

Canadian Diabetes Association Clinical Practice Guidelines Expert Committee
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Introduction

In the *2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada*, the peer-reviewed evidence published since 2003 relevant to the prevention and management of diabetes was assessed by volunteers from the Clinical Practice Guidelines Expert Committee, and incorporated into revised recommendations for the care of Canadians living with diabetes, as well as preventive measures for populations at high risk of developing type 2 diabetes. In addition to updating chapters from the previous guidelines, a number of new chapters have been added, widening the scope to address emerging research in cardiovascular disease and diabetes or in self-management, for example. It is our hope that, ultimately, these guidelines will lead to improved quality of care, reduced morbidity and mortality from diabetes and its complications, and a better quality of life for people living with this chronic disease.

The intent of this executive summary is to provide a general overview of the entire guidelines document and to highlight some of what is new in the 2008 guidelines. For further information, see the full guidelines document.

DEFINITION, CLASSIFICATION AND DIAGNOSIS OF DIABETES AND OTHER DYSGLYCEMIC CATEGORIES

- The chronic hyperglycemia of diabetes is associated with significant long-term sequelae, particularly the damage, dysfunction and failure of various organs.
- A fasting plasma glucose (FPG) level of 7.0 mmol/L correlates most closely with a 2-hour plasma glucose value of ≥ 11.1 mmol/L in a 75-g oral glucose tolerance test and best predicts the development of microvascular disease. This permits the diagnosis of diabetes to be made on the basis of the commonly available FPG test.
- The term “prediabetes” is a practical and convenient term for impaired fasting glucose and impaired glucose tolerance, conditions that place individuals at risk of developing diabetes and its complications.

HIGHLIGHTS OF REVISIONS

- Coverage of the definitions of metabolic syndrome has been expanded.

SCREENING FOR TYPE 1 AND TYPE 2 DIABETES

- In the absence of evidence for interventions to prevent or delay type 1 diabetes, screening for type 1 diabetes is not recommended.
- Screening for type 2 diabetes using a fasting plasma glucose (FPG) should be performed every 3 years in individuals ≥ 40 years of age.
- While the FPG is the recommended screening test, a 2-hour plasma glucose in a 75-g oral glucose tolerance test (OGTT) is indicated when the FPG is 6.1 to 6.9 mmol/L and may be indicated when FPG is 5.6 to 6.0 mmol/L and suspicion of type 2 diabetes or impaired glucose tolerance (IGT) is high (e.g. for individuals with risk factors).

HIGHLIGHTS OF REVISIONS

- ▶ The 2003 chapter "Screening and Prevention" has been divided into 2 separate chapters: "Screening for Type 1 and Type 2 Diabetes" and "Prevention of Diabetes."
- ▶ Screening recommendations have been revised and strengthened to better identify individuals with IGT or diabetes. Testing with a 2hPG in a 75-g OGTT should be undertaken in individuals with an FPG of 6.1 to 6.9 mmol/L and may be undertaken in individuals with an FPG of 5.6 to 6.0 mmol/L and ≥ 1 risk factors in order to identify individuals with IGT or diabetes [Grade D, Consensus]

PREVENTION OF DIABETES

- As safe and effective preventive therapies for type 1 diabetes have not yet been identified, any attempts to prevent type 1 diabetes should be undertaken only within the confines of formal research protocols.
- Intensive and structured lifestyle modification that results in loss of approximately 5% of initial body weight can reduce the risk of progression from impaired glucose tolerance (IGT) to type 2 diabetes by almost 60%.
- Progression from prediabetes to type 2 diabetes can also be reduced by pharmacologic therapy with metformin (~30% reduction), acarbose (~30% reduction) and thiazolidinedione (~60% reduction).

