

The Role of the Dental Professional in Diabetes Care

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Abstract

Diabetes mellitus, specifically type 2 diabetes, is one of the major public health issues facing the world in the 21st Century. This article summarizes the rapid changes in the management of diabetes and its impact on dental practice. The reader will find many "hyperlinks" to other diabetes information on the Internet throughout this article as these links provide greater detail. The incidence of type 1 diabetes has increased slowly, while that of type 2 diabetes has increased explosively. The worldwide incidence of type 2 is likely to double by the year 2010 due in large part to changing lifestyles, longer life expectancy, and rapid growth of ethnic and racial populations that have high prevalence rates. There are 15.7 million people or 5.9% of the population in the United States who have diabetes. While an estimated 10.3 million have been diagnosed, it is unfortunate that 5.4 million people are not aware they have the disease. Diabetic dental patient management strategies are presented. Dental professionals are urged to remain current in their knowledge of this disease in order to provide proper care for their patients.

Keywords: Diabetes mellitus, insulin, hyperglycemia, diabetic patient management, pharmacological management of diabetes, diabetes and oral diseases.

Introduction

Diabetes mellitus is a chronic disorder that is:

1. Characterized by hyperglycemia.
2. Associated with major abnormalities in carbohydrate, fat, and protein metabolism.
3. Accompanied by a marked propensity to develop relatively specific forms of renal, ocular, neurologic, and premature cardiovascular diseases.¹

It is a disease that often goes undiagnosed and one that can compromise the oral health of an afflicted patient. With the known oral complications associated with hyperglycemia, the fact that many individuals are untreated or poorly controlled compromises efforts to provide effective dental care.²

Diagnosis and Classification of Diabetes Mellitus



The classification of diabetes mellitus as Type 1 and 2 was changed in 1997 from the old classification of Insulin-dependent diabetes mellitus (IDDM) and Non-insulin-dependent diabetes mellitus (NIDDM). These older classifications are no longer used.

Types of Diabetes Mellitus

Type 1 diabetes mellitus is an autoimmune disease in which the body does not produce any insulin, most often occurring in children and young adults. People with type 1 diabetes must take daily insulin injections to stay alive. Type 1 diabetes accounts for 5-10% of diabetes. There are an estimated 500,000 to 1 million people with type 1 diabetes in the United States today. The risk of developing type 1 diabetes is higher than virtually all other severe chronic diseases of childhood.

Peak incidence occurs during puberty, around 10 to 12 years of age in girls and 12 to 14 years of age in boys. There is a higher incidence of this type of diabetes in Caucasians than in the Hispanic, Native American, and African-American groups.

Type 2 diabetes mellitus results from the body's inability to make enough, or properly use, insulin. Type 2 diabetes accounts for 90-95% of diabetes. The diagnosis is made in one of three ways:

1. A random blood sugar > 200 mg/dl in the presence of obvious symptoms of diabetes.
2. A fasting blood sugar of > 126 mg/dl.
3. An abnormal 75 gram oral glucose tolerance test where fasting blood sugar is < 126 mg/dl but two hour post-prandial blood sugar > 200 mg/dl and one of the tests is again abnormal on another occasion.

Type 2 diabetes is nearing epidemic proportions due to an increased number of older Americans and a greater prevalence of obesity and a sedentary lifestyle. The underlying problem is insulin resistance, with some degree of insulin deficiency. Often type 2 diabetes can be controlled through weight loss, improved nutrition, and exercise alone. Sometimes these are not enough and either oral medications and/or insulin must be used. People usually develop type 2 after age 45, but often are not aware they have diabetes until severe symptoms occur or they are treated for one of its serious complications. The risk for type 2 increases with age. Nearly 18.4% of the United States population aged 65 or older has type 2 diabetes. Table 1 summarizes the risk for type 2 diabetes.

