Dietary + exercise	Regular diet counseling from a dietician	Physical activity counseling from a physiotherapist
Dietary + exercise	Individualized dietary counseling from a nutritionist	Circuit-type resistance training sessions and advice on increasing overall physical activity
Dietary + exercise	Regular dietary advice	Stimulated to lose weight and increase physical activity with visits scheduled at regular intervals
Dietary + exercise	Weight-reduction through a healthy low-calorie, low-fat diet	Engage in physical activity of moderate intensity by individualized curriculum by case managers
Dietary alone	Reduced-fat diet and participation in monthly small-group education session for one year	
Dietary alone	Reducing energy intake, especially at dinner	

### Working with Clients to Set Goals

Healthcare providers can work with their patients to set realistic goals to reduce the risk for developing diabetes. The National Institutes of Health have developed an easy-to-use toolkit that stresses the following points:

- Identify patients who will benefit most from lifestyle interventions.
- Discuss the importance of lifestyle for reducing diabetes risk.
- Determine each patient's readiness to initiate lifestyle changes.
- Talk to your patients about initiating a "game plan".
- Provide patients with tools to begin making lifestyle changes.
- Follow-up with your patients (NDEP, 2003).

## Pharmacotherapeutic Strategies

The drug **metformin** is effective in delaying or preventing conversion of prediabetes to diabetes. However, it is not as effective as the lifestyle intervention. While the lifestyle intervention reduced diabetes onset by 58%, metformin reduced onset by 31% (CDC, 2007).

Several clinical trials have shown reductions in the incidence of diabetes with different pharmacotherapies, though their longer-term effectiveness remains unknown. For example, **rosiglitazone** is a newer drug that has been shown to reduce the incidence of diabetes in 60% of individuals with elevated blood glucose levels over the reduction observed in a placebo group. While this drug could be effective, the main clinical trial did not compare this treatment to lifestyle change or other drugs.

Rosiglitazone can have side effects; these include headaches, back pain, fatigue, hypoglycemia, hyperglycemia, and upper respiratory tract infections. A major side effect of rosiglitazone was an increased incidence of cardiovascular events, including a 7-fold increase in heart failure over what was observed in those receiving a placebo. Also, **acarbose** (another drug) was shown to delay progression to type 2 diabetes in patients with IGT by 25% over 3.3 years. Researchers also observed a greater than 50% reduction in the incidence of type 2 diabetes in Hispanic women who were treated with **trogliatone**, an insulin-sensitizing drug. These women continued to experience the protective benefits from diabetes eight months after the drug was stopped. Troglitazone was removed from the market due to safety concerns. As questions remain regarding the long-term efficacy and cost-effectiveness of pharmaceutical interventions for prediabetes, experts continue to recommend diet and exercise as the most effective preventive approach for people with prediabetes (CDC, 2007).

## Prevention Interventions and Cost-Effectiveness

Interventions to prevent or delay prediabetes from progressing to type 2 diabetes can be feasible and cost-effective. Many individuals in the United States, particularly those who are overweight or obese, could benefit from such interventions. As shown in Table 6, research from the DPP found that lifestyle interventions are more cost-effective than pharmacological agents (CDC, 2007).

