Is the initiation of non-invasive dental hygiene procedures* contra-indicated?  No

- Is medical consult advised? ................................................. No, unless previously diagnosed diabetes is thought to be poorly controlled and/or there are significant untreated complications (e.g., infection or renal/cardiovascular disease). Urgent referral (e.g., to the emergency room) should occur if diabetic ketoacidosis or significant hypoglycemia is suspected. If diabetes is newly suspected based on the patient/client’s presenting signs/symptoms or history (including history of fasting blood glucose ≥ 7.0 mmol/L [126 mg/dL], 2-hour postprandial1 blood glucose ≥11.1 mmol/L [200 mg/dL], or hemoglobin A1C ≥ 6.5%), the patient/client should be referred to a physician/nurse practitioner for definitive diagnosis and medical management.

Is the initiation of invasive dental hygiene procedures contra-indicated?** Possibly, under certain circumstances of poor diabetes control. See below under “medical clearance”.

- Is medical consult advised? ................................................. See above. Consultation may also be required for consideration of antibiotic prophylaxis (see below) and for clearance after postponement of treatment.
- Is medical clearance required? .............................................. No, assuming diabetes is well controlled.
  - Yes, if blood glucose is < 3.9 mmol/L [70 mg/dL] or is > 11.1 mmol/L [200 mg/dL]). Such clearance is particularly important in the presence of various comorbidities2. Blood glucose < 3.9 mmol/L [70 mg/dL] should typically involve prompt administration of carbohydrates.
  - Yes, if there are any concerns about the patient/client’s suitability for invasive procedures regardless of blood glucose level (including oral infection or infection elsewhere in the body).
- Is antibiotic prophylaxis required? ........................................ No, not routinely in patients/clients with well controlled diabetes and no evidence of infection. However, patients/clients with diabetes may have compromised immunity, which places them at risk for distant-site infections from dental procedures. Thus, prophylactic antibiotic premedication before periodontal instrumentation should be considered for the poorly controlled diabetic patient/client in consultation with the patient/client’s physician.
- Is postponing treatment advised? ........................................ Yes, if blood glucose is < 3.9 mmol/L [70 mg/dL], which indicates hypoglycemia (and which should typically entail prompt administration of carbohydrates). Non-emergency dental work and dental hygiene care, including scaling of teeth and root planing, should be postponed until the patient/client’s blood glucose is better controlled.
  - Yes, if blood glucose is > 11.1 mmol/L [200 mg/dL], which indicates significant hyperglycemia. Invasive procedures should be postponed until medical clearance is obtained, ideally in conjunction with better control of the patient/client’s blood glucose. Non-emergency dental work and dental hygiene care, including scaling of teeth and root planing, should be postponed until the patient/client’s blood glucose is better controlled, and generally should not be provided if blood glucose is > 13.3 mmol/L [> 240 mg/dL], at which level ketoacidosis may start to become a concern.

Oral management implications

- Dental hygienists are in a position to detect new cases of diabetes mellitus based on history and examination, and to refer for medical follow-up.
- With optimal control of blood glucose levels and good oral hygiene, patients/clients with diabetes are less likely to develop gum disease and other oral problems.

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1 “Postprandial” means “after a meal”. In the controlled medical setting, 75 g of glucose is ingested by a person with suspected diabetes in an oral glucose tolerance test (OGTT), and plasma glucose is measured two hours later.

2 Co-morbidities of concern include post-myocardial infarction, kidney disease, heart failure, symptomatic angina, advanced age, cardiac dysrhythmia, cerebrovascular accident (stroke), and hypertension (with blood pressure >180/110 mm Hg).
Oral management implications (cont’d)

- Persons living with diabetes should be advised to promptly report any signs of gum disease (e.g., redness, swelling, and bleeding) — as well as dry mouth, loose teeth, and mouth pain — to their oral healthcare professional.

- Patients/clients with well-controlled diabetes (blood glucose of 4.4 to 6.7 mmol/L [80 to 120 mg/dL]) can be treated safely, provided that their daily routine is not significantly affected. Patients/clients should be told to take their usual insulin dosage or other medication and to eat normal meals before the appointment, which is usually best scheduled for the morning.

