

WORKING TOGETHER TO MANAGE DIABETES



**A GUIDE FOR PHARMACISTS,
PODIATRISTS, OPTOMETRISTS, AND
DENTAL PROFESSIONALS**



THE NATIONAL DIABETES

WORKING TOGETHER TO MANAGE DIABETES

This primer was produced by the **Pharmacy, Podiatry, Optometry, and Dentistry (PPOD) Work Group** of the National Diabetes Education Program (NDEP). The NDEP is a joint program of the Centers for Disease Control and Prevention (CDC) and the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) of the National Institutes of Health (NIH). The NDEP's goal is to reduce the illness and deaths associated with diabetes and its complications. Its objectives are:

- To improve understanding about diabetes and its control among people with diabetes and members of their social support system
- To promote better self management among people with the disease
- To improve health care providers' understanding of comprehensive diabetes care and promote an integrated approach to care
- To promote health care policies that improve the quality of and access to diabetes care

ES EDUCATION PROGRAM

- To increase awareness of the seriousness of diabetes, its risk factors, and strategies for preventing diabetes and its complications among people at high risk for the disease
- To reduce health care disparities in racial and ethnic groups that are disproportionately affected by diabetes

More than 200 NDEP partner organizations are actively engaged in the development of programs, tools, educational materials, and activities that address these objectives with people with diabetes and their social support systems, people at high risk for diabetes, and policymakers, health care providers, payers, and purchasers.

The PPOD Work Group is one of nine NDEP work groups that lend their expertise to help develop, implement, and disseminate specific diabetes-control initiatives. The PPOD is made up of health professionals from the four disciplines who work through their professional organizations and with provider colleagues to improve care for persons with diabetes.



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CONTENTS

The National Diabetes Education Program	i
Credits and Acknowledgments	ii
Foreword	1
Diabetes: A Major Health Problem	2
Preventing Complications	2
Diabetes Prevention	3
Self-Management Support	5
What To Discuss With People With Diabetes	6
Promote the ABCs—A1C, Blood Pressure, and Cholesterol	6
Promote a Healthy Lifestyle	6
Explain the Risks and Benefits of Diabetes Comprehensive Care	7
Ask About Health Examinations	7
Support Self-Care Behaviors	8
Assess Symptoms That Require Referral	9
Foot Health and Diabetes	10
Prevalence of Foot Symptoms and Complications	10
Foot Evaluation in People With Diabetes	10
Comprehensive Foot Examination	11
Eye Health and Diabetes	12
Diabetes-Related Eye Conditions	12
Retinopathy	12
Other Eye Complications	13
Oral Health and Diabetes	14
Changes in the Oral Cavity	14
Periodontal Disease	14
Drug Therapy Management and Diabetes	16
Drug-Related Problems	16
Strategies for Managing Drug Therapy	16
Coordination of Care	17
Appendixes	19
Appendix A. Set Up a Referral System	21
Appendix B. Blood Glucose Testing	23
Appendix C. Managing Problems Related to Foot, Eye, and Oral Health	25
Additional Resources	26
References	30



WORKING TOGETHER TO MANAGE DIABETES

FOREWORD

As a pharmacist, podiatrist, optometrist, or dental care professional, you are often a primary point of care for people with type 2 diabetes. You play an important role in ensuring that diabetes care is continuous and patient centered. You can educate people with diabetes about their disease, encourage them to practice self management, and refer those who require the care of other health professionals.

The purpose of this primer is to reinforce consistent diabetes messages across all four disciplines related to pharmacy, podiatry, optometry, and dentistry (PPOD), and promote a team approach to comprehensive diabetes care that encourages collaboration among all diabetes care providers.

Many people with diabetes or those who are at risk for diabetes do not regularly visit a primary care provider but may seek the services of a PPOD provider. For example, a new health problem may prompt a person with diabetes to ask a pharmacist's advice on over-the-counter (OTC) medications. The pharmacist can provide information on the best way to use the medicine and refer the person to his or her health care provider for further information.

PPOD providers are well positioned to deliver prevention messages, communicate the need for metabolic control, and encourage multidisciplinary team diabetes care. In addition, when PPOD providers understand the diabetes care issues of other PPOD disciplines, they can recognize symptomatic concerns warranting urgent referral, reinforce annual screening recommendations, and contribute to a proactive approach to diabetes care beyond the scope of their particular discipline.

A multidisciplinary team approach provides comprehensive care for people with diabetes.¹ In addition to the physician or other primary care provider, a nurse and dietician (one of whom is a certified diabetes educator), others in a multidisciplinary team may include physician specialists such as those in the PPOD fields, social workers, and psychologists. Each member of a multidisciplinary team contributes his or her particular skills and experience within his or her scope of practice, as allowed by state and federal regulations using established clinical guidelines. Collaboration and communication are essential components of a team care approach. Coordination of care can be facilitated by having in place a system for referrals (see appendix A).

This primer is divided into six sections:

- The first section, "Diabetes: A Major Health Problem," provides general information on diabetes.
- The second section, "What To Discuss With People With Diabetes," provides a list of messages that all health care providers should discuss with people with diabetes. It also provides suggestions to help practitioners provide comprehensive care and management for these patients and promote diabetes self-management behaviors.
- The subsequent sections provide background information on the pathophysiology of diabetes as it relates to diseases of the foot, eye, and mouth. A section on drug therapy management discusses medication-related problems and the role that pharmacists play in drug therapy management and advising on self-care issues.

DIABETES: A MAJOR HEALTH

Diabetes is serious, common, costly, but controllable. Diabetes is the sixth leading cause of death in the United States and affects 18.2 million Americans, an estimated 5.2 million of whom have not yet been diagnosed. Diabetes is the number one cause of lower limb amputation not related to trauma, the number one cause of acquired blindness, and the number one cause of kidney disease leading to dialysis in the United States. Diabetes is a major contributor to cardiovascular disease, the number one cause of death in this country. About 65 percent of people with diabetes die from cardiovascular disease.

Diabetes management includes an individualized food plan, monitoring blood glucose as directed by the health care provider, physical activity, and possibly oral medications, insulin, or both.