HIGHLIGHTS OF REVISIONS

- ▶ The 2003 chapter "Screening and Prevention" has been divided into 2 separate chapters: "Screening for Type 1 and Type 2 Diabetes" and "Prevention of Diabetes."
- ▶ The evidence base for prevention in both type 1 and type 2 diabetes has been expanded.
- ▶ The recommendation for pharmacologic prevention has been expanded: in individuals with IGT and/or impaired fasting glucose and no known cardiovascular disease, treatment with a thiazolidinedione could be considered to reduce the risk of type 2 diabetes [Grade A, Level 1A].

MANAGEMENT

Organization of Diabetes Care

- Diabetes care depends upon the daily commitment of the person with diabetes to self-management practices with the support of an integrated diabetes healthcare (DHC) team.
- The DHC team should be multi- and interdisciplinary, and should establish and sustain a communication network among the health and community systems needed in the long-term care of the person with diabetes.
- Diabetes care should be systematic and, when possible, should incorporate organizational interventions such as electronic databases, automatic reminders for the patient and DHC team, and adaptations for distance.

HIGHLIGHTS OF REVISIONS

- ▶ Case management by health professionals with specialized training in diabetes should be considered in those individuals with difficult-to-manage diabetes [Grade B, Level 2].

Self-management Education

- Self-management education (SME) that incorporates knowledge and skills development, as well as cognitive behavioural interventions, should be implemented for all individuals with diabetes.
- The content of SME programs must be individualized according to the individual's type of diabetes, current state of metabolic stability, treatment recommendations, readiness for change, learning style, ability, resources and motivation.
- SME is a fundamental component of diabetes care and is most effective when ongoing diabetes education and comprehensive healthcare occur together.

- All providers should implement interventions in a collaborative manner that increases the adult patient's participation in healthcare decision-making.

HIGHLIGHTS OF REVISIONS:

- ▶ This chapter is a new addition for 2008.

Targets for Glycemic Control

- Optimal glycemic control is fundamental to the management of diabetes.
- Both fasting and postprandial plasma glucose levels correlate with the risk of complications and contribute to the measured glycated hemoglobin value.
- When setting treatment goals and strategies, consideration must be given to individual risk factors such as age, prognosis, presence of diabetes complications or comorbidities, and their risk for and ability to perceive hypoglycemia.

HIGHLIGHTS OF REVISIONS

- ▶ A target A1C of $\leq 6.5\%$ may be considered in some patients with type 2 diabetes to further lower the risk of nephropathy [Grade A, Level 1A], but this must be balanced against the risk of hypoglycemia [Grade A, Level 1A], and increased mortality in patients who are at significantly elevated risk of cardiovascular disease [Grade A, Level 1A].

Monitoring Glycemic Control

- Glycated hemoglobin (A1C) is a valuable indicator of treatment effectiveness, and should be measured every 3 months when glycemic targets are not being met and when diabetes therapy is being adjusted.
- Awareness of all measures of glycemia, including self-monitoring of blood glucose (SMBG) results and A1C, provide the best information to assess glycemic control.
- For individuals using insulin, SMBG should be recommended as an essential part of diabetes self-management.
- The frequency of SMBG should be determined individually, based on the type of diabetes, the treatment prescribed, hypoglycemia risk, the need for information about BG levels and the individual's capacity to use the information from testing to modify behaviours or adjust medications.
- SMBG should include both pre- and postprandial measurements.

HIGHLIGHTS OF REVISIONS

- ▶ A1C testing at 6-month intervals may be considered in adults during periods of treatment and lifestyle stability when glycemic targets have been consistently achieved [Grade D, Consensus].
- ▶ When ketone testing is indicated for individuals with type 1 diabetes, blood ketone testing may be preferred over urine ketone testing, as it has been associated with earlier detection of both ketosis and response to treatment [Grade B, Level 2].
- ▶ The evidence related to continuous glucose monitoring systems is expanding, and practitioners should be aware of this technology.