- Persons with uncontrolled diabetes are at increased risk of medical emergencies, including coma, insulin shock (severe hypoglycemia resulting from too much insulin relative to food intake), severe hyperglycemia (ketoacidotic and non-ketotic hyperosmolar), lactic acidosis, uremia, infection, myocardial infarction, and stroke.

- Patients/clients with diabetes are better able to tolerate transient periods of hyperglycemia than periods of hypoglycemia.

- Patients/clients with type 2 diabetes are typically less prone to acute fluctuations in blood glucose levels and are better able to tolerate all forms of dental treatment than are patients/clients with type 1 diabetes.

- To inform care provision to the patient/client who has diabetes, the dental hygienist should determine the level of disease severity and the level of glycemic control, particularly the patient/client’s blood glucose level at the time dental hygiene therapy is to be provided. This can be accomplished by asking about home glucose monitoring (e.g., glucometer) and determining the most recent glucose level, as well as enquiring about the frequency and most recent occurrence of insulin reactions. The frequency of physician visits should also be ascertained, as well as the timing and results of the last A1C test. [Hemoglobin A1C (i.e., glycosylated hemoglobin) is used to assess the long-term control of hyperglycemia over the past 2 to 3 months; in well-controlled diabetes, the level should stay below 7%.] The patient/client should be asked to promptly inform the dental hygienist if there are any signs/symptoms of hypoglycemia during the dental hygiene appointment.

- There are many types of insulin preparations (rapid-acting, short-acting, intermediate-acting, long-acting, and premixed combinations) and oral anti-diabetic drugs [including sulfonylureas, biguanides (e.g., metformin), alpha-glucosidase inhibitors, thiazolidinediones/glitazones, glinides, incretin (GLP-1) analogues, dipetidyl peptidase-4 (DPP-4) inhibitors and combination drugs]. The dental hygienist should determine the type of medical treatment being used, including the amount and frequency of insulin injection.

- To reduce the risk of hypoglycemia, diabetic patients/clients should be scheduled for morning appointments when glucose levels tend to be highest. Patients/clients should also be advised to eat normally and take their usual medications. In persons with type 1 diabetes, inappropriate insulin regimens, delayed or decreased food intake, increased exercise, potentiating drugs, alcohol, and hypoglycemic unawareness (absence of signs/symptoms, long-standing diabetes, autonomic neuropathy) increase risk of hypoglycemia. In patients/clients with type 2 diabetes, oral sulfonylurea agents (e.g., glyburide) and glinides (e.g., repaglinide) may result in hypoglycemia. However, the commonly prescribed biguanide metformin is not associated with risk of hypoglycemia. The analgesic aspirin (ASA) and other non-steroidal anti-inflammatory drugs (NSAIDs) should be avoided in patients/clients taking sulfonylureas, because these can worsen hypoglycemia.

- The dental hygienist should be alert for signs and symptoms of hypoglycemia in the diabetic patient/client, particularly if the person is taking insulin or sulfonylurea drugs. The mild stage of hypoglycemia, which is most common, manifests as trembling, weakness, tachycardia, palpitations, pallor, sweating, anxiety, nausea, hunger, and, less frequently, paresthesias (i.e., tingling). In the moderate stage, the patient/client becomes incoherent and uncooperative, with impaired judgment and orientation. The severe stage involves unconsciousness, hypotension, and hyperthermia with or without tonic or clonic muscular movements. The reaction to excessive insulin in the mild to moderate stages can often be corrected by giving the patient/client sweetened fruit juice or anything with sugar in it; there should be a ready glucose source in the clinic. The severe stage (unconsciousness) constitutes a medical emergency, with prompt emergency treatment required (e.g., intravenous glucose solution, or glucagon for temporary relief). It is advisable that all patients/clients with symptomatic hypoglycemia, even if corrected in the dental hygiene office, be referred for prompt medical attention.
Oral management implications  

- Oral infections complicate diabetes control, because the bacteria from severe gum disease may increase both blood glucose levels and the length of time the body deals with high blood sugar. In turn, gum disease tends to be more severe among persons with diabetes, because suboptimal control of DM decreases the ability to fight infection and slows healing. Thus, the relationship between gum disease and diabetes is two-way. Preventing and treating gum disease helps improve blood sugar control.

- **Oral candidiasis** is treated with antifungal medication (e.g., nystatin suspension), as well as by controlling blood glucose levels.