Type 1 diabetes. Type 1 diabetes (formerly known as insulin-dependent or juvenile-onset diabetes) is an autoimmune disease that is distinguished by the destruction of insulin-producing beta cells. Type 1 diabetes can occur at any age, but type 1 onset usually begins in childhood or the young adult years. People with type 1 diabetes must take insulin daily by injection or insulin pump. They must test their blood glucose levels several times a day, follow an individualized meal plan, and engage in regular physical activity.

Type 2 diabetes. Formerly known as noninsulin-dependent or adult-onset diabetes, type 2 diabetes is related to insulin resistance, whereby the pancreas continues to make insulin, but the insulin is not used well by other body

tissues. Eventually, insulin production decreases. Type 2 diabetes affects 8.7 percent of the U.S. population aged 20 and older, occurring more often in adults who are overweight and sedentary. In recent years, however, it has been seen increasingly in young people, including children. The prevalence of type 2 diabetes in younger age groups is of special concern because the risk of complications increases as diabetes duration increases.

Type 2 diabetes disproportionately affects African Americans, Hispanics/Latinos, American Indians and Alaska Natives, and some groups of Asians and Native Hawaiians or other Pacific Islanders. African Americans and Hispanic/Latino Americans are about twice as likely to have diabetes as non-Hispanic/Latino whites in a similar age group. Some populations of American Indians have the highest rates of diabetes in the world.

Adults with type 2 diabetes are two to four times more likely to have heart disease or suffer a stroke than persons without diabetes. They also are at risk for other complications, such as blindness, kidney disease, amputations, nervous system disease, and gum disease.²

PREVENTING COMPLICATIONS

Comprehensive diabetes care is a team effort involving self-management behaviors (see “Self-Management Support” at the end of this section) by the person with diabetes and complication prevention services by health care providers. At routine visits, health care providers of foot, dental, and eye care and drug therapy management can monitor, prevent, and treat complications.

THE PROBLEM

An important part of diabetes management includes control of risk factors for cardiovascular disease, or the ABCs of diabetes:

- A** is for A1C, also known as hemoglobin A1C—a test that reflects average blood glucose over the last 3 months. The goal for most people with diabetes is <7. An A1C of 7 corresponds to an average blood glucose level of 150 mg/dL.
- B** is for blood pressure. The goal for people with diabetes is <130/80 mm Hg.
- C** is for cholesterol. The goal for people with diabetes is an LDL level of <100 mg/dL.

The Diabetes Control and Complications Trial (DCCT) showed that tight glycemic control reduced risk of microvascular disease in persons with type 1 diabetes (76 percent reduction in eye disease, 50 percent reduction in nephropathy, 60 percent reduction in neuropathy).³ The United Kingdom Prospective Diabetes Study (UKPDS) showed that, among people with type 2 diabetes, improved glycemic control (average A1C = 7 percent vs average A1C = 7.9 percent in the conventionally treated group) led to a reduction in risk of 25 percent for microvascular disease, 21 percent for retinopathy, 33 percent for albuminuria, 16 percent for myocardial infarction, and 24 percent for cataract extraction. Improved blood pressure control (average of 144/82 mm Hg vs 154/87 mm Hg control) over 8 years led to a reduction in risk of 34 percent for retinopathy, 47 percent for vision loss, 37 percent overall for microvascular disease, 56 percent for heart failure, and 44 percent for stroke incidence.⁴ Similarly, multiple studies have shown that lowering LDL cholesterol reduces risk of CVD events.

People with diabetes can take action to lower their risk for heart attack, stroke, and other diabetes complications by controlling the ABCs, following an individualized meal plan, increasing physical activity, avoiding tobacco use, and taking medicines as prescribed. A multidisciplinary team approach is critical to success in diabetes care and prevention. All health care providers can help by discussing how self management and diabetes control relate to preventing complications.

Tools for health care providers and patients can be found on the NDEP Web site at <http://ndep.nih.gov/>. The NDEP Team Care monograph (available at <http://ndep.nih.gov/diabetes/pubs/TeamCare.pdf>) can tell you more about the advantages of team care and how to form a team, and gives examples of effective team care. For information on the link between diabetes and cardiovascular disease, see <http://ndep.nih.gov/control/cvd.htm>.

DIABETES PREVENTION

An estimated 41 million Americans aged 40 to 74 (40 percent of the U.S. population) have pre-diabetes, a condition that puts them at high risk for developing type 2 diabetes. **Pre-diabetes** is a condition in which blood glucose levels are higher than normal but not in the diabetes range. Pre-diabetes is defined as impaired fasting glucose (IFG) of 100 to 125 mg/dL or impaired glucose tolerance (IGT) diagnosed by a post 75-gram glucose challenge (oral glucose tolerance test or OGTT) of >140 to <200 mg/dL or both IFG and IGT. (See appendix B for more information on blood glucose testing.) *The Am I at Risk for Type 2 Diabetes?*



WORKING TOGETHER TO MANAGE DIABETES

brochure, produced by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), can help patients and providers assess individual risk for pre-diabetes.

A major clinical trial—the Diabetes Prevention Program (DPP)—provided scientific evidence that diabetes onset could be prevented or delayed in people at high risk. In the DPP, adults with pre-diabetes reduced their risk of developing diabetes during the course of the study by 58 percent through lifestyle changes in diet and physical activity level (e.g., 30 minutes of brisk walking 5 days a week), resulting in a modest weight loss (5 to 7 percent of body weight). These lifestyle changes worked for men and women and for people of every ethnic or racial group who participated in the study, and such changes were especially successful for people older than age 60.⁵

DPP participants have been enrolled in a continuation study and follow-up data will be forthcoming. Further information on pre-diabetes, testing recommendations, and information on the NDEP's *Small Steps. Big Rewards. Prevent Type 2 Diabetes.* campaign and tools can be found on the NDEP Web site at <http://ndep.nih.gov/get-info/dpi.htm>.

SELF-MANAGEMENT SUPPORT

In contrast to traditional patient education, where information is delivered to the person with diabetes, self-management education involves teaching the behavioral skills needed to make decisions about diabetes management in daily life. Self-management support is a partnership between patient and health care provider. It involves collaborative goal-setting, problem-solving, and individualized behavior-change plans that address concerns identified by the patient as highest priority.

Self-management support relies on principles of self efficacy, short-term action plans, realistic goal setting, and proactive identification of barriers to optimal diabetes control. Self-management support involves asking the person with diabetes to identify an accomplishable action he or she would like to take in changing a behavior (e.g., walking 10 minutes a day before dinner starting tomorrow), not telling the individual what to do.