Table 1

People at Risk for Type 2 Diabetes
* People over age 45
* People with a family history of diabetes
* People who do not exercise regularly
* People with low HDL or high triglycerides
* Certain racial and ethnic groups (e.g., African Americans, Hispanic Americans, Asian & Pacific Islanders, and Native Americans)
* Women who had gestational diabetes or who have had a baby weighing 9 pounds or more at birth

The increased risk for diabetes in minority groups is dramatic. African Americans are 1.7 times as likely to have type 2 diabetes as the general population. An estimated 2.3 million African Americans or 10.8% have diabetes. Hispanic Americans are almost twice as likely to have type 2 diabetes. For example, diabetes affects 1.2 million or 10.6% of the Mexican American population. The overall prevalence of type 2 diabetes in Native Americans is 12.2% vs. 5.2% of the general population. In some tribes, 50% of the population has diabetes.³



Gestational diabetes mellitus is defined as any degree of glucose intolerance with onset or first recognition during pregnancy.⁴ It develops in 2%

to 5% of all pregnancies but disappears when a pregnancy is over. Women who have had gestational diabetes are at increased risk for later developing type 2 diabetes.⁵

“Other specific types” of diabetes result from specific genetic syndromes, surgery, drugs, malnutrition, infections, and other illnesses. This paper will not dwell on those topics.

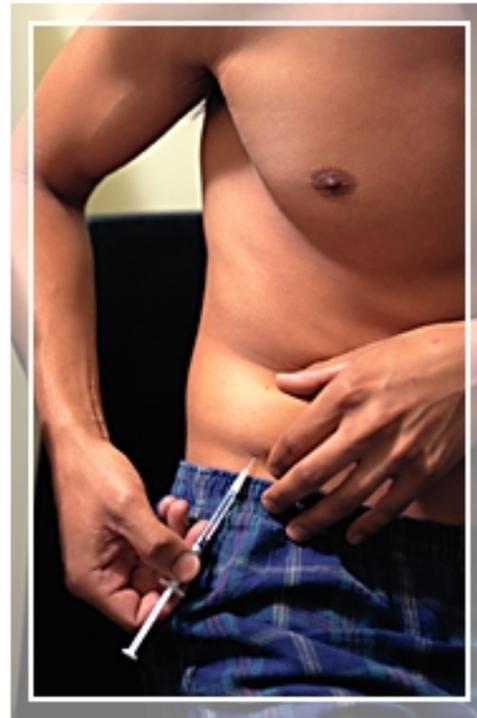
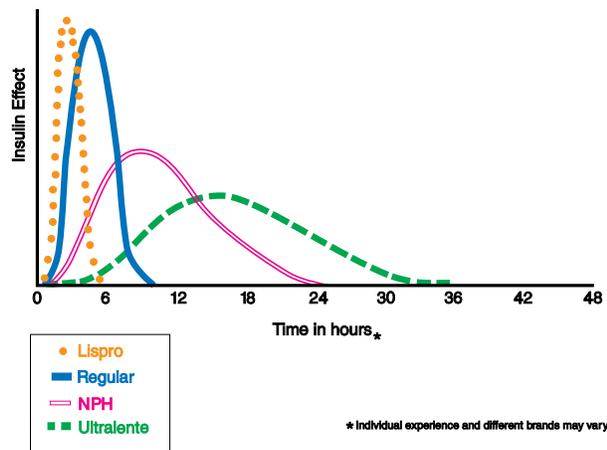


Pharmacological Management

The goal of pharmacological therapy is to achieve levels of glycemic control that will effectively prevent or delay microvascular and neuropathic complications of both type 1 and type 2 diabetes mellitus. Both the *Diabetes Control and Complications Trial (DCCT)* and the *United Kingdom Prospective Diabetes Study (UKPDS)* demonstrated that diabetes complications could be improved by decreasing the average blood glucose concentration. The average blood glucose concentration is determined by a test called the Hemoglobin A_{1c}, which represents the level of glycemic control over the previous 60 to 90 days.

Oral medications are used extensively for the management of persons with type 2 diabetes mellitus. There has been a rapid proliferation of new drugs to improve the treatment outcomes over the past decade with five types available. Most of the drugs available provide an absolute decrease in hemoglobin A_{1c} of 1 to 2%. The drug **Glucophage®** (Metformin) of the biguanide class may increase the risk of lactic acidosis if used in patients who become dehydrated. Thus, it is recommended that patients on the drug who are not eating or drinking normally stop taking the drug until usual oral intake resumes. This should include stopping the drug on the day of a dental procedure and restarting the drug only when normal fluid intake resumes. In certain instances “combination therapy” which includes oral medications with insulin injections is used to achieve better glycemic control. Other oral medications cur-

rently used are **Amaryl®**, **GlucotrolXL®**, **Avandia®**, **Rezulin®**, and **Actos®**. These drugs either serve to augment the supply of insulin from the pancreas (Amaryl, GlucotrolXL) or enhance the effects of insulin (Glucophage, Avandia, Actos, Rezulin).



