EVIDENCE-STATEMENT:

DIABETES (Screening)

Why This Chapter is Important for Employers: An Overview

- Diabetes affects over 21 million Americans, 7% of the United States population.[1] In addition, 41 million adults aged 40 to 74 have prediabetes, a condition that increases the risk of diabetes, heart disease, and stroke.[1-2]
- Alarmingly, the prevalence of type 2 diabetes and gestational diabetes has increased 61% in United States since 1990.[3]
- Diabetes is a major cause of premature morbidity, disability, and death. In addition to being a direct cause of death, uncontrolled diabetes can cause heart disease, stroke, blindness, kidney failure, pregnancy complications, and amputations of toes, feet, or legs.
- The total annual economic burden of diabetes in the United States exceeds $132 billion dollars.[4]
- Diabetes is among the top 10 most costly physical health conditions for employers in various industries in terms of direct medical expenditures, absenteeism, short-term disability, and presentism.[5]
- In 2002, the average annual healthcare cost for a person with diabetes was $13,243 as opposed to $2,560 for a person without diabetes.[4]

Clinical Preventive Service Recommendations

U.S. Preventive Services Task Force Recommendation

The U.S. Preventive Services Task Force (USPSTF) recommends screening for type 2 diabetes in adults with hypertension (high blood pressure) or hyperlipidemia (high cholesterol).[6]

Evidence Rating: **B (Recommended/At Least Fair Evidence)**

The USPSTF found good evidence that, in adults who have hypertension and clinically detected diabetes, lowering blood pressure below conventional target blood pressure values reduces the incidence of cardiovascular events and cardiovascular mortality; this evidence is considered fair when extrapolated to cases of diabetes detected by screening. Among patients with hyperlipidemia, there is good evidence that detecting diabetes substantially improves estimates of individual risk for coronary heart disease, which is an integral part of decisions about lipid-lowering therapy.[6]

Note: the USPSTF found insufficient evidence to support a recommendation for or against universal screening of adults for diabetes.

Other Recommended Guidance American Diabetes Association (ADA)

The American Diabetes Association (ADA) recommends that adults at normal risk for diabetes be screened at 3-year intervals for prediabetes and diabetes beginning at age 45. Adults at high risk (based on a family history of the disease, overweight or obesity, or other factors; see condition/disease risk factor section below) should be screened at a younger age or screened more frequently (1 to 2 year intervals).[7]

Evidence Rating:

Expert Opinion

American Association of Clinical Endocrinologists (AACE)

The American Association of Clinical Endocrinologists (AACE) recommends targeted screening beginning at age 30 for people at high risk for diabetes.[8]

Evidence Rating: Expert Opinion

Information Sources

The recommendations and supporting information contained in this document came from several sources, including the:

- Agency for Healthcare Research and Quality (AHRQ)
- American Association of Clinical Endocrinologists (AACE)
- American Diabetes Association (ADA)
- Centers for Disease Control and Prevention (CDC)
- Center for Medicare & Medicaid Services (CMS)
- Peer-reviewed research
- U.S. Preventive Services Task Force (USPSTF)

The background and supporting information contained in this document is a compilation of research findings. All information presented in this document should be attributed to its referenced source and should not be considered a reflection of other organizations cited in the text.

Condition/Disease Specific Information

Epidemiology of Condition/Disease

Diabetes is divided into 3 types: type 1 diabetes (previously referred to as "juvenile" diabetes), type 2 diabetes (previously referred to as "adult-onset" diabetes), and gestational diabetes (a form of diabetes that occurs only during pregnancy).

In the past, type 1 diabetes typically affected young people who had few symptoms or signs of the disease before experiencing an abrupt onset, type 2 diabetes primarily affected adults, and gestational diabetes affected pregnant women and indicated a higher-than-average risk for type 2 diabetes. While the epidemiological profiles of type 1 diabetes and gestational diabetes have remained constant, the profile of type 2 diabetes has changed dramatically in recent years. Type 2 diabetes used to be an adult-onset disorder; now type 2 diabetes affects children, adolescents, and young adults as well.

Since the onset of type 1 diabetes is usually relatively sudden and associated with symptoms that require care, screening for type 1 diabetes has not been considered useful.

Type 2 diabetes, on the other hand, has a longer asymptomatic phase. Early recognition and intervention can forestall its onset and may even prevent its emergence. For reasons not completely understood, but seemingly related (at least in part) to obesity, changing dietary habits, and levels of physical activity, the incidence of type 2 diabetes is increasing. It is also being identified at younger and younger ages.