Self-management support does not replace traditional patient education but complements it. Prompting a patient to consider and plan for challenging events is self-management support. For example, after giving information to reinforce a less calorie-dense diet, the health care provider should ask the person with diabetes what he or she thinks will be the greatest challenge in adopting such a diet, and then ask him or her to identify one thing he or she can do differently next time. The step may be small. For example, if the patient identifies eliminating dessert as a problem, ask what action he or she can take toward finding an acceptable alternative. A self-identified change in portion size from two scoops to one of ice cream is an acceptable short-term goal. Support also involves follow up: asking about progress in achieving behavioral goals and supporting problem-solving skills.⁶

Psychosocial considerations and comorbid conditions such as depression can adversely influence self-management behaviors. Multidisciplinary team care includes working closely with social services, certified diabetes educators, and mental health specialists who can help address these concerns. More information can be found in the NDEP Team Care monograph (available at <http://ndep.nih.gov>).

WHAT TO DISCUSS WITH P

This section provides messages that you as a health care provider should discuss with people with diabetes about foot, eye, and oral health and about drug therapy management. The bullets highlight questions to ask, and information to discuss about diabetes-associated risks, the benefits of comprehensive care, the need for regular medical examinations, symptoms to look for, and self-care issues. You can discuss these topics, when appropriate, over a series of patient visits; you need not cover all the material with every patient. Guidelines for referral to other health care providers are also provided.

PROMOTE THE ABCs—A1C, BLOOD PRESSURE, AND CHOLESTEROL

It is important to control risk factors for cardiovascular disease. Ask persons with diabetes if they understand the ABCs.

- Advise them that controlling the ABCs can prevent complications of diabetes and reduce the risk for heart attack and stroke.
- Ask if they know their ABC goals and how to manage them. They should work with their health care team to determine both long- and short-term goals for each ABC.
- Explain that poor control of the ABCs can lead to problems in foot, eye, and oral health but that screening and team care can prevent complications.

PROMOTE A HEALTHY LIFESTYLE

Diabetes can be controlled through a healthy lifestyle. Describe ways this can be accomplished.

- **Weight.** Advise people with diabetes to aim for a healthy weight.
- **Diet.** Encourage meal planning that includes a variety of foods and controls portion sizes and snacks. Increasing fiber and limiting saturated fats and salts will help control blood glucose, blood pressure, and cholesterol.
- **Physical activity.** Advise people with diabetes that moderate physical activity (such as walking) can help control the ABCs and prevent complications.
- **Self management.** Ask people with diabetes to identify their high priority concerns. Prompt them to plan for challenging situations and set short-term achievable goals. Compliment them on any steps taken toward these goals. See “Self-Management Support” in the previous section.
- **Tobacco.** Ask about tobacco use. Encourage people with diabetes to avoid smoking and using smokeless tobacco products. People who use tobacco are at greater risk for stroke; heart, kidney, and eye diseases; nerve damage; and lower-extremity complications.

PEOPLE WITH DIABETES

EXPLAIN THE RISKS AND BENEFITS OF DIABETES COMPREHENSIVE CARE

Explain the risks of the disease to foot, eye, and oral health, and the benefits of drug therapy management.

- **Foot health.** Ask people with diabetes if they know how diabetes affects the feet. Explain that diabetes raises the risk of foot ulcers, which can lead to amputation, and that proper foot care reduces this risk.
- **Eye health.** Advise people with diabetes about the risk of diabetic retinopathy, a leading cause of blindness in adults and one that may be prevented or delayed by good control of blood glucose. People with diabetes also may be at greater risk for eye problems such as cataracts, glaucoma, fluctuation of visual acuity, double vision, and changes in color vision.
- **Oral health.** Explain the link between periodontal disease and poor control of blood glucose. Good oral health can help control diabetes—and controlling blood glucose levels can improve oral health.
- **Drug therapy management.** Advise people with diabetes about the benefits of proper drug therapy management. Recommend that they talk with their pharmacist about how to get the most benefit from their medications by individualizing dosage regimens. Pharmacists can provide regular medication reviews to ensure that people with diabetes take medications as prescribed and understand the risks of using over-the-counter (OTC) medications.

ASK ABOUT HEALTH EXAMINATIONS

Ask people with diabetes if they have had an annual screening for foot, eye, and oral health to prevent complications.

- **Foot exams.** Ask people with diabetes if they have had a comprehensive foot examination (including a sensory exam with a monofilament) in the past year. Recommend a comprehensive annual foot exam and a foot inspection at every doctor visit. Assist by referral to a foot care specialist or their primary care provider, as indicated.
- **Eye exams.** Ask when the person with diabetes last had a comprehensive dilated eye exam by an optometrist or an ophthalmologist. Reinforce the need for regular screening eye exams to prevent or delay the onset of blindness due to diabetic retinopathy. Most people with diabetes should have an annual complete dilated eye exam by an ophthalmologist or optometrist. Less frequent exams (every 2-3 years) may be considered with the advice of an eye care professional in the setting of a normal eye exam. Examinations will be needed more frequently if retinopathy is progressing.
- **Oral health exams.** Ask the date of last dental/oral health exam. Stress the importance of good oral hygiene and regular exams, including two cleanings a year, to prevent periodontal disease. Even people with no teeth need an oral health exam once a year.

- **Drug therapy management.** Advise people with diabetes that regular medication reviews, individualized drug regimens, and screening for interactions and side effects from medications, OTC medications, herbal products, and supplements can help them get the most from their drug therapy.
- **ABC monitoring.** Ask if they have had their A1C, blood pressure, and cholesterol levels checked.

SUPPORT SELF-CARE BEHAVIORS

People with diabetes make daily decisions that affect their diabetes control. Cornerstones of diabetes self management include meal planning, physical activity, and self monitoring of blood glucose. Encourage routine self-care behaviors that people with diabetes should practice.