- **Xerostomia** is treated by controlling blood glucose levels, as well as by common measures to reduce dry mouth.

- To reduce the risk of hyperglycemia and ketoacidosis, periods of waiting and treating time should be minimized to reduce patient/client stress. (Stressed patients/clients release hormones that can affect insulin uptake and blood glucose levels.)

- Patients/clients with diabetes being treated with insulin who develop oral infections may require an increase in insulin dosage; a physician should be consulted.

- Gingival and periodontal diseases associated with the systemic factors of diabetes may not respond well to therapeutic scaling, periodontal debridement, and oral biofilm control. However, removal of hard and soft deposits from crown and root surfaces of teeth is important to prevent periodontal infection. Unnecessary tissue manipulation should be avoided to minimize the risk of post-procedural infection and poor healing.

- Antimicrobial treatment (e.g., 100 mg of systemic doxycycline daily for two weeks in the non-pregnant adult patient/client) has the potential to improve glycemic control following scaling and root debridement. [Note: A well-controlled diabetic with no evidence of infection does not require prophylactic antibiotics.]

- Tobacco cessation should be encouraged, given tobacco’s well-known adverse effects, which includes increasing the risk of serious diabetes complications.

Oral manifestations

- The risk of dental caries — especially in the cervical region — is elevated in diabetic persons, because elevated blood glucose levels enhance the supply of sugars to oral bacteria. Xerostomia also contributes to caries occurrence.

- Patients/clients with diabetes have an accentuated response to plaque. Consequently, the gingiva can be hyperplastic and erythematous, and acute and fulminating abscesses can occur.

- Bilateral, asymptomatic parotid gland swelling with increased saliva viscosity may occur.

- Odontalgia and percussion sensitivity (acute pulpitis) can result from microangiopathy in pulp blood vessels.

- Periodontal changes include periodontal disease (resulting from accumulation of advanced glycation end products), excessive bone loss, tooth mobility, early tooth loss, rapidly progressive pocket formation, gingival bleeding, and subgingival polyps. Overall, periodontal disease is more severe and more frequent in persons with poorly controlled diabetes, and it may be a predictive clinical marker for diabetes in persons who have not yet developed diabetes.

- Diabetes predisposes persons to slow wound healing and increased susceptibility to oral infection, including gingivitis, periodontitis, and fungal infection (including oral candidiasis and mucormycosis, a rare fungal infection that affects the palate and maxillary sinuses). Oral ulcers refractory to therapy, irritation fibromas, and dry socket may also occur.

- Glossodynia and median rhomboid glossitis (glossal central papillary atrophy) may occur, in addition to burning mouth symptoms associated with diabetic neuropathy.

- Oral lichen planus (in various “lichen-like” manifestations) occurs in up to 30% of persons with diabetes.
**DIABETES MELLITUS**
(also known as “diabetes” or “DM”)

### Oral manifestations (cont’d)

- “Fruity” acetone breath occurs when a person is in a ketoacidotic state and is close to a diabetic coma. Immediate medical/emergency referral is indicated.
- Metallic taste can occur with use of the oral hypoglycemic drug metformin.