Type 2 diabetes (hereafter referred to as *diabetes*) affects over 21 million Americans (7% of the United States population) and more than 6 million Americans with diabetes are undiagnosed. In addition, 41 million adults age 40 to 74 have

prediabetes, a condition that increases the risk of diabetes, heart disease, and stroke.[1-2] People with prediabetes have a high blood sugar level but not high enough to be classified as diabetes. Many people with prediabetes will develop clinical diabetes. Alarmingly, the prevalence of type 2 diabetes (including gestational diabetes) in the United States has increased 61% since 1990.[3]

Diabetes is a major cause of premature morbidity and disability, and uncontrolled diabetes can cause death. Diabetes is the sixth leading cause of death in the United States — each year 200,000 Americans die of complications resulting from the disease.[1]

Death rates are about 2 to 4 times higher for adults with diabetes than for those without the disease.[2] Heart disease and stroke are leading causes of diabetes-related deaths. Uncontrolled diabetes can also cause blindness, neurologic problems, kidney failure, pregnancy complications, and amputations of toes, feet, or legs. Persons with diabetes are at higher risk of acquiring influenza and pneumonia, which are additional causes of disproportionate death among diabetics. Each year, 12,000 to 24,000 people become blind, 42,813 have kidney failure, and 82,000 have leg, foot, or toe amputations.[2]

Condition/Disease Risk Factors

Diabetes disproportionately affects women, older adults, and certain racial and ethnic groups, such as African-Americans, Hispanics, and American Indians/ Alaska Natives. One in five adults older than 65 has diabetes.

The risk of developing type 2 diabetes increases with[8]:

- Cardiovascular disease, high cholesterol levels, or both
- Hypertension
- High levels of triglycerides
- Low concentrations of high-density lipoprotein
- Family history of diabetes
- Impaired glucose tolerance or impaired fasting glucose
- Hispanic, African-American, Asian American, Native American, or Pacific Islander race or ethnicity
- BMI over 25kg/m2 and/or central obesity
- History of gestational diabetes
- Delivery of a baby weighing more than 9 pounds (4 kg)
- Polycystic ovary syndrome
- Sedentary lifestyle

Value of Prevention*

Economic Burden of Condition/Disease

The estimated direct and indirect costs for diabetes care in 2002 totaled $132 billion[4], 11% of the national health care expenditures for 2002. Diabetes is among the costliest physical health conditions in terms of total medical costs[9-11] and productivity losses.[4,9,12] In 2002, the average annual healthcare cost for a person with diabetes was $13,243 as opposed to $2,560 for a person without diabetes.[4]

Workplace Burden of Condition/Disease

Diabetes is among the top 10 most costly physical health conditions for employers in various industries in terms of direct medical expenditures, absenteeism, short-term disability, and presentism.[5] If pharmaceutical expenditures, costs related to absenteeism, and claims for short-term disability are combined with medical expenditures, diabetes ranks as the third most costly physical health condition for employers.[13] In addition, diabetes-related prescriptions rank in the top 2 treatment expenses for employers based on 1997-1999 claims data for inpatient and outpatient costs.[13]

Employees with diabetes who reduce their glycemic levels (the way your body's sugar level responds to certain foods) demonstrate short-term (4 to 5 months) health outcomes (quality of life improvements), work-related outcomes (reduced absenteeism and increased productivity), and cost-savings through reduced hospital visits.[14] Sustaining reduced glycemic levels for 1 year reduces primary and specialty care visits and is associated with (longer-term) cost-savings within 1 to 2 years of improvement.[15] Therefore, reduced glycemic levels in persons with diabetes has short- and long-term direct and indirect economic benefits.

More than 30% of employer costs associated with employees who have diabetes are attributable to medically related absences or disability.[16] Diabetes may affect the number of disability claims and the length of disability claims.[16-18] When stratified by age, total medical and productivity costs for beneficiaries with diabetes range from $2,589 for those younger than 18 years to $8,568 for those aged 56 through 64 years (in year 1998 dollars).[16]

People with diabetes lose income as a result of missing work and disability. The average annual earnings loss (in year 1994 dollars) for a person with diabetes is estimated at $4,306 for men and $1,865 for women.[12] In 1998 dollars, medically related work loss cost employees with diabetes an estimated $1,121 for those aged 18 through 35 years, $1,448 for those aged 36 through 45 years, $1,467 for those aged 46 through 55 years, and $1,095 for those aged 56 through 64 years.[16]