- **Daily foot care.** Ask people with diabetes about proper daily foot care. Advise them to take the following steps:
 - Examine feet daily, both by looking and touching. Look for cuts, bruises, puncture wounds, corns or calluses, areas of redness, or pus. Seek medical advice right away for these symptoms.
 - Clean feet (both skin and nails) daily, and dry the spaces between the toes. Check the insides of shoes for objects before putting them on.
 - Never walk barefoot. Wear appropriate footwear, such as athletic or walking shoes that fit well and cover the feet (i.e., NOT sandals).
- **Eye care.** Advise people with diabetes to report eye symptoms to their health care provider and maintain a current prescription for eyeglasses, contact lenses, or low-vision aids.
- **Daily oral care.** Advise about the need to brush teeth after eating and floss at least once a day. If dentures are worn, advise about their care: daily cleaning and a dental visit if dentures become loose or irritation develops.
- **Monthly oral self exam.** Advise people with diabetes to do a monthly self exam and to contact the dentist or dental hygienist if they notice signs of infection, such as sore, swollen, or bleeding gums; loose teeth; mouth ulcers; or pain.
- **Selection and use of a blood glucose meter.** Refer people with diabetes to a pharmacist or diabetes educator for help in choosing an appropriate blood glucose meter, learning how to use it, and understanding the results to check how medications are working.
- **Personal ABCs.** Ask if they know how to take steps to control their ABCs. Advise about the ABC goals: A1C <7, BP <130/80, LDL cholesterol <100.
- **Medications**
 - Ask persons with diabetes if they take their medication exactly as prescribed. Advise them to talk to their pharmacist or primary care provider if they are unable to follow their medication plans.
 - Remind persons with diabetes that they should seek advice from their pharmacist or primary care provider before taking any OTC medications, herbal products, or other supplements.

ASSESS SYMPTOMS THAT REQUIRE REFERRAL

See appendix C for a list of common diabetes-related foot, eye, and oral health complaints and examples of inappropriate self care.

- **Foot symptoms.** Ask about foot symptoms and recommend prompt medical attention for bruises, lacerations, puncture wounds, swelling, and areas of redness or pus from any area of the foot.

- Refer people with these symptoms to a foot care specialist or to their primary care provider.

- **Eye symptoms.** Ask about eye symptoms and their frequency and duration. Encourage people with diabetes to report any changes in their eyes, such as sudden onset of blurriness, seeing spots, or persistent redness or pain to their health care provider.

- If there is sudden change in vision, refer the person at once to an optometrist or ophthalmologist.

- **Oral symptoms.** Ask about oral health symptoms (e.g., signs of infection, bad breath, or a bad taste in the mouth). Evaluate whether an acute problem, such as infection, is present that requires immediate attention.

- Refer individuals with oral findings or complaints to a dentist or periodontist and/or their primary care provider, as indicated.



- **Medication-related symptoms.**

- Ask about medication and supplement use at every visit.
- Ask people with diabetes to report any changes in symptoms, medical conditions, medications, doses, supplements, or lifestyle to all health care providers.
- Refer individuals to a pharmacist or primary care provider, as indicated, for evaluation.

FOOT HEALTH AND DIABETES

PREVALENCE OF FOOT SYMPTOMS AND COMPLICATIONS

Early manifestations of diabetes may present initially in the foot. Foot symptoms increase the risk for comorbid complications, of which nontraumatic lower-extremity amputations (LEAs) are the greatest concern. According to 1997 hospital discharge data, diabetes accounted for approximately 87,720 LEAs in the United States, representing 67 percent of all LEAs.⁷ Between 1980 and 2001, the number of diabetes-related hospital discharges with LEA increased from an average of 33,000 to 82,000 per year.⁸ LEA rates were highest among men, non-Hispanics/Latinos, African Americans, and the elderly.

One study found that 80 percent of nontraumatic LEAs are preceded by a foot ulceration, which provides a portal for infection.⁹ According to BRFSS data, approximately 12 percent of U.S. adults with diabetes had a history of foot ulcer, a risk factor for LEA.¹⁰ Another report identified minor trauma, ulceration, and faulty wound healing as precursors to 73 percent of LEAs, often in combination with gangrene and infection.¹¹ Other risk factors include the presence of sensory peripheral neuropathy, altered biomechanics, elevated pressure on the sole of the foot, and limited joint mobility.¹²

People with diabetes who have neuropathy are 1.7 times more likely to develop a foot ulceration; in persons with both neuropathy and foot deformity, the risk is 12 times greater; in those who also have a history of pathology (prior amputation or ulceration), the risk is 36 times greater.^{13, 14}

People with diabetes who have increased risk for lower-extremity ulceration and amputation are males, people with diabetes for more than 10 years, people who use tobacco and those with a history of poor glycemic control or the presence of cardiac, retinal, or renal complications.^{15, 16, 17}

FOOT EVALUATION IN PEOPLE WITH DIABETES

The podiatrist uses the following considerations in evaluating the feet of people with diabetes to assess the risk for complications.

- **Neuropathy.** The presence of subjective tingling, burning, numbness, or the sensation of bugs crawling on skin may indicate peripheral sensory neuropathy. On clinical examination, this condition can be detected with an instrument known as a Semmes-Weinstein 5.07 (10 gram) monofilament.
- **Vasculopathy.** Cramping of calf muscles when walking (“charley horse”) that requires frequent rest periods suggests intermittent claudication. This condition, often caused by insufficient blood supply to the region beneath the knee, indicates the presence of early or moderate occlusion of the arteries that is common to the lower extremities of people with diabetes. Intense cramping and aching in the toes only at night indicates “rest pain,” which is usually relieved by hanging the feet over the side of the bed and by walking. This symptom signifies the end-stage blood vessel disorder and tissue ischemia that precedes diabetic gangrene. Although poor blood supply is not a risk factor for developing ulceration, it is a significant risk factor for amputation.

- **Dermatological conditions.** Corns and calluses (hyperkeratotic lesions) of the feet result from elevated mechanical pressure and shearing of the skin. They often precede breakdown of skin and lead to blisters or ulceration. Superficial lacerations and fissures, or maceration (softening) between the toes or on the heel, all can serve as portals for infection. Corns, calluses, and bleeding beneath the nail may signify the presence of sensory neuropathy.
- **Musculoskeletal symptoms.** Structural changes in the diabetic foot may develop in conjunction with muscle-tendon imbalances as a result of motor neuropathy. These deformities include the presence of hammer-toes, bunions, high-arched foot, or flatfoot—all of which increase the potential for focal irritation of the foot in the shoe.
- **Lifestyle and family history.** People with diabetes who smoke are four times more likely than nondiabetic smokers to develop lower-extremity vascular disease. Poor diet and low physical activity levels worsen long-term control of blood glucose and increase the risk of progression of disorders of the peripheral nervous system and/or blood vessels. A family history of cerebrovascular accidents and coronary artery disease may indicate a risk of developing lower-extremity arterial complications. Inherited foot types may predispose to biomechanical deformities that lead to problems with skin breakdown.