Insulin therapy is used to manage the hyperglycemia in persons with type 1 and those type 2 individuals that are unable to produce adequate levels of insulin from their pancreas. There are different forms of insulin, each with a different pharmacological action. Humalog (Lispro)® is the newest insulin on the market with a quick onset of action and duration of only two hours. Humalog is rapidly absorbed so diabetics can eat immediately after the insulin is injected. Types and duration of action of insulin exists in short, intermediate and long-acting forms. For up-to-date information, visit the web sites listed in Table 2.

Table 2

Insulin Information Web Sites
* Eli Lilly's Diabetes Management
* Types and Actions of Insulin

Insulin Delivery

Syringes are used to administer insulin in the abdominal area from just below the ribs to the groin area. Patients need to rotate their injection sites and not inject in the same site repeatedly so as to avoid a problem called lipohypertrophy

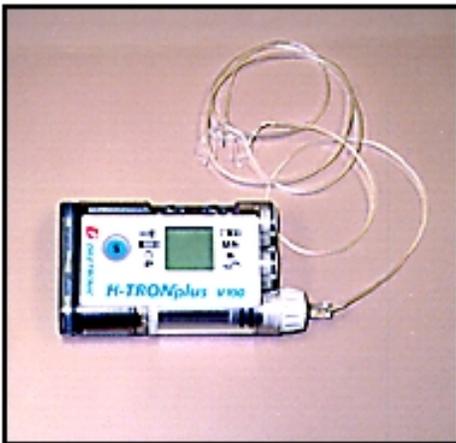
associated with unpredictable insulin absorption. Patients will need to draw up insulin into an insulin syringe or "insulin pens" are now available that are prefilled and can deliver a metered dose.

Continuous subcutaneous insulin infusion (CSII) or the "insulin pump" delivers a basal dosage of insulin for the patient supplemented by a "boost" or bolus at meal times. The pump is connected to the patient by a needle and catheter and is worn on the patient like a pager. Short-acting insulin such as Velosulin® or Humalog Lispro® are used in the pump and stored in a reservoir. Because the basal rate for the pump is established to maintain glucose control without hypoglycemia, the pump can be worn safely through any dental procedure. One must remember that these pumps provide a basal rate of insulin. The two lead manufacturers of insulin pumps are Minimed and Disetronic. Both sites detail specific information on insulin pumps. The Minimed insulin pump and a Disetronic's pump with infusion set are shown in Figures 1 and 2 respectively.

Figure 1: Minimed Insulin Pump



Figure 2: Disetronic Insulin Pump



Oral inhalation is a metered-dose form to be taken in through the mouth. It is still in the clinical trial process for approval by the FDA and may be available in the near future.

Diabetic Complications

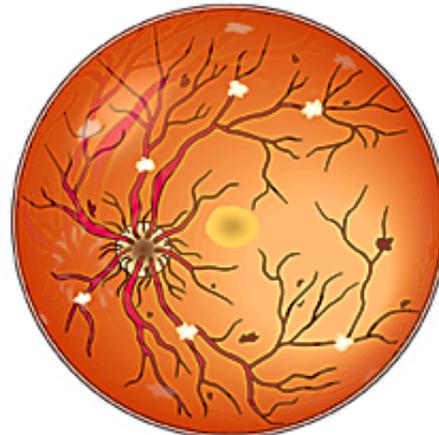
The cardinal feature in preventing the complications of diabetes mellitus is early diagnosis and achieving normoglycemia. The *Diabetes Control and Complications Trial (DCCT)* study compared the development of complications in two groups of type 1 diabetics by treating one group with “standard” therapy and the other group with “intensive” control. The results were stunning with a dramatic reduction in complications for the patients undergoing “intensive” treatment for their diabetes.

The dental professional should be aware of the types and scope of diabetic complications, as they may encounter them before the patient has sought help from their physician.