Economic Benefit of Preventive Intervention

The Diabetes Prevention Program (DPP) showed that lifestyle interventions delayed the development of diabetes by 11 years and reduced the absolute incidence by 20%.[19] Metformin, an oral medication, delayed the development of diabetes by 3 years and reduced the absolute incidence by 8% (compared to a placebo). The cost was $1,100 per quality-adjusted life year (QALY) for the lifestyle intervention and $31,300 for the metformin intervention. The lifestyle intervention included a weight reduction goal of at least 7% of initial body weight through a healthy, low-fat, lower calorie diet; and physical activity of moderate intensity (brisk walking) for at least 150 minutes/week. A 16 lesson curriculum was developed and group and individual sessions were designed to reinforce changes.[19]

Estimated Cost of Preventive Intervention

The cost of screening for type 2 diabetes varies by location and provider. In 2004, the private-sector cost of diabetes screening averaged $15 (range $0 to $40).[20] However, this is a rough average: one or two follow-up visits may be necessary (depending on test results), and if so, would increase the cost of each complete screening cycle.

Estimated Cost of Treatment

From the health system perspective, the cost of a metformin intervention (compared to placebo) is $2,191/participant over 3 years; the cost of a lifestyle intervention (compared to placebo) is $2,269/participant over 3 years.[19] It is significant to note that although the lifestyle intervention costs about 37% more than the metformin in year 1, the lifestyle intervention costs about 12% and 7% *less* than metformin intervention in years 2 and 3. Therefore, the cost of lifestyle intervention relative to metformin intervention would decrease with follow-up beyond 3 years.[19]

Cost-Effectiveness and/or Cost-Benefit Analysis of Preventive Intervention

It is cost-effective to screen people with hypertension in all age groups for type 2 diabetes. It is even more cost-effective to screen people with hypertension aged 55 to 75 years.[21] In year 1997 dollars, the cost per quality-adjusted life year (QALY) for targeted screening (compared to no screening) at age 55 was estimated to be $34,375. In comparison to other preventive interventions and to commonly accepted cost-effectiveness benchmarks, diabetes screening is cost-effective.[22] In general, opportunistic screening (i.e., screening patients during routine healthcare encounters) is more cost-effective than universal or population screening, and targeted screening (i.e., screening people with particular health risk factors, such as hypertension) is the most cost-effective.[21]

Preventive Intervention Information

Preventive Intervention: Purpose of Screening

Screening is meant to identify individuals with diabetes and individuals at high risk of diabetes. Intervention may delay the onset of diabetes and its complications among individuals at high-risk.[1] Early detection by screening allows clinicians to suggest a variety of interventions during the preclinical period, including tight glycemic control; intensive use of antihypertensive agents; aggressive use of lipid treatment and aspirin; foot care programs; and improvements in diet, increases in physical activity, and cessation of tobacco use. The efficacy of early interventions is affected by numerous variables, such as the relationship between the intervention and the timing of the specific complication: some complications typically occur early in the disease process (e.g., cardiovascular disease) and some occur late in the process (e.g., blindness).[23]

Benefits and Risks of Intervention

The USPSTF found that people at risk for cardiovascular disease benefit most from diabetes screening. Screening people with hypertension or hyperlipidemia for type 2 diabetes allows the disease to be diagnosed and treated before it causes certain complications. Evidence shows that people with hypertension and type 2 diabetes can reduce their risk of cardiovascular disease by reducing their blood pressure to a level below that recommended for people with hypertension but without diabetes. People with hyperlipidemia and type 2 diabetes can lower their risk of cardiovascular disease by beginning lipid-lowering therapy in combination with diabetes treatment.[24]

Few studies have examined the harmful effects of screening asymptomatic people for diabetes. As with all screening tests, there is a risk of false-positive results. False-positive results have the potential to cause harmful effects including a negative change in self-perception, undue stress and anxiety, risk of loss of insurability (life insurance or health insurance), and the risk of beginning unneeded treatment for diabetes.[23]

Initiation, Cessation, and Interval of Screening

USPSTF

The USPSTF found insufficient evidence in order to determine whether adults *without* hypertension or hyperlipidemia should be screened for diabetes. Therefore, when to screen individual patients is a matter of clinical judgment and patient preference.