COMPREHENSIVE FOOT EXAMINATION

A comprehensive foot examination (including checking pulses, checking sensation, evaluating general foot structure, and evaluating skin and nails for abnormalities) helps determine the person's category of risk for developing foot complications. Persons with diabetes who are at high risk have one or more of the following characteristics: (1) loss of protective sensation, (2) absent pedal pulses, (3) foot deformity, (4) history of foot ulcers, or (5) prior amputation. Low-risk individuals have none of these characteristics.¹⁸ Assessment of risk status identifies people who need more intensive care and evaluation. Further patient education, early intervention, and special footwear if indicated can prevent ulcers and ultimately LEAs.



EYE HEALTH AND DIABETE

Diabetes is the leading cause of new cases of blindness among adults aged 20 to 74. Diabetic retinopathy causes 12,000 to 24,000 new cases of blindness each year.¹⁹ People with diabetes can maintain optimal vision and healthy eyes by having an annual comprehensive vision examination, including a dilated eye examination with early intervention if retinopathy is found.

DIABETES-RELATED EYE CONDITIONS

People with diabetes are at 25 times greater risk for blindness.²⁰ People with diabetes who smoke, have poor nutrition, and do not control their diabetes have an even greater risk of developing eye complications. Because many people with diabetes have slower healing time, eye injuries—even minor corneal scratches—should not be taken lightly.

RETINOPATHY

Retinopathy is a common eye complication in people with diabetes. Poor glycemic control and longer duration of diabetes lead to increased rates of retinopathy in people with type 1 and type 2 diabetes. Retinopathy is the term used that describes the damage to the blood vessels in the back of the eye. The condition affects the retina's macula (the area responsible for fine visual acuity),

causing vision reduction and potentially leading to blindness. It can also lead to the development of abnormal new blood vessels, which are fragile and can bleed into the center of the eye. This can lead to sudden loss of vision. Diabetic retinopathy, however, is treatable, and one of the most preventable causes of vision loss and blindness.

Early detection and treatment can prevent or delay blindness due to diabetic retinopathy in 90 percent of people with diabetes. Good glycemic control has been shown to reduce or delay by 76 percent the development of retinopathy in people with diabetes.²¹ Intensive therapy reduces the first appearance of any retinopathy by 27 percent. Retinal laser photocoagulation surgery can reduce the risk of severe vision loss from proliferative diabetic retinopathy (PDR) to 4 percent or less.²²

Optometrists and ophthalmologists can provide low-vision aids—from simple hand magnifiers to innovative optical devices—to help persons who have experienced uncorrectable severe vision loss due to diabetic retinopathy. These eye care providers also can provide the care and services that allow people with diabetes to maintain good vision, which they need to maintain their quality of life and help control their diabetes (e.g., to read instructions, take medication, and drive to medical appointments).

OTHER EYE COMPLICATIONS

Other eye complications include diplopia (double vision) and frequent visual fluctuations. These complications tend to be more prevalent in people with type 2 diabetes.

Double vision. People with diabetes may complain about sudden onset of double images. Because this can be due to damage to the nerves leading from the brain directly to the eye it is important to see a doctor immediately. This may be due to mononeuropathy—damage to a single nerve—usually cranial nerves III, IV, and VI. The sixth and third nerves are most frequently affected. Third-nerve palsies occur with pupillary sparing in 80 percent of cases. Most diabetic third-nerve palsies usually resolve spontaneously within 2 to 3 months.

Vision fluctuation. Poor control of blood glucose levels may lead to a fluctuation in vision. These temporary visual fluctuations can occur because of fluid imbalance in the crystalline lens. When the glucose level is elevated, the lens thickens, causing the eye to become nearsighted. When the glucose level returns to normal, the lens can shrink back to its normal state. For those persons who need glasses, this constant state of flux can make it difficult to determine the best lenses for the glasses if the glucose level is poorly controlled.



ORAL HEALTH AND DIABETES

CHANGES IN THE ORAL CAVITY

Diabetes can lead to changes in the oral cavity. Of particular concern to dentists and dental hygienists are the effects of diabetes on the health of the gingiva (gums) and periodontal tissues. Diabetes can cause gingival hyperplasia and gingivitis. Other diabetes-related conditions affecting the mouth include burning sensations (known as burning mouth syndrome), abnormal wound healing, fungal infections, and dental decay. Some individuals with diabetes may notice a fruity (acetone) breath, and others may report frequent xerostomia (dry mouth) or a change in saliva thickness. These findings are associated with excessive loss of fluids through frequent urination, altered response to infection, altered connective tissue metabolism, microvascular changes, medications for dry mouth, and possible increased glucose concentration in saliva.

Unfortunately, caring for the mouth is often overlooked when trying to control other problems associated with diabetes.

PERIODONTAL DISEASE

People with diabetes are two to three times more likely than persons without diabetes to have destructive periodontal disease, such as periodontitis.²³ Periodontal disease progresses more rapidly and often is more severe in individuals with both type 1 and type 2 diabetes.²⁴

Periodontal disease is a bacterially induced chronic inflammatory disease that destroys noncalcified connective tissue and bone supporting the teeth and can lead to tooth loss. Recent research suggests a two-way connection between diabetes and periodontal disease. Not only are people with diabetes more susceptible to periodontal disease, but the presence of periodontal disease can worsen glycemic control.^{25, 26, 27, 28, 29} Proper care of the mouth can help people with diabetes achieve better glycemic control.

Some studies have suggested a relationship between insulin resistance and inflammatory mediators.^{30, 31} The inflamed periodontal tissue, which can affect an area as large as an adult palm, is highly vascular and may become ulcerated. This can allow the entry of inflammatory mediators, as well as bacteria, lipopolysaccharides, and other toxins, into the systemic circulation.

Signs and symptoms of periodontal disease include bleeding gums; red, swollen, or tender gums; gums that have pulled away from the teeth; pus between the gums when they are compressed; persistent bad breath or bad taste in the mouth; permanent teeth that are loose or moving apart; any change in the way the teeth fit together when the patient bites; and any change in the fit of dentures. Most people with diabetes do not experience pain with periodontal disease, however, and some can have periodontal disease and be asymptomatic.