Diabetic Complications - Chronic

Diabetic eye disease refers to a group of sight-threatening eye problems that people with diabetes may develop as a complication of the disease. They include:

Proliferative Diabetic Retinopathy



 Cotton wool spots

 Neovascularization

 Deep hemorrhage

- * **Diabetic retinopathy:** This disease damages blood vessels in the retina which in turn compromises the light-sensitive tissue at the back of the eye that translates light into electrical impulses that the brain interprets as vision. This is the most common diabetic eye disease.
- * **Cataract:** A cataract is an opacity of the eye’s crystalline lens that results in blurring of normal vision. People with diabetes are twice as likely to develop a cataract as someone who does not have the disease. In addition, cataracts tend to develop around middle age.
- * **Glaucoma:** This disease occurs when increased fluid pressure in the eye leads to progressive optic nerve damage. People with diabetes are nearly twice as likely to develop glaucoma as other adults.

Diabetes is the leading cause of new cases of blindness in people ages 20-74. Each year, from 12,000 to 24,000 people lose their sight because of diabetes. The "Diabetes Control and Complications Trial" mentioned previously reduced the risk for developing retinopathy by 76%. For those with eye damage at the beginning of the study, the disease was slowed by 54%.⁶

More detailed information on this topic can be found on the **National Eye Institute's** web site.

Diabetic neuropathy is a nerve disorder characterized by pain and weakness in the feet. There may also be a loss or reduction of sensation in the feet, and in some cases, the hands. The symptoms are often slight at first; allowing many mild cases to go unnoticed for a long time. The first sign of the disease is usually numbness, pain, or tingling in the hands, feet, or legs.



Occasionally, diabetic neuropathy can flare-up suddenly, causing weakness, burning sensations in the extremities, and weight loss. The loss of sensation in the feet is important as it may increase the possibility of injuries of which the patient is not aware. These foot injuries can develop into ulcers or lesions that can become infected. In some cases, ulcers may not heal and amputation may be required.

Nerve damage caused by diabetes generally occurs over a period of years and may lead to problems with internal organs including the digestive tract, heart, and sexual organs. These problems can cause indigestion, diarrhea or constipation, dizziness, bladder infections, and impotence. Sixty percent of patients with diabetes have some form of neuropathy, but in most cases (30-40%), there are no symptoms. Thirty-four percent of

diabetics have symptoms suggesting neuropathy, compared with 10% of people without diabetes.⁷ For further detailed information on the diagnosis and treatment of Diabetic neuropathy follow the hyperlinks presented in Table 3.

Table 3

Diabetic Neuropathy Web Sites
* Diabetic Neuropathy
* Multidisciplinary Treatment Approach
* Neuropathic Pain Treatment
* Online Diabetes Resources
* Standardized Measures of Diabetic Neuropathy



Renal Arteriogram

Courtesy Dr. E. L. Lansdown
University of Toronto,

Diabetic nephropathy is the leading cause of end-stage renal disease, accounting for about 40% of new cases. In 1995, about 27,900 people initiated treatment for end-stage renal disease (kidney failure) due to diabetes. After having diabetes for 15 years, one-third of people with type 1 diabetes develop kidney disease. Diabetes dam-

ages the small blood vessels in the kidneys, impairing their ability to filter impurities from blood for excretion in the urine. Persons with kidney failure must have a kidney transplant or undergo dialysis to cleanse their blood. Once diabetic renal failure has occurred, there is nearly 100% morbidity within ten years.⁸ For more detailed information on diabetic nephropathy, visit the web sites listed in Table 4.

Table 4

Diabetic Neuropathy Web Sites
* American Association of Kidney Patients
* National Institute of Diabetes and Digestive and Kidney Diseases
* Diabetic Nephropathy Position Statement
* Preventing Diabetic Nephropathy
* Dealing with Diabetic Nephropathy

Stroke or cerebrovascular disease was the third leading cause of death in the United States in 1992. Elevated blood pressure is the major risk factor with diabetes; cigarette smoking and high levels of LDL cholesterol are the others. Persons with diabetes may have a worse prognosis following a stroke. Since the 1930's stroke death rates have been declining ~5%-6% per year in all age, race, and sex groups.⁹ For more information visit the web sites listed in Table 5.