Physical Activity and Diabetes

- Moderate to high levels of physical activity and cardiorespiratory fitness are associated with substantial reductions in morbidity and mortality in both men and women and in both type 1 and type 2 diabetes.
- Before beginning a program of physical activity more vigorous than walking, people with diabetes should be assessed for conditions that might be contraindications to certain types of exercise, predispose to injury or be associated with increased likelihood of cardiovascular disease.

- Structured physical activity counselling by a physician or skilled healthcare personnel or case managers has been very effective in increasing physical activity, improving glycemic control, reducing the need for antihyperglycemic agents and insulin, and producing modest but sustained weight loss.

HIGHLIGHTS OF REVISIONS

- **In the absence of contraindications, people with diabetes should accumulate 150 minutes per week of moderate to vigorous aerobic physical activity [Grade B, Level 2, for type 2 diabetes; Grade C, Level 3, for type 1 diabetes], and should also do resistance exercise (such as weight lifting) 3 times per week.**

Nutrition Therapy

- Nutrition therapy can reduce glycated hemoglobin by 1.0 to 2.0% and, when used with other components of diabetes care, can further improve clinical and metabolic outcomes.
- Consistency in carbohydrate intake, and spacing and regularity in meal consumption may help control blood glucose and weight.
- Replacing high-glycemic index carbohydrates with low-glycemic index carbohydrates in mixed meals has a clinically significant effect on glycemic control in people with type 1 or type 2 diabetes.

HIGHLIGHTS OF REVISIONS

- **Nutritional considerations have been updated to reflect Health Canada's revised *Eating Well with Canada's Food Guide*. Daily macronutrient distribution recommendations are more flexible and allow for carbohydrate intakes of 45 to 60% of energy and fat intake of not greater than 35%.**
- **Recommendations on fat intake have been revised: adults with diabetes should consume no more than 7% of total daily energy from saturated fats [Grade D, Consensus] and should limit intake of trans fatty acids to a minimum [Grade D, Consensus].**
- **Recommendations on consistency and timing of carbohydrate intake have been updated for people with both type 1 and type 2 diabetes.**

Insulin Therapy in Type 1 Diabetes

- Basal-prandial insulin regimens (e.g. multiple daily injections or continuous subcutaneous insulin infusion) are the insulin regimens of choice for all adults with type 1 diabetes.
- Insulin regimens should be tailored to the individual's treatment goals, lifestyle, diet, age, general health, motivation, hypoglycemia awareness status and ability for self-management.
- All individuals with type 1 diabetes should be counselled about the risk, prevention and treatment of insulin-induced hypoglycemia.

HIGHLIGHTS OF REVISIONS

- **Insulins introduced since 2003 (detemir, glulisine, inhaled insulin) have been included.**
- **The table of insulin types and time-action profiles has been expanded.**
- **Recommendations for the use of rapid-acting and long-acting insulin analogues have been upgraded [Grade A, Level 1].**

Pharmacologic Management of Type 2 Diabetes

- If glycemic targets are not achieved within 2 to 3 months of lifestyle management, antihyperglycemic pharmacotherapy should be initiated.
- Timely adjustments to and/or additions of antihyperglycemic agents should be made to attain target glycated hemoglobin (A1C) within 6 to 12 months.
- In patients with marked hyperglycemia (A1C $\geq 9.0\%$) antihyperglycemic agents should be initiated concomitantly with lifestyle management, and consideration should be given to either initiating combination therapy with 2 agents or initiating insulin.

HIGHLIGHTS OF REVISIONS

- An introduction emphasizing the importance of individualizing treatment has been added.
- The section on treatment regimens has been augmented.
- The table of antihyperglycemic agents has been updated.
- The pharmacologic management algorithm has been updated.
- Recommendations have been updated to reflect new developments in pharmacotherapy and to further emphasize combination therapy or insulin therapy in the presence of marked hyperglycemia.