DRUG THERAPY MANAGEMENT

Drug therapy management has traditionally been concerned with ensuring correct dosage, avoiding drug interactions, and educating patients about possible side effects. People identified as at high risk for drug-related problems include those with chronic and multiple diseases, those who take multiple (five or more) medications, and those who see multiple health care providers. Because people with diabetes fall into these categories, drug therapy management is especially important. It includes comprehensive reviews of medication and medical records, education of people with diabetes to improve compliance with medication regimens, and an assessment of individual response to therapy to ensure timely interventions and coordination and continuity of care.

DRUG-RELATED PROBLEMS

Today's pharmaceuticals and advanced medical technologies provide many therapeutic options for treating diabetes and its comorbidities. If used inappropriately, however, they can cause serious illness, long-term disability, or even death. A study released in February 2001 shows that misuse of prescription drugs in the United States costs \$177 billion annually in additional treatments, hospital care, and doctor visits, up from \$76.5 billion in 1995. The study estimates that, more importantly than the costs, 218,000 annual prescription-drug-related deaths are due to misused prescription medications.³² The study identifies

several categories of drug-related problems: improper drug choice, underdosage, overdosage, adverse drug reactions, drug interactions, and undertreatment. Additional identified factors include untreated medical conditions and medication use with no indication.^{33, 34}

More than 50 percent of individuals who have chronic disorders do not take their medication properly. Over 60 percent of persons with diabetes do not adequately control their blood glucose. Of those persons being treated for high blood pressure and high cholesterol, 65 percent and 49 percent, respectively, are not able to reach target blood pressure and total cholesterol levels.³⁵ To improve compliance and minimize these health care adversities, medication therapy regimens must be consistently and carefully monitored. Correct use of medication improves individuals' health and saves money for the health care system.^{36, 37, 38}

STRATEGIES FOR MANAGING DRUG THERAPY

People with diabetes should establish a relationship with a pharmacist who can help monitor drug regimens, advise how to take medications properly, and provide other information to help them control their diabetes. Strategies include the following:

- **Use of medications.** Individualize drug regimens to determine the best time to take medications to reduce side effects and drug interactions. Offer behavior strategies, compliance aids, appropriate dosage forms, and drug delivery systems.

ENT AND DIABETES

- **Monitoring treatment.** Support treatment plans by monitoring for adverse effects and medication effectiveness. As part of the collaborative care plan with other health care providers, monitor the ABCs between regular physician or clinic visits. Provide referrals, as needed, for reevaluation and treatment.
- **Self treatment and OTC medications.** Ask people with diabetes if they are using nonprescription medications; vitamin, herbal, and nutritional supplements; or topical and skin care products. Assess the severity and urgency of the person's complaint, the appropriateness for self treatment, and any cautions and contraindications. Recommend self treatment, follow up, and/or a referral to another health care professional, as appropriate.
- **Selecting and using a blood glucose meter.** Help the person choose an appropriate blood glucose meter and provide training on how to use it. Educate the person about the results, actions to take, and when to seek help. Self monitoring blood glucose (SMBG) is an important way to assess the effectiveness of therapy.
- **Cost control.** Advise on ways to decrease costs of medications and supplies by providing information on private insurance plans, prescription drug programs, Medicare and Medicaid, the role of generic medications, and possible coverage for referrals to other health care providers.

COORDINATION OF CARE

Coordination of care presents many challenges when delivered by multiple providers in a variety of settings. Changes in drug therapy may occur when patients see specialty providers or during acute illness or hospitalization. When there are issues of multiple disease states and multiple drugs, along with the use of OTC drugs, herbal products, and other supplements, diligent case management is required to ensure continuity of care that is well coordinated.

As an extension of the dispensing role of pharmacists, central medication review and drug therapy management (including nonprescription products) can ensure that a current drug therapy plan is appropriately implemented. In one study, collaborative drug therapy management (CDTM), provided by pharmacists in collaboration with other health care providers, resulted in identification of problems in 65 percent of individuals' drug regimens.³⁹ In other studies, CDTM resulted in decreased morbidity and mortality, as well as decreased costs attributable to fewer un-scheduled physician visits, urgent care visits, emergency room visits, and hospital days.^{40, 41, 42}

With coordinated care, all members of the health care team, including the person treated, benefit from having a primary resource to deliver intended drug therapy, information, and monitoring for effectiveness and adverse effects. This coordination will help ensure adherence to the intended treatment plan and identify drug and disease management issues in a timely manner.



APPENDIXES

APPENDIX A

SET UP A REFERRAL SYSTEM

Integrated, multidisciplinary team care is key to successful diabetes management, and coordination of care can be facilitated by setting up a system for referrals for routine preventive care as well as urgent needs.

- Create a mechanism for preventive care and urgent referrals; don't just tell the person with a potentially serious problem to see a health specialist right away. Contact primary care and specialty providers to discuss with them criteria and ensure that procedures are in place for seeing a person who is referred on a preventive care or an urgent basis.
- Make a list of providers, case managers, phone numbers, and other contact information; keep it handy for quick reference.
- Consider giving individuals handouts with referral information, or calling clinics directly for urgent referrals.

Check the NDEP health care providers' Web site, <http://www.betterdiabetescare.nih.gov>, for tools to help set up a referral system.

APPENDIX B

BLOOD GLUCOSE TESTING

Diagnostic testing for diabetes is not usually performed by PPOD providers. Information on diagnostic criteria, relative merits of different screening tests, and an algorithm for evaluating people at risk can be found at <http://ndep.nih.gov/ddi/#HC>. Blood glucose testing can be performed using different methods for different purposes.