Table 5

Cerebrovascular Web Sites
* National Heart, Lung, and Blood Institute
* National Institute of Neurological Disorders and Stroke
* American Stroke Association

Cardiovascular disease is a very common complication that is seen often in diabetic patients. Atherosclerosis is the most important of all chronic complications because it accounts for ~80% of total diabetic mortality. The most common are:

- * **Coronary Heart Disease** is the development of atherosclerosis in the coronary arteries with the result of obstructing blood flow to the heart muscle. Reduction of hyperlipidemia by improved glycemic control limits this complication. Diabetes itself accelerates atherosclerosis by 200-400%. Diabetic patients are often afflicted with multiple risk factors for atherosclerosis, including such important concomitant or related disorders as hypertension, hyperlipidemia or dyslipidemia, and obesity.
- * **Acute Myocardial Infarction.** Although 70% of patients survive their first myocardial infarction, diabetes increases the risk of recurrent infarction by at least 100% and sudden coronary death by 100-200%. Survivors have considerable loss of muscle mass, sufficient to produce chronic congestive heart failure, the incidence of which is increased by 600% in men and 950% in women with diabetes compared with non-diabetic cohorts.¹⁰ Further information on cardiovascular disease is available on the American Heart Association's web site.



Peripheral vascular disease is the primary reason for non-healing ulceration, pain, and amputation in persons with or without diabetes. The incidence of this disease in diabetics is four times that in non-diabetics. Risk factors include hypertension, smoking, hyperlipidemia, obesity, and family history. Some signs and symptoms include the following:

- * Claudication (the inability to walk a certain distance without an ache or pain in the leg muscles)
- * Feet cold to touch
- * Absent pulses
- * Blanching on elevation
- * Nocturnal and rest pain relieved with dependency

Reduction of symptoms includes smoking cessation, good diabetes control, weight reduction, and an active exercise program.¹¹

Gastrointestinal disturbances caused by autonomic neuropathy are common and often a disabling complication of diabetes. Between 20 and 40% of patients with diabetes mellitus develop dysfunction of the autonomic nervous system. This may be a functional disturbance, as occurs with severe hyperglycemia or ketoacidosis, or a consequence of autonomic neuropathy. The gastrointestinal manifestations are quite variable and include dysphagia, abdominal pain, nausea, vomiting, malabsorption, fecal incontinence, diarrhea, and constipation. The clinical spectrum of these complaints can range from relatively silent to life threatening.¹²

The National Institute of Diabetes and Digestive and Kidney Diseases web site provides more information on this topic.



Dental complications are generally related to poor glycemic control. The most common problems are:

- * **Periodontal Disease** is a common problem in diabetics and is more severe in individuals

that are not well-controlled. The reason for the periodontal destruction is not clear; however, the alteration in host responses to periodontal pathogens account for the differences in periodontal destruction.

- * **Xerostomia** is also a common feature in poorly controlled diabetics and the etiology is unknown. In well-controlled individuals, salivary gland function does not appear to be impaired.

- * **Infections**, especially Candidiasis, are prevalent in diabetics with poor disease control. The evidence for an immunological defect and deficient leukocyte functions superimposed on the metabolic abnormality of diabetes seems increasingly convincing.¹³

The important factor here is that the oral health problem needs to be related to the level of glycemic control for the patient and the patient must be educated about this fact. Further information can be found at the sites listed in Table 6.

Table 6

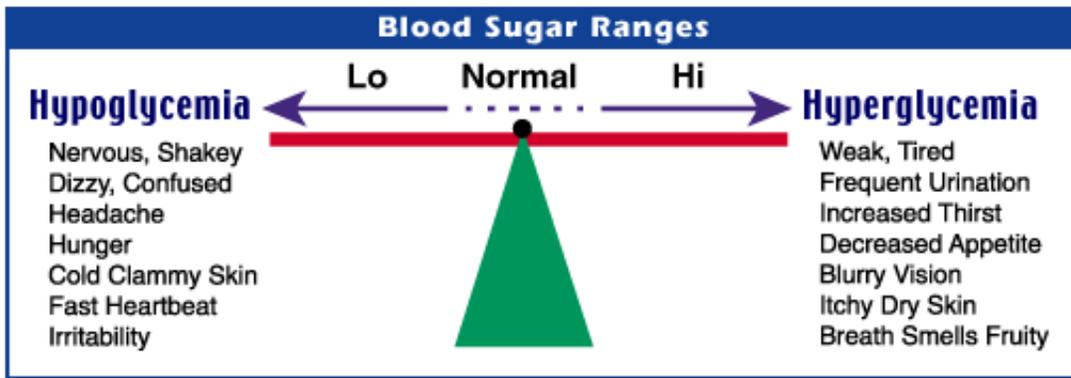
Oral Health and the Diabetic Patient Web Sites
* National Center for Chronic Disease Prevention and Health Promotion
* National Oral Health Information Clearinghouse
* National Institute of Dental and Craniofacial Research

Diabetic Complications - Acute

Hypoglycemia is defined as a blood sugar of <60 mg/dl and is the most common complication of insulin-treated diabetics.