Hypoglycemia

- It is important to prevent, recognize and treat hypoglycemic episodes secondary to the use of insulin or insulin secretagogues.
- The goals of treatment for hypoglycemia are to detect and treat a low blood glucose level promptly by using an intervention that provides the fastest rise in blood glucose to a safe level, to eliminate the risk of injury and to relieve symptoms quickly.
- It is important to avoid overtreatment, since this can result in rebound hyperglycemia and weight gain.

HIGHLIGHTS OF REVISIONS:

- Information and recommendations regarding hypoglycemia in pediatric patients has been removed from this chapter. See “Type 1 Diabetes in Children and Adolescents” for a discussion of hypoglycemia in this population.
- Information and recommendations regarding hypoglycemia in hospitalized patients has been removed from this chapter. See “In-hospital Management of Diabetes” for a discussion of hypoglycemia in this situation.

Hyperglycemic Emergencies in Adults

- Diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic state (HHS) should be suspected in ill patients with diabetes. If either DKA or HHS is diagnosed, precipitating factors must be sought and treated.
- DKA and HHS are medical emergencies that require treatment and monitoring for multiple metabolic abnormalities and vigilance for complications.
- Ketoacidosis requires insulin administration (0.1 U/kg/hour) for resolution; bicarbonate therapy should be considered only for extreme acidosis (pH ≤ 7.0).
- Specific issues related to the treatment of DKA in children and adolescents are addressed in “Type 1 Diabetes in Children and Adolescents.”

HIGHLIGHTS OF REVISIONS:

This chapter is a new addition for 2008.

In-hospital Management of Diabetes

- Diabetes increases the risk for disorders that predispose individuals to hospitalization, including cardiovascular diseases, nephropathy, infection and lower-extremity amputations. The prevalence of diabetes in the hospitalized population is 2- to 3-fold higher than that of the general population.
- Healthcare institutions should have multidisciplinary teams to improve diabetes care in hospital and effect better outcomes and reduced hospital length of stay.
- Careful consideration should be given to control of glucose values in hospital, as adverse outcomes may be associated with hyperglycemia.
- In severe, acute illnesses, intravenous insulin infusions may have significant advantage (major surgery, intensive care units). Use of “sliding scale” subcutaneous insulin therapy is considered suboptimal, as it treats hyperglycemia after it has occurred. A proactive approach to management with the use of basal, bolus and correction insulin is preferred.
- Concern about hypoglycemia remains a major impediment to achieving optimal glycemic control in hospitalized patients. Educational strategies should be aimed at appropriate diabetes management regimens to reduce the risk of hypoglycemia and the use of standardized treatment protocols to treat events when they occur.

HIGHLIGHTS OF REVISIONS

- The 2003 chapter “Perioperative Glycemic Control” has been renamed, revised and expanded to cover overall in-hospital management of diabetes, including the following:
 - The roles of antihyperglycemic agents and subcutaneous and intravenous insulin.
 - Organization of care of the hospitalized patient with diabetes.
 - The critically ill patient.
- All recommendations are either significantly revised or new.

Management of Obesity in Diabetes

- An estimated 80 to 90% of persons with type 2 diabetes are overweight or obese.
- A modest weight loss of 5 to 10% of initial body weight can substantially improve insulin sensitivity and glycemic, blood pressure and lipid control.
- A comprehensive healthy lifestyle intervention program should be implemented in overweight and obese people with diabetes to achieve and maintain a healthy body weight. The addition of a pharmacologic agent should be considered for appropriate overweight or obese adults who are unable to attain clinically important weight loss with lifestyle modification.
- Adults with severe obesity may be considered for bariatric surgery when other interventions fail to result in achieving weight goals.

HIGHLIGHTS OF REVISIONS

- Ethno-specific waist circumference cutoffs have been provided.

Psychological Aspects of Diabetes

- All individuals with diabetes and their families should be regularly screened for symptoms of psychological distress.
- Preventive interventions such as participative decision-making, feedback and psychological support should be

incorporated into all primary care and self-management education interventions to enhance adaptation to diabetes and reduce stress.