Patients at increased risk for cardiovascular disease may benefit the most from screening for type 2 diabetes, since effective management of cardiovascular risk factors leads to reductions in major adverse cardiovascular events. For adult patients with diagnosed hypertension or hyperlipidemia, diabetes screening should be part of an integrated approach to reduce cardiovascular risk.[24]

American Diabetes Association

While acknowledging the insufficiency of evidence regarding the benefits of screening, the ADA recommends (on the basis of expert opinion) that adults at normal risk for diabetes should be screened at 3-year intervals for prediabetes and diabetes beginning at age 45. Adults at high risk (based on a family history of the disease, overweight or obesity, or other factors) should be screened at a younger age or screened more frequently (1 to 2 year intervals).[7]

There is no universally accepted interval for type 2 diabetes screening of healthy adults or adults with hypertension or hyperlipidemia. The ADA recommends that adults at normal risk for diabetes undergo screening every 3 years and adults at high-risk of diabetes undergo screening every 1 to 2 years.[7]

CMS Coverage

As of September 2006, the Centers for Medicare and Medicaid Services (CMS) covers screening tests for diabetes. This is significant because CMS's decisions frequently influence other managed care policies. Some employers also provide healthcare insurance to retirees eligible for Medicare. The CMS policy covers the following[25]:

- Two screening tests per year for individuals with diagnosed prediabetes (not less than 6 months apart).
- For those who are not diabetic or have not previously been diagnosed as pre-diabetic, Medicare covers one diabetes screening test within a 12-month period (or that at least 11 months have passed following the month in which the last Medicare covered diabetes screening test was performed).

Covered tests are the fasting blood glucose (FBG) test and the Oral Glucose Tolerance Test (OGTT).

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 equal to or greater than 30 kg/m^2)
- Elevated impaired fasting glucose intolerance

Also eligible for the CMS benefit are individuals who have at least two of the following characteristics:

- Overweight (a body mass index >25 but <30 kg/m^2
- A family history of diabetes
- Age 65 or older
- A history of gestational diabetes
- Delivery of a baby weighing more than 9 lbs

Intervention Process

Screening requires a blood glucose test. Several tests are appropriate and should be used at the discretion of the physician, they include the fasting plasma glucose test (FPG), the 2-hour post-load plasma glucose test, and the oral glucose tolerance test (OGTT).

Treatment Information

Health benefits should include provisions for diagnostic, follow-up, and treatment services.

Strength of Evidence for the Clinical Preventive Service

The level of evidence supporting the recommendations contained in this chapter is described below.

Evidence-Based Research:

U.S. Preventive Services Task Force (USPSTF)
Strength of Evidence: B (Recommended/At Least Fair Evidence)

- The USPSTF found at least fair evidence that the benefits of screening adults with hypertension or hyperlipidemia for diabetes outweigh the associated risks and costs.

Recommended Guidance:

The American Diabetes Association (ADA)
Strength of Evidence: Expert Opinion

- The ADA recommends that adults at normal risk for diabetes be screened at 3-year intervals for prediabetes and diabetes beginning at age 45. Adults at high risk (based on a family history of the disease, overweight or obesity, or other factors) should be screened at a younger age or screened more frequently (1-2 year intervals).[7]

The American Association of Clinical Endocrinologists (AACE)
Strength of Evidence: Expert Opinion

- The AACE recommends targeted screening, beginning at age 30, for people at high risk for diabetes.[8]

Authored by:

Cooksey C, Allweiss P, Campbell KP. Diabetes evidence-statement: screening. In: Campbell KP, Lanza A, Dixon R, Chattopadhyay S, Molinari N, Finch RA, editors. *A Purchaser's Guide to Clinical Preventive Services: Moving Science into Coverage*. Washington, DC: National Business Group on Health; 2006.

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Notes:

* The preceding are direct and indirect economic data on diabetes for employers to consider in the design of employee healthcare benefits, including conducting annual negotiations on contracts for healthcare. Some studies cited compared employers' diabetes-related costs with costs for other conditions. Because no standard method can account for the nuances associated with each disease, differing study methods, designs, and data sets create challenges for 1) researchers who compare the cost of different disease conditions and 2) executives and senior managers who may use the cost data to inform their decisions for covering specific preventive services. The study researchers acknowledged the limitations and scientifically accounted for these limitations as well as possible. In addition, the lack of standard metrics for indirect cost, such as disability and productivity, create challenges. Yet, it is for this reason that some researchers (Goetzel, et. al.) conducted their studies—to advance 1) the scientific knowledge and collection methods related to such complex data and 2) the usefulness of such data to the real world (i.e., its usefulness to employers who must make decisions related to employee health and wellness).