Hypoglycemia may cause a sense of hunger initially, followed by irritability, tachycardia, palpitations, cold sweat, decreased mental abilities followed by confusion and coma if not recognized.

Treatment requires intake of calories with quickly absorbed sources of glucose (tablets, juice, or candy) if the patient is able to chew/swallow. If the diabetic becomes unconscious or swallowing ability is compromised, then glucagons should be administered as well as intravenous glucose.



To reduce the likelihood of hypoglycemia on the day of a dental procedure, diabetic patients should be scheduled as close to 8:00 a.m. as possible. If they take morning insulin and are on both short and intermediate (NPH) or short and long (ultralente) acting insulin, dosage modifications should be made to accommodate for delayed and/or reduced oral intake. In general, the short acting dosage of insulin is withheld, while the usual intermediate or long acting dose is given (or reduced to 3/4 the usual amount if oral intake post-procedure is likely to be poor).

Diabetic ketoacidosis (DKA) results from unrecognized or untreated insulin deficiency (type 1 diabetes) or any severe stress in established type 1 diabetics. With the inadequate glucose utilization in this condition, there is unregulated lipolysis with formation of free fatty acids that are converted to ketones. All type 1 diabetics are encouraged to monitor urine ketones when the blood sugar exceeds 240 to prevent the development to DKA. If urine ketones are positive, supplemental insulin is to be given (often by a sliding scale of subcutaneous regular insulin) every two hours and oral fluids increased until the urine ketones are negative. Inability to increase fluid intake, comply with glucose monitoring and supplemental insulin administration, or resolve hyperglycemia/clear urine ketones is an indication for an emergent evaluation by the patient's diabetologist/primary care provider or emergency room physician. DKA can uncommonly occur in a severely stressed type 2 diabetic if there is decreased insulin action and relative decreased secretion.

Symptoms include fever, malaise, headache, dry mouth polyuria, polydipsia, nausea, vomiting, abdominal pain, and lethargy. Treatment requires replacement of what has been lost during the development of DKA: fluids, insulin, and potassium.

Thus all type 1 diabetics and infrequently type 2 diabetics with dental infections and hyperglycemia are at increased risk for DKA and need to be monitoring urine ketones and adjusting insulin/fluid intake accordingly. The dental professional needs to recognize the often-increased insulin requirement in this setting and encourage the patient to work with his diabetes management team to optimize control and avoid DKA.

Hyperosmolar hyperglycemia nonketotic syndrome is a rare, acute condition of hyperglycemia (usually over 600mg/dl) with the absence of ketones found in type 2 diabetics. This condition is insidious in nature, and patients typically come to medical attention later and sicker.¹⁴ Fluids and insulin therapy accomplish treatment.

Dental Management of the Diabetic Patient

Managing a person with diabetes will become increasingly more complex due in part to improved medical treatment standards. Diagnosis, treatment, and maintenance of diabetic patients with this disease requires a thorough knowledge of the diabetic disease process. In general the dental profession is severely lacking in this knowledge base at a time when this disease is nearing epidemic proportions. Furthermore, the dental professional will be called upon to help manage these patients as part of the "Team Approach" to diabetes management.

It is, therefore, highly recommended the dental professional seek diabetic management training. The International Diabetes Center in Minneapolis, Minnesota has an excellent week long course on "Team Management of Diabetes." This is not the only course or class of its type. Diabetes education classes can be found in most medical centers. The knowledge base for diabetes and its management is dynamic and will continue to be modified in all areas of care, and dental professionals are advised to remain current in their knowledge of this rapidly changing area.

Dentists should become familiar with the *Standards of Medical Care for Patients with Diabetes Mellitus* to better assess the diabetic patient's level of medical care. Familiarity with the *Nutrition Recommendations and Principles for People with Diabetes Mellitus* is also advisable since many dental services may affect a patient's ability to function orally. The dental professional will find that many of their diabetic patients are not receiving the minimal standard of medical care, and this can create the scenario resulting in poor dental treatment outcomes.