- Diagnosis is based on plasma glucose levels obtained from a venous sample.⁴³
- Screening refers to testing asymptomatic individuals at high risk for diabetes via venous sample (preferred) or a capillary sample to determine if follow-up diagnostic testing is indicated.⁴⁴
- Blood glucose testing to monitor glycemic status by patients and health care providers is considered a cornerstone of diabetes care. Results of monitoring are used to assess the efficacy of therapy and guide adjustments in medical nutrition therapy (MNT), exercise, and medications to achieve the best possible glucose control.⁴⁵
- Blood glucose testing by people with diabetes—self monitoring of blood glucose (SMBG)—is recommended for all people with type 1 diabetes. For most people with type 1 diabetes, SMBG three or more times a day is recommended. For people with type 2 diabetes, the frequency of testing should be sufficient to facilitate reaching glucose goals. The frequency of testing should be increased with therapy modification.⁴⁶
- Because the accuracy of SMBG depends on both the instrument and the user, the technique used by people with diabetes who perform SMBG should be evaluated by a health care provider initially and then periodically.⁴⁷

REQUIREMENTS FOR LABORATORY TESTING

All health care providers who perform fingersticks or other laboratory testing must be registered with the Centers for Medicare & Medicaid Services (CMS) under the Clinical Laboratory Improvement Amendment (CLIA), which established quality standards to ensure the accuracy, reliability, and timeliness of patient test results regardless of where the test is performed. Three categories of tests and certification have been established, depending on the complexity of the test method. CLIA has established compliance regulations for each level of testing that requires quality control and documentation procedures.⁴⁸ Certain states have established additional requirements for various sites or health care providers. For specific additional requirements, health care providers should contact their state agency (see <http://www.cms.hhs.gov/clia> for contact information). Compliance with the Occupational Safety and Health Administration's regulations for bloodborne pathogens must also be documented and maintained.

DIAGNOSTIC CRITERIA

Test	Value	Diagnosis
FPG*	100-125 mg/dL	IFG (pre-diabetes)
FPG	>125 mg/dL	Diabetes
OGTT**	2-hour value 140-199 mg/dL	IGT (pre-diabetes)
OGTT	2-hour value > 200 mg/dL	Diabetes

*FPG = fasting plasma glucose

**OGTT = oral glucose tolerance test, blood glucose measured 2 hours after 75 gm glucose load

APPENDIX C

MANAGING PROBLEMS RELATED TO FOOT, EYE, AND ORAL HEALTH

Common problems that people who have diabetes present for assessment and drug therapy management or OTC care include the following:

FOOT AND SKIN CARE

- Dry skin
- Wounds, fungal and bacterial infections, ulcers
- Pain, numbness, tingling of extremities
- Corns, calluses, bunions, ingrown toenails

Example:

A person requests a foot soak from the pharmacist for an ingrown toenail. Assessment reveals that he or she has diabetes and for 3 weeks has had a severely inflamed ingrown toenail that has not responded to topical bacitracin. The pharmacist discusses the relationship between diabetes and complications with the person as well as the need to seek immediate attention from a podiatrist or primary care physician.

EYE HEALTH

- Dry itchy eyes, allergies (e.g., hay fever)
- Blurred vision, poor vision (seeking reading glasses)
- Eye pain
- Conjunctivitis
- Other eye problems such as partial vision, hemorrhages, floaters, “spots,” foreign objects, contact lens problems

Example:

A 45-year-old woman mentions to her dentist that she needs reading glasses because her vision has been blurry off and on for about 3 months. She was diagnosed recently with diabetes. She assumed that she needed reading glasses but has not had an eye exam because she never had poor vision before. The dentist recognizes that the patient’s blurred vision may be a sign of poor glycemic control or eye pathology, and discusses the relationship between diabetes and vision problems, both transient and long term. The dentist then refers the patient to an optometrist or an ophthalmologist for a comprehensive eye examination, including pupil dilation.

ORAL HEALTH

- Sore, red, inflamed, bleeding gums
- Toothache, pain, infections
- Dry mouth
- Candida infections
- Denture pain
- Cold sores, canker sores

Example:

A person with diabetes asks the pharmacist for a product to use as a mouth rinse for irritated gums. Assessment reveals that the person has poorly controlled diabetes and symptoms consistent with oral candida infection. Advise the person about the relationship between diabetes and oral health, and refer him or her to a dentist or physician for treatment. Suggest follow-up care for diabetes and self-management training.

ADDITIONAL RESOURCES

American Academy of Ophthalmology

<http://www.aao.org/aao/index.cfm>

The American Academy of Ophthalmology has more than 27,000 members worldwide. Academy members are eye M.D.s or D.O.s, doctors of medicine or osteopathy who specialize in the eyes and vision. The majority of Academy members are practicing physicians who are comprehensive eye M.D.s. These eye M.D.s provide the full spectrum of eye care, from prescribing glasses and contact lenses to the medical and surgical treatment of a wide variety of eye conditions. In addition, many eye M.D.s are subspecialists, physicians who have special training and focus their practices in specific areas of ophthalmology, such as glaucoma, cataract, or pediatric ophthalmology.

American Academy of Periodontology

<http://www.perio.org>

The mission of the AAP is to advance the periodontal health of the public and to represent and serve the Academy's members. It provides clinical and scientific publications as well as consumer information.

American Association of Clinical Endocrinologists

<http://www.aace.com>

The American Association of Clinical Endocrinologists (AACE) is a professional medical organization devoted to the enhancement of the practice of clinical endocrinology. Its members are physicians with special education, training, and interest in the practice of clinical endocrinology.

American Association of Diabetes Educators 800-TEAM-UP4

<http://www.aadenet.org>

The AADA is a multidisciplinary organization representing health care professionals who provide diabetes education and care. It provides continuing education and products for health care professionals in all settings.

American College of Clinical Pharmacy

<http://www.accp.com>

The ACCP provides leadership, education, advocacy, and resources enabling clinical pharmacists to achieve excellence in practice and research. It provides research forums, continuing education, publications, and a practice and research network.

American Dental Association

<http://www.ada.org>

The American Dental Association is the professional association of dentists committed to the public's oral health, as well as ethics, science, and professional advancement. It provides continuing education and a monthly journal for dentists, in addition to consumer education on oral health topics.

American Dental Hygienists' Association

800-243-ADHA

www.adha.org

The ADHA is the largest professional organization representing the interests of dental hygienists. It provides continuing education through its Institute for Oral Health, as well as information on oral health topics, careers in dental hygiene, and professional issues.

American Diabetes Association

800-342-2383

<http://www.diabetes.org>

The American Diabetes Association funds research; publishes scientific findings; provides information and other services to people with diabetes, their families, health care professionals, and the public; and advocates for scientific research and the rights of people with diabetes.