### Related signs and symptoms

- More than 2.4 million Canadians have diabetes. This figure includes about one million Ontarians, representing 7.5% of the Ontario population. First Nations persons have an incidence of diabetes that is 3 to 5 times that of the general population.
- The prevalence of diabetes in Canada (and in many other countries) has increased dramatically over the past several decades. This is due primarily to the rise in obesity, which predisposes persons to type 2 diabetes.
- Diabetes mellitus is a group of metabolic diseases characterized by hyperglycemia (high blood glucose levels). There are three main types:
  - **Type 1 (insulin deficient),** which is usually diagnosed in children and young adults less than 40 years of age, occurs when the pancreas is unable to produce insulin (which is the hormone that regulates glucose in the blood). Onset is usually abrupt. Signs/symptoms include polydipsia (excessive thirst), polyuria (excessive urination), polyphagia (excessive hunger or increased appetite), weight loss, weakness, and fatigue. Body build is usually thin. About 10% of persons with diabetes have type 1 DM. Insulin, primarily via subcutaneous injection or pump, is required for all type 1 diabetics.
  - **Type 2 (insulin resistant),** which usually develops in adults older than 40 years of age, occurs when the pancreas does not produce enough insulin or when the body does not effectively use insulin (i.e., “insulin resistance”). Onset is usually gradual, and specific signs/symptoms are frequently absent, but may include recurring skin, gum, or bladder infections; fatigue; blurred vision; tingling or numbness in hands or feet; and itching. About 90% of persons with diabetes have type 2 DM, which is often associated with obesity and poor nutrition. In addition to weight reduction, dietary management, and exercise, oral hypoglycemic medications may be employed, with insulin ultimately being required in up to 40% of Type 2 diabetics.
  - **Gestational,** which is temporary glucose intolerance that occurs in 2% to 6% of pregnant women, usually after 24 weeks of gestation. In most women, it does not cause noticeable symptoms during pregnancy. However, both mother and child are at elevated risk of developing diabetes later in life.
- **Prediabetes** refers to a condition where a person’s blood glucose levels are higher than normal (either impaired glucose tolerance or impaired fasting glucose), but not yet sufficiently high to fit the diagnostic criteria for diabetes.
- The severity of complications of DM is largely dependent on the degree of glycemic control. Complications affect the eyes (retinopathy, cataracts, glaucoma); kidneys (glomerulonephritis, nephrosclerosis, pyelonephritis, and renal failure); nerves (somatic and autonomic neuropathy, the former most commonly manifesting as numbness, pain, and weakness in the feet, legs, hands, and arms, and the latter resulting in gastroparesis [delayed gastric emptying]); heart (angina and myocardial infarction); blood vessels (microvascular angiopathy, as well as macrovascular disease caused by accelerated atherosclerosis); skin (pruritus, xanthoma diabeticorum [fat deposits in the skin], furunculosis, and limited joint mobility); and the reproductive system (miscarriages, stillbirths, high birth-weight babies, congenital defects, and neonatal deaths, as well as erectile dysfunction). Atherosclerotic sequelae include hypertension (which affects about 70% of people with diabetes), stroke, and ulceration and gangrene of the feet. Elevation of blood glucose is also associated with alterations in lipid and protein metabolism.
### Disease/Medical Condition

**DIABETES MELLITUS**

(also known as “diabetes” or “DM”)

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#### Related signs and symptoms *(cont’d)*

- Acanthosis nigricans is a skin disorder associated with type 2 diabetes. It is characterized by hyperpigmented, velvet-textured plaques that are symmetrically distributed in folds and creases of the body. The dental hygienist may identify acanthosis nigricans of the neck and hands during clinical evaluation.

- Diabetes is associated with an elevated risk of clinical depression.

- In addition to reduction in quality of life, life expectancy is reduced by at least 5 to 10 years, depending on the duration and severity of the disease.

- Ketoacidosis may result when blood glucose levels rise to > 22.2 mmol/L [>400 mg/dL]; in this potentially life-threatening condition (more common in Type 1 rather than Type 2 diabetics), the body catabolizes fats and proteins to satisfy energy requirements, with consequent production of ketoacids and ketones, which acidify the blood. Signs/symptoms include “fruity” acetone breath, frequent urination, excessive thirst, nausea, dry skin and mucous membranes, flushed facial appearance, abdominal tenderness, and rapid, deep breathing.

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#### References and sources of more detailed information


  [www.oda.on.ca/oral-health-a-your-body/diabetes-awareness](http://www.oda.on.ca/oral-health-a-your-body/diabetes-awareness)

  [https://www.cdha.ca/pdfs/profession/resources/0504_your_mouth_portal.pdf](https://www.cdha.ca/pdfs/profession/resources/0504_your_mouth_portal.pdf)

- Caring for Your Teeth. Canadian Diabetes Association.  


- DKA (Ketoacidosis) & Ketones. American Diabetes Association.  


*cont’d on next page…*
**DIABETES MELLITUS**

(also known as “diabetes” or “DM”)

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**References and sources of more detailed information (cont’d)**

- Diabetic Ketoacidosis. Medscape.  

- Type 1 Diabetes. PennState Health.  


  [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3609373/](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3609373/)


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* Includes oral hygiene instruction, fitting a mouth guard, taking an impression, etc.

** Ontario Regulation 501/07 made under the Dental Hygiene Act, 1991. Invasive dental hygiene procedures are scaling teeth and root planing, including curetting surrounding tissue.

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