There are several psychosocial aspects for the person with diabetes. They include:

- major depression,
- eating disorders,
- stress,
- and impotence.

Diabetics with eating disorders will have extensive dental problems and will require a multi-specialty approach for appropriate management.

The following is an outline for the dental professional in the care of the diabetic patient:

Health Questionnaire

Frequent updates of the health history is imperative for these patients since their condition can change rapidly. A simple question like, "How are you feeling today?," may reveal problems not yet evaluated by their physician. Also, information should include whether the patient is self-monitoring their blood sugars daily and if a glycated hemoglobin (hemoglobin A_{1c}) has been run in the past 60-90 days. Table 7 contains a list of questions to ask a diabetic patient during a review of their health history.

Table 7

Questions to Ask a Diabetic Patient
* Do you self-monitor your blood sugar?
* If so, how often?
* What were the blood sugar values?
* How are you feeling?
* Are you having any problems with your eyes, feet or legs?
* When have you last seen your physician?
* Do you see an eye doctor yearly?
* Have you had nutrition counseling?
* What medications have you taken today?
* Do you know what your average hemoglobin is? (the hemoglobin A _{1c})

Assessing Glycemic Control

It is important to ensure that the blood glucose is less than 200 mg/dl prior to an invasive procedure. If the blood glucose exceeds 200 mg/dl, the white blood cells decrease in function.¹⁵ Deciding whether to utilize antibiotic prophylaxis before an invasive dental procedure should be made after medical consultation. The dentist should not be afraid to test the patient's glucose

in their office using a glucometer prior to an invasive dental procedure or if the patient does not feel well. This may be symptomatic of an acute complication.

Seeking a Medical Consultation

The dentist should not hesitate to seek a medical consultation in support of a plan of care. Table 8 provides a summary of conditions that should alert the dental professional to seek such consultations.

Table 8

Conditions Which Warrant a Medical Consult
* When it is apparent that the patient has diabetic complications previously undiagnosed by their physician
* When the patient has not seen their physician within the past six months
* When the patient presents with an acute dental infection and the patient's glucose exceeds 200 mg/dl
* If the patient has never had formal diabetes education training
* When questions arise about glycemic control and invasive dental procedures
* When adjustments of diabetes medications are needed
* Nutritional support during extended post-operative periods

Dental Treatment Considerations

There are several simple strategies dental professionals can use to manage a diabetic dental patient. These are listed in Table 9.

Table 9

Basic Patient Management Strategies
* Schedule dental appointments in the early to mid-morning hours
* Keep appointments short
* Use adjunct sedation procedures when appropriate
* Instruct patient to continue normal dietary intake before dental procedures
* Prior to an invasive procedure, check the patient's blood glucose
* Modify diet to soft solids and liquids when patient is expected to have difficulty eating solid foods after dental procedures
* Perform appropriate follow-up care in the post-operative period
* Frequent recall examinations and prophylaxis
* Use of topical fluoride when patients are at risk for caries
* Supportive, palliative care for dry mouth using salivary substitutes

Specific Dental Problems

Periodontal Disease: Aggressive soft tissue management, periodontal scaling, root planing and periodontal surgery are indicated depending on the level of periodontal disease involvement. The patient's level of disease control should be reassessed on a regular basis and related to any oral health problems they may have.

Infections: Host immune defenses are altered in the diabetic patient through several mechanisms. High glucose concentrations in blood and body fluids promote the overgrowth of certain fungal pathogens, particularly the *Candida* species. Infections, whether from the mouth or other sites, will sometimes cause an increase in blood glucose levels. Treatment of infection in a patient with diabetes requires aggressive antibiotic therapy.

Xerostomia: The primary cause of this condition is due to poor glycemic control. A non-inflammatory, non-neoplastic enlargement of the parotid gland is believed to occur in 25% of patients with moderate to severe diabetes and especially in IDDM patients with poor metabolic control.¹⁶ However, in well-controlled individuals with altered glucose metabolism, salivary gland function does not seem to be significantly impaired.¹⁷ A secondary cause of this condition that must be considered is due to drug side effects especially the psychotropic and anti-hypertensive drugs.



Caries: Various studies have shown a caries incidence in diabetics to be higher, lower, or similar to non-diabetics depending on the study. Adult patients with poor control seem to have more coronal caries. This area requires more research before conclusions can be drawn.