**Table 5. DPP Findings on Cost-Effectiveness of Interventions (CDC, 2007)**

Lifestyle Intervention Strategies	Pharmacological Agent (metformin)
<ul style="list-style-type: none"> <li>• Delayed development of type 2 diabetes by an average of 11 years</li> <li>• Reduced the number of new cases of type 2 diabetes by 20%</li> <li>• Over time could be predicted to result in cost per Quality Adjusted Life Year (QALY)<sup>a</sup> of approximately \$1,100 from a <b>health system perspective<sup>b</sup></b> and \$8,800 from a <b>societal perspective<sup>c</sup></b></li> <li>• During the DPP study period, direct medical cost for care received outside the study was \$432 lower per participant after receiving the lifestyle change intervention than for a placebo group that did not receive any intervention. Within the trial period, the lifestyle change intervention cost \$16,000 per case of diabetes prevented and \$32,000 per QALY.</li> </ul>	<ul style="list-style-type: none"> <li>• Delayed onset of diabetes by an average of three years</li> <li>• Reduced the number of new cases of type 2 diabetes by 8%</li> <li>• Resulted in higher costs per Quality Adjusted Life Year (QALY) <b>a</b> than the lifestyle change intervention—costs per QALY for individuals receiving metformin were approximately \$31,300 from a <b>health system perspective<sup>b</sup></b> and \$29,900 from a <b>societal perspective<sup>c</sup></b></li> <li>• During the program period, direct medical cost for care received outside the study for the metformin group was \$272 lower per participant than a placebo group not receiving any intervention. Within the trial period, metformin cost \$31,000 per case of diabetes prevented and \$100,000 per QALY.</li> </ul>
<p>a A QALY measures the cost to extend life by one healthy year. It measures not only years of life gained but also the quality of those life years.</p> <p>b The health system perspective includes the cost of treatment (e.g., clinician time and medication cost).</p> <p>c The societal perspective includes costs to society (e.g., indirect costs such as lost productivity and taxes paid for health care and disability, direct non-medical costs related to lifestyle changes).</p>	

The American Diabetes Association supports lifestyle modification as the best method of treating prediabetes because there is insufficient evidence to support the cost-effectiveness of medication interventions. The completed prevention trials indicate that an intensive lifestyle intervention provides the greatest reduction in the occurrence of diabetes, along with a modest reduction in cardiovascular disease risk factors (CDC, 2007).

Assessing costs and savings can be a challenge in determining the best strategies for preventing diabetes among those with prediabetes. For example, lifestyle changes are usually paired with medical treatment, making it difficult to decipher which prevention strategy is most cost effective. Also, the brief duration of some trials limits the ability to determine long-term effects, such as morbidity (complications) or mortality (CDC, 2007).

## Current Reimbursement for Prediabetes Care

Insurance plans differ in reimbursement for diabetes and prediabetes screening and treatment. Most insurance plans cover testing for people suspected of having diabetes. Because the tests and risk factors are the same for both conditions, a prediabetes test may be covered (CDC, 2007).

## Medicare

As of 2005, the Centers for Medicare and Medicaid Services (CMS) cover screening tests for diabetes for those who have been diagnosed with prediabetes. The CMS policy covers the following:

- Two diabetes screening tests per year for individuals with diagnosed prediabetes.
- One diabetes screening test per year for individuals who were never tested or whose test results were negative for prediabetes.

Covered tests include the fasting blood glucose (FBG) test and the post-glucose challenge test (OGTT). Medicare-covered diabetes screening tests do not require co-payments, deductibles, or coinsurance from the Medicare member (CDC, 2007).

Individuals who have any one of the following risk factors for diabetes are eligible for the CMS benefit:

- Hypertension (high blood pressure)
- Dyslipidemia (high cholesterol)
- Obesity (a body mass index  $\geq 30$  kg/m<sup>2</sup>)
- Elevated impaired fasting glucose intolerance (CDC, 2007)

or

Individuals who have at least two of the following characteristics:

- Overweight (a body mass index of 25–29 kg/m<sup>2</sup>)
- A family history of diabetes
- Age 65 or older
- A history of gestational diabetes
- Delivery of a baby weighing >9 lbs (CDC, 2007)

## Medicaid

Medicaid, the combined federal and state health insurance program for the poor and disabled, has no national-level requirements around screening or treatment for diabetes or prediabetes, though all states and Medicaid plans must cover physician, hospital, and lab services. Generally, the Medicaid program covers most diabetes medications but may not always cover diabetes education services, insulin pumps or prediabetes screening.<sup>28</sup> Medicaid coverage rules are set at the state level and vary from state to state (CDC, 2007).

## Private Insurance

Private insurance generally consists of group (i.e., self-insured, employer-sponsored health insurance) and individual coverage. Individual coverage is subject to state insurance laws and mandates. As of December 2005, 46 states had laws requiring coverage of diabetes treatment in private insurance plans. Employer-sponsored health plans that are self-insured are exempt from these mandates through the Employee Retirement Income Security Act of 1974 (ERISA), so coverage of diabetes services varies greatly. (CDC, 2007)

## Conclusion

The Diabetes Prevention Program and other studies have definitively shown that type 2 diabetes can be delayed or prevented by modest weight loss (5 to 7 percent of total body weight) through diet modification and moderate exercise such as walking, 30 minutes a day, 5 days a week. Other studies also suggest that metformin and acarbose reduced the incidence of diabetes in individuals at risk. However, these medications have not yet been approved for preventing diabetes (NDEP, 2003).