American Dietetic Association

800-366-1655

<http://www.eatright.org>

The American Dietetic Association is the nation's largest organization of food and nutrition professionals. Its mission is to promote optimal nutrition and well being for all people by advocating for its members.

American Optometric Association

www.aoanet.org

The mission of the American Optometric Association is to influence the future of eye care by ensuring the welfare of the public and promoting the profession of optometry. Its objectives are centered on improving the quality and availability of eye and vision care.

American Pharmacists Association

<http://www.aphanet.org>

The APHA is the largest national professional society of pharmacists. It is a leader in providing professional information and in advocating for the improved health of the American public through the provision of comprehensive pharmaceutical care.

American Podiatric Medical Association

<http://www.apma.org>

The APMA represents approximately 80 percent of the nation's podiatrists and has more than 20 affiliated and related societies. Its mission is to increase awareness among other health professionals and the public concerning the importance of foot health.

American Society of Health-System Pharmacists

<http://www.ashp.org>

The ASHP represents pharmacists who practice in hospitals and other components of health care systems. It provides extensive publishing, education, and accreditation programs designed to help members improve their delivery of pharmaceutical care.

Bureau of Primary Health Care Health Disparities Collaborative

www.healthdisparities.net

The Collaborative is a partnership program of the Bureau of Primary Health Care, Institute for Healthcare Improvement, National Association of Community Health Centers, Inc., and other strategic partners to generate and document improved health outcomes for underserved populations; transform clinical practice through

models of care, improvement, and learning; develop infrastructure, expertise, and multi-disciplinary leadership to support and drive improved health status; and build strategic partnerships.

Centers for Disease Control and Prevention Division of Diabetes Translation

877-232-3422

<http://www.cdc.gov/diabetes>

The CDC's Division of Diabetes Translation aims to reduce the burden of diabetes on the nation by strengthening public health surveillance systems for diabetes, conducting applied transnational research, developing state-based diabetes control programs, implementing the National Diabetes Education Program (NDEP), and providing public information.

Centers for Medicare & Medicaid Services

410-786-3000

<http://www.cms.gov>

CMS, formerly known as the Health Care Financing Administration (HCFA), is the federal agency responsible for administering Medicare, Medicaid, the State Children's Health Insurance Program (SCHIP), and several other health-related programs.

National Association of Chain Drug Stores

<http://www.nacds.org>

The NACDS provides a wide range of services to meet the needs of the chain drug industry. It provides publications for members and information for consumers.

National Community Pharmacists Association

<http://www.ncpanet.org>

NCPA represents the nation's community pharmacists, including the owners of nearly 24,000 pharmacies. These independently owned pharmacies generate more than \$67 billion in annual sales and dispense nearly half of all retail prescriptions. NCPA is committed to high-quality pharmacist care and to promoting the health and well being of the public.

National Diabetes Education Program

<http://www.cdc.gov/diabetes/ndep>

<http://www.ndep.nih.gov>

<http://www.diabetesatwork.org>

<http://www.betterdiabetescare.nih.gov>

The NDEP brings together public and private partners to improve treatment and outcomes for people with diabetes, promote early diagnosis, and prevent the onset of type 2 diabetes. It promotes diabetes awareness and education activities, and quality diabetes care. The NDEP Web site provides tools for educating health care providers and patients.

National Diabetes Information Clearinghouse

800-860-8747

<http://www.niddk.nih.gov/health/diabetes/ndic.htm>

The NIDDK's National Diabetes Information Clearinghouse is an information and referral service designed to increase knowledge about diabetes among patients and their families, health care professionals, and the public.

National Eye Institute

301-496-5248

<http://www.nei.nih.gov>

The NEI conducts and supports research to help prevent and treat eye diseases and other disorders of vision, including diabetic retinopathy. It also develops public and professional education programs, including the National Eye Health Education Program (NEHEP), a partnership of more than 65 organizations concerned with eye health.

National Heart, Lung, and Blood Institute

301-592-8573

<http://www.nhlbi.nih.gov>

The NHLBI provides leadership for a national program in diseases of the heart, blood vessels, lungs, and blood; blood resources; and sleep disorders. It supports research, develops and evaluates interventions, and conducts educational activities with an emphasis on prevention.

National Institute of Dental and Craniofacial Research

<http://www.nidcr.nih.gov>

The NIDCR conducts and supports research and the training of researchers to promote the oral, dental, and craniofacial health of the American people, prevent diseases and conditions, and develop new diagnostics and therapeutics.

National Institute of Diabetes and Digestive and Kidney Diseases

<http://www.niddk.nih.gov>

The NIDDK conducts and supports basic and clinical research on the treatment and prevention of diabetes and other serious diseases affecting metabolism and the endocrine system, digestion and nutrition, the kidneys and urinary tract, and the blood and blood-forming organs.

National Optometric Association

<http://www.natoptassoc.org>

The NOA promotes the recruitment of minority students for schools and colleges of optometry and their placement into appropriate practice settings upon graduation. It also works to enhance the delivery of eye and vision care services in communities with little or no eye-care presence.

National Oral Health Information Clearinghouse

<http://www.nohic.nidcr.nih.gov>

The NOHIC, a service of the NIDCR, produces and distributes patient and professional education materials and also sponsors the Oral Health Database. NOHIC staff provides free searches on specific topics in oral health.

Selected Publications for Health Care Providers and Patients

Available from the CDC

<http://www.cdc.gov/diabetes/pubs/tcyd/index.htm>

Take Charge of Your Diabetes

Available from the NDEP

(<http://www.ndep.nih.gov>):

- Your GAMEPLAN for Preventing Type 2 Diabetes: Health Care Providers' Toolkit
- Your GAMEPLAN for Preventing Type 2 Diabetes: Information for Patients
- Team Care: Comprehensive Lifetime Management for Diabetes
- Feet Can Last a Lifetime: A Health Care Provider's Guide to Preventing Diabetes Foot Problems
- Diabetes Numbers At-a-Glance (card for health care providers)
- Be Smart About Your Heart
- 7 Principles for Controlling Your Diabetes
- If You Have Diabetes, Know Your Blood Sugar Numbers
- Control Your Diabetes. For Life. Tips for Feeling Better and Staying Healthy
- Asian Language Patient Materials
- Spanish Patient Materials

Available from the NIDCR

(<http://www.nidcr.nih.gov>):

- Diabetes: Dental Tips

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