Summary

The importance of diabetes care in the dental practice is only as important as the dentist wants it to be. Practicing dental professionals must prepare themselves for the increase in the diabetic patient population and the extensive medical care that they require to curtail the development of complications. Dentist's training in preventive healthcare philosophy makes them aptly suited to play a significant role as part of the "Diabetes Team."

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8. Diabetic nephropathy. National Institute of Diabetes, Digestive and Kidney Disorders. National Institutes of Health. www.niddk.nih.gov
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Additional Resources

The authors have providing the following list of additional readings for the convenience of the readership.

Book Resources

[American Diabetes Association Complete Guide to Diabetes](#), American Diabetes Association, Call 1- (800) DIABETES.
[Therapy for Diabetes Mellitus and Related Disorders, 3rd edition](#); American Diabetes Association, Clinical Education Series, 1998.
[Women & Diabetes, Life Planning for Health and Wellness](#), American Diabetes Association, 1998.
[Diabetes in America](#), 2nd Edition, National Institute of Health, National Institute of Diabetes, Digestive and Kidney Diseases, National Diabetes Information Clearinghouse, 1995.
[Medical Management of Type 1 Diabetes](#), 3rd edition; American Diabetes Association, Clinical Education Series, 1998.
[Medical Management of Type 2 Diabetes](#), 3rd edition; American Diabetes Association, Clinical Education Series, 1998.
[Practical Psychology for Diabetes Clinicians](#) by Barbara J. Anderson and Richard R. Rubin, PhD, CDE, Editors.

On-line Resources

American Diabetes Association www.diabetes.org
Juvenile Diabetes Foundation www.jdfcure.org
National Institute of Dental and Craniofacial Research www.nidr.nih.gov
American Dental Association www.ada.org
American Academy of Periodontology www.perio.org
National Institute of Health www.nih.gov
National Institute of Diabetes and Digestive and Kidney Diseases www.niddk.nih.gov
Minimed Corporation www.minimed.com

Centers of Disease Control and prevention www.cdc.gov/nccdphp/ddt/ddthome.htm
 American Association of Diabetes Educators www.aadenet.org
 The Doctor's Guide to Diabetes Information & Resources www.pslgroup.com/DIABETES.htm
 Eli Lilly's Managing Your Diabetes Patient Education Program www.diabetes.lilly.com
 Joslin Diabetes Center at Harvard Medical School
 Becton-Dickinson and Company www.bd.com
 NetHealth's Diabetes www.diabetes.com
 Roche Diagnostics Diabetes Care USA www.roche.com
 Children with Diabetes
 International Diabetes Center
 Diabetes Monitor www.diabetesmonitor.com
 Diabetes Information at Mediconsult.com www.mediconsult.com/diabetes
 Diabetes Well www.diabeteswell.com
 Diabetes Health Economics Study Group www.pitt.edu/~tjs/diabecon.html
 Children with Diabetes on-line Community www.childrenwithdiabetes.com
 Birthplace of insulin www.diabetes.ca/banting/banting.htm
 Ask NOAH about: Diabetes is a partnership of the New York Online Access to Health www.noah.cuny.edu/diabetes/diabetes.html
 Amaryl www.amaryl.com
 GlucotrolXL www.pfizer.com/hml/know/knowglucotrolxl.html
 Glucophage www.diabetesnetwork.com
 Parke-Davis Rezulin www.rezulin.com
 Avandia Smith-Kline Beecham Pharmaceuticals www.avandia.com
 Actos pioglitazone HCL www.actos.com
 American Association of Clinical Endocrinologists www.aace.com/indexjava.htm
www.diabeteswebsite.com
 National Eye Institute www.nei.nih.gov

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Frank Varon, DDS is a general dentist practicing in Omaha, Nebraska. He graduated from the University of Texas-Dental Branch, Houston. His professional affiliations include the American Dental Association, Nebraska Dental Association, Omaha District Dental Society, Chicago Dental Society, American Academy of Oral Medicine and the American Dental Association, Professional Section member, Council on Complications. He has authored many papers and presentations on diabetes care for the dental profession and oral healthcare for the diabetic patient. He serves as a dental consultant for the Diabetes Monitor and Children with Diabetes web sites. Dr. Varon intends to launch his own web site on oral health for the diabetic patient, www.diabeticoralhealth.com, in the year 2000. He can be e-mailed at fvaron@home.com



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