Because individuals with IGT are at a 1.5 times greater risk for heart disease, it is advisable to counsel patients with pre-diabetes about cardiovascular risk factors such as tobacco use, high blood pressure, and high cholesterol. Hypertension and dyslipidemia also should be treated aggressively and are responsive to lifestyle modification and pharmacologic therapy (NDEP, 2003).

Referral is advisable to a registered dietitian or credible weight loss program / service for counseling in calorie-reduction strategies, low-fat meal planning and lifestyle modification. Reimbursement of nutrition counseling is available for diabetes. It also may be available for hypertension and dyslipidemia (NDEP, 2003).

## References

NDEP (2003). Your Game Plan for Preventing Type 2 Diabetes: Healthcare Provider's Toolkit. [http://www.ndep.nih.gov/diabetes/pubs/GP\\_Toolkit.pdf](http://www.ndep.nih.gov/diabetes/pubs/GP_Toolkit.pdf).

CDC (2005). *Publications and Products: National Diabetes Education Fact Sheet*. Accessed 5-10-08 from: <http://www.cdc.gov/diabetes/pubs/general.htm#what>.

CDC (2007). *Prediabetes*. National Center for Chronic Disease Prevention and Health Promotion. Diabetes Public Health Resource. Accessed 5-6-08 from: <http://www.cdc.gov/diabetes/faq/prediabetes.htm>.

NDEP (2004). National Diabetes Education Program, National Institutes of Health. *Guiding Principles for Diabetes Care for Health Care Providers*. Accessed 6-10-08 from: <http://www.ndep.nih.gov/resources/guidingprinciples/index.htm>.

## Post Test

Circle one answer per question.

1. Type 1 diabetes:
  - a. Can be caused by obesity.
  - b. Accounts for the majority of diabetes cases.
  - c. Develops when the body's immune system destroys pancreatic beta cells.
  - d. Can be associated with a history of gestational diabetes.
2. Type 2 diabetes:
  - a. Is a rare form of diabetes.
  - b. Was previously called insulin-dependent diabetes.
  - c. Is treated by insulin delivered by injection or pump.
  - d. Is a disorder in which cells do not use insulin properly.
3. Gestational diabetes:
  - a. Must be treated to normalize blood sugar levels and avoid complications with the baby.
  - b. Is most commonly seen in women of European and Asian ancestry.
  - c. Is not an indication that a woman will develop diabetes later in life.
  - d. Should not be treated during pregnancy because of the possibility of harming the fetus.
4. Prediabetes describes those states that occur when blood glucose levels are higher than normal but not high enough for a diagnosis of diabetes.
  - a. True
  - b. False
5. People with prediabetes:
  - a. Inevitably develop Type 2 diabetes despite lifestyle interventions.
  - b. Are likely to develop Type 1 diabetes.
  - c. May prevent or delay the development of Type 2 diabetes with lifestyle changes.
  - d. Are most likely those with active lifestyles and healthy eating habits.
6. People with pre-diabetes and Type 2 diabetes:
  - a. Are usually active people of normal weight.
  - b. Must use insulin delivered by injection or pump.
  - c. Are frequently underweight.
  - d. May have no symptoms for several years.
7. The American Diabetes Association recommends diabetes testing for:
  - a. All persons of African or Pacific Island heritage.
  - b. Those who are 45 years or older with a history of hypertension.
  - c. Any woman planning a pregnancy.
  - d. A child of normal weight with a diabetic parent.
8. Individuals with prediabetes:
  - a. Have fewer risk factors than those with type 2 diabetes.
  - b. Have the same risk factors as those with type 2 diabetes.
  - c. Are less likely to progress to diabetes than those with normal blood glucose levels.
  - d. Always progress to diabetes despite weight loss and exercise.