HIGHLIGHTS OF REVISIONS

- ▶ A recommendation has been added that multidisciplinary team members with required expertise offer cognitive behavioural interventions, such as stress management strategies and coping skills training [Grade A, Level 1A, for type 2 diabetes; Grade B, Level 2, for type 1 diabetes], family behaviour therapy [Grade B, Level 2] and case management [Grade B, Level 2] for individuals with suboptimal self-care behaviours, suboptimal glycemic control and/or psychological distress.

Influenza and Pneumococcal Immunization

- Studies in high-risk individuals, which included people with diabetes, have shown that influenza vaccination can reduce hospitalizations by approximately 40%.
- As people with diabetes are at least as susceptible to pneumococcal infection as other people with chronic diseases, the use of the pneumococcal vaccine is encouraged.
- A one-time pneumococcal revaccination is recommended for individuals >65 years of age if the original vaccine was administered when they were <65 years of age and >5 years earlier.

HIGHLIGHTS OF REVISIONS

- ▶ Information and recommendations regarding the immunization of children and adolescents has been removed from this chapter. Please see "Type 1 Diabetes in Children and Adolescents" for a discussion of immunization in this population.

Pancreas and Islet Transplantation

- Pancreas transplant can result in prolonged insulin independence and a possible reduction in the progression of secondary complications of diabetes.
- Islet transplant can result in transient insulin independence and can reliably stabilize blood glucose concentrations in people with glycemic lability.
- The risks of chronic immunosuppression must be carefully weighed against the potential benefits of pancreas or islet transplant for each individual.

HIGHLIGHTS OF REVISIONS

- ▶ The recommendations have been revised to better identify patients who are potential candidates for transplantation.
- ▶ A new section on the risks of transplantation has been added.

Complementary and Alternative Medicine in the Management of Diabetes

- Up to 30% of patients with diabetes use complementary and alternative medicine (CAM) for various indications.
- Most CAM studies have small sample sizes and are of short duration, and therefore may have missed harmful side effects.
- Certain CAM in common use for disorders other than diabetes can result in side effects and drug interactions.

HIGHLIGHTS OF REVISIONS

- ▶ This chapter is a new addition for 2008.

COMPLICATIONS AND COMORBIDITIES

Identification of Individuals at High Risk of Coronary Events

- Diabetes increases the prevalence of coronary artery disease (CAD) approximately 2- to 3-fold compared to individuals without diabetes. People with diabetes develop CAD 10 to 12 years earlier than individuals without diabetes. When a person with diabetes has an acute coronary event, the short- and long-term outcomes are considerably worse than for the person without diabetes.
- People with diabetes should be considered to have a high 10-year risk of CAD events if ≥ 45 years and male, or ≥ 50 years and female. For the younger person (male < 45 years or female < 50 years) with diabetes, the risk of developing CAD may be assessed from the evaluation of risk factors for CAD (both classical and diabetes-related).
- When assessing the need for pharmacologic measures to reduce risk in the younger person with diabetes, it is important to consider his or her high lifetime risk of developing CAD.

HIGHLIGHTS OF REVISIONS

- This chapter is a new addition for 2008.

Screening for the Presence of Coronary Artery Disease

- Compared to people without diabetes, people with diabetes (especially women) are at higher risk of developing heart disease, and at an earlier age. Unfortunately, a large proportion will have no symptoms before either a fatal or nonfatal myocardial infarction (MI). Hence, it is desirable to identify patients at high risk for vascular events, especially patients with established severe coronary artery disease (CAD).
- In individuals at high risk of CAD (based on age, gender, description of chest pain, history of prior MI and the presence of several other risk factors), exercise stress testing is useful for the assessment of prognosis.
- Exercise capacity is frequently impaired in people with diabetes due to the high prevalence of obesity, sedentary lifestyle, peripheral neuropathy (both sensory and motor) and vascular disease. For those unable to perform an exercise test, pharmacologic stress imaging may be required.

HIGHLIGHTS OF REVISIONS

- This chapter is a new addition for 2008.

Vascular Protection in People with Diabetes

- The first priority in the prevention of macrovascular complications should be reduction of cardiovascular (CV) risk through a comprehensive, multifaceted approach, integrating both lifestyle and pharmacologic measures.
- Lifestyle measures, optimized glycemic control and blood pressure control are applicable to all patients. For patients considered at high risk for a cardiovascular event, recommended treatment is with either angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blocking agents (ARBs), antiplatelet therapy (usually ASA), and lipid lowering therapy (usually statins).
- Treatment with ACE inhibitors and ARBs has been shown to result in better outcomes for people with atherosclerotic vascular disease, recent myocardial infarction, left ventricular impairment and heart failure, and is recommended for all patients at high risk of a CV event.
- Low-dose acetylsalicylic acid (ASA) therapy may be considered in people with stable CV disease. The decision to prescribe antiplatelet therapy for primary prevention of CV events, however, should be based on individual clinical judgment.

HIGHLIGHTS OF REVISIONS

- The 2003 chapter "Macrovascular Complications, Dyslipidemia and Hypertension" has been divided into three separate chapters: "Vascular Protection in People with Diabetes," "Dyslipidemia" and "Treatment of Hypertension."

- ▶ Content relating to vascular protection has been greatly expanded, with added material on vascular protection, renin-angiotensin-aldosterone system inhibition (with both ACE inhibitors and ARBs) and antiplatelet therapy.
- ▶ Recommendations for vascular protection approaches have been expanded. Pharmacotherapy (ACE inhibitors or ARBs, antiplatelet therapy, lipid-lowering medication) has been recommended for people with diabetes at high risk of a CV event.
- ▶ Clopidogrel has been added as a possible option for antiplatelet therapy for those who cannot tolerate ASA [Grade D, Consensus].

Dyslipidemia

- The beneficial effects of lowering low-density lipoprotein cholesterol (LDL-C) with statin therapy apply equally well to people with diabetes as to those without.
- The primary target for high-risk persons with diabetes is an LDL-C of ≤ 2.0 mmol/L, which is generally achievable with statin monotherapy.
- The secondary goal is a total cholesterol (TC)/high-density lipoprotein cholesterol (HDL-C) ratio of < 4.0 . This is often more difficult to achieve than the primary LDL-C target, and may require improved glycemic control, intensification of lifestyle changes (weight loss, physical activity, smoking cessation) and, if necessary, pharmacologic interventions.

HIGHLIGHTS OF REVISIONS

- ▶ The 2003 chapter “Macrovascular Complications, Dyslipidemia and Hypertension” has been divided into three separate chapters: “Vascular Protection in People with Diabetes,” “Dyslipidemia” and “Treatment of Hypertension.”
- ▶ Content relating to dyslipidemia has been greatly expanded, with added information on screening, LDL-C, TC/HDL-C ratio, HDL-C, triglycerides (TGs) and additional lipid markers.
- ▶ Recommendations have been extensively revised and updated:
 - People with type 1 or type 2 diabetes should be encouraged to adopt a healthy lifestyle to lower their risk of cardiovascular disease [Grade D, Consensus].
 - Fasting lipids (TC, HDL-C, TG and calculated LDL-C) should be measured at the time of diagnosis of diabetes and then every 1 to 3 years as clinically indicated [Grade D, Consensus].
 - Individuals at high risk of a vascular event should be treated with a statin to achieve an LDL-C ≤ 2.0 mmol/L [Grade A, Level 1, Level 2]. Clinical judgment should be used as to whether additional LDL-C lowering is required for those with an on-treatment LDL-C of 2.0 to 2.5 mmol/L [Grade D, Consensus].
 - The primary target of therapy is LDL-C [Grade A, Level 1, Level 2]; the secondary target is TC/ HDL-C ratio [Grade D, Consensus].
 - If the TC/HDL-C ratio is ≥ 4.0 , consider strategies to achieve a TC/HDL-C ratio < 4.0 [Grade D, Consensus].
 - If serum TGs are > 10.0 mmol/L despite best efforts at optimal glycemic control and other lifestyle interventions, a fibrate should be prescribed to reduce the risk of pancreatitis [Grade D, Consensus]. For those with moderate hyper-TG (4.5 to 10.0 mmol/L), either a statin or a fibrate can be attempted as first-line therapy, with the addition of a second lipid-lowering agent of a different class if target lipid levels are not achieved after 4 to 6 months on monotherapy [Grade D, Consensus].

- For individuals not at target(s) despite optimally dosed first-line therapy as described above, combination therapy (typically statin plus either ezetimibe, fibrate, or niacin) can be considered [Grade B, Level 2].
- Plasma apo B can be measured, at the physician's discretion, in addition to LDL-C and TC/HDL-C ratio, to monitor adequacy of lipid-lowering therapy in the high-risk individual [Grade D, Consensus]. Target apo B should be <0.9 g/L [Grade D, Consensus].

Treatment of Hypertension

- In the prevention of diabetes-related complications, vascular protection (using a multifaceted, comprehensive approach to risk reduction) is the first priority, followed by control of hypertension in those whose blood pressure (BP) levels remain above target, then nephroprotection for those with proteinuria despite the above measures.
- People with diabetes and elevated BP should be aggressively treated to achieve a target BP of <130/80 mm Hg to reduce the risk of both micro- and macrovascular complications.
- Most people with diabetes will require multiple BP-lowering medications to achieve BP targets.

HIGHLIGHTS OF REVISIONS

- The 2003 chapter "Macrovascular Complications, Dyslipidemia and Hypertension" has been divided into three separate chapters: "Vascular Protection in People with Diabetes," "Dyslipidemia" and "Treatment of Hypertension."
- It has been recommended that lifestyle changes be initiated concurrently with pharmacological interventions to reduce BP [Grade D, Consensus].
- Pharmacotherapy recommendations for the treatment of hypertension have been revised and expanded, with special consideration given to angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers, given their additional renal benefits [Grade D, Consensus].
- New recommendations have been added for the treatment of hypertension in people with diabetes and microalbuminuria, and the treatment of people with isolated systolic hypertension and no chronic kidney disease.

Management of Acute Coronary Syndromes

- Diabetes is an independent predictor of increased short- and long-term mortality, recurrent myocardial infarction (MI) and the development of heart failure in patients with acute MI (AMI).
- Patients with an AMI should receive insulin-glucose infusion therapy to maintain blood glucose between 7.0 and 10.0 mmol/L for at least 24 hours, followed by multidose subcutaneous insulin for at least 3 months.
- People with diabetes are less likely to receive recommended treatment such as revascularization, thrombolysis, beta blockers or acetylsalicylic acid than people without diabetes. Efforts should be directed at promoting adherence to existing proven therapies in the high-risk patient with MI and diabetes.

HIGHLIGHTS OF REVISIONS

- The 2003 chapter "Peri-acute Coronary Syndrome Glycemic Control" has been revised and expanded to cover management of acute coronary syndromes (ACS) in people with diabetes.
- Content has been greatly expanded, with added information on treatment of ACS in people with diabetes, and issues in the management of the patient with diabetes and ACS (thrombolysis and ocular hemorrhage, long-term management, and the treatment gap).
- Recommendations have been added that the presence of retinopathy should not be a contraindication to fibrinolysis [Grade B, Level 2], and that beta blockers should not be withheld because of concern about hypoglycemia [Grade D, Consensus].

Treatment of Diabetes in People with Heart Failure

- Heart failure is still under-recognized and misdiagnosed. This has