9. The natural history of diabetes indicates that:
  - a. Only about 2 % of those with prediabetes progress to diabetes within 3–5 years.
  - b. Over the course of a lifetime, as many as 83% of persons with prediabetes who do not lose weight or exercise will develop diabetes.
  - c. Over the course of a lifetime, very few of those with prediabetes who lose weight and exercise will develop diabetes.
  - d. African-Americans and Hispanics are less likely to develop diabetes.
10. In the Diabetes Prevention Program, lifestyle interventions including low-fat diets and increased physical activity:
  - a. Were shown to be most effective in preventing diabetes in younger, heavier people.
  - b. Show very little promise in preventing the onset of diabetes in young children.
  - c. Along with the use of Metformin have been shown to be most effective in teens.
  - d. Reduced the development of diabetes by 71% in people aged 60 and older.
11. The National Institutes of Health (NIH) recommends that healthcare providers:
  - a. Talk to patients at risk of diabetes about a “game plan” for initiating lifestyle changes.
  - b. Encourage the use of diet pills for patients who do not have the “will power” to begin a diet.
  - c. Help obese patients to reject the thin ideal presented by the American media and accept themselves for who they are.
  - d. Instruct those at risk for diabetes to check their blood sugar levels at least once a day.
12. The Diabetes Prevention Program:
  - a. Found that the use of metformin was more effective than lifestyle interventions in delaying the onset of diabetes.
  - b. Showed that lifestyle intervention programs reduced the number of new cases of type 2 diabetes by 20 %.
  - c. Found that metformin delayed the onset of diabetes by 11 years.
  - d. Encouraged the use of insulin pumps in diabetics to keep blood sugar levels from fluctuating excessively.

## Evaluation Learning Activity

Please answer each of the following questions. Questions with an asterisk (\*) are required.

- \* 1. This course met the goals and learning objectives.  
 Yes  No
- \* 2. The author was well prepared to write about the content in a way that facilitated my learning.  
 Yes  No
- \* 3. This course was free from commercial bias.  
 Yes  No
- \* 4. The learning activity met my continuing education needs.  
 Yes  No
- \* 5. The learning activity took me 60 minutes per contact hour.  
 (If you answer "No", please enter the total time it took to finish the course, test, and evaluation.)  
 Yes  
 No. How long did it take to finish the course, test, and evaluation? \_\_\_\_\_

6. My professional educational level is (check one):

### Nursing

- Nurse Aide  LVN/LPN  RN (diploma)  RN (AD)
- BSN  MSN  Nurse Practitioner / Advanced Practice Nurse
- PhD / DNSc

### Therapy

- OT Aide  COTA  OT  MOT  OTD
- PT Aide  PTA  PT  MPT  MSPT  DPT  PhD

**Other** (please specify): \_\_\_\_\_

7. I heard about ATrain Education from:

- Search engine
- Government or Board website
- Friend
- Advertisement
- Returning customer
- Other \_\_\_\_\_

(continued on next page)

8. I found the ATrainCEU.com website easy to use:

Yes  No\_\_\_\_\_

9. Comments or suggestions (optional): \_\_\_\_\_

---

---

---

---

## Registration Information

Please answer all of the following questions (\*required).

\*Name: \_\_\_\_\_

\*Address: \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

\*Phone: \_\_\_\_\_

\*Professional Designation: \_\_\_\_\_

\*License Number and State: \_\_\_\_\_

\*Please e-mail my certificate:  Yes  No

\*Email: \_\_\_\_\_

(Note: If you request an email certificate we will not send a copy of your certificate by US Mail.)

### Payment Options

You may pay by credit card or by check.

Fill out this section only if you are **paying by credit card**.

1 contact hours - \$10

### Fill out this section if paying by credit card

Name \_\_\_\_\_

Address: (if different) \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Card type:  Visa  MC  American Express  Discover

Card number \_\_\_\_\_

Expiration date \_\_\_\_\_

### Test Completion and Mailing Instructions

1. Complete all forms:

- Post Test
- Evaluation Learning Activity
- Registration Form (this page)

2. If you are **paying by check**, prepare a check for \$10 made out to ATrain Education, Inc.

3. Mail the completed forms and your payment to:

ATrain Education, Inc  
5171 Ridgewood Rd  
Willits, CA 95490

Once we receive your forms and payment, we will mail (or email, if you request it) your certificate of completion. If you have any questions or concerns, please call or contact us at [info@ATrainCEU.com](mailto:info@ATrainCEU.com). And thanks for taking the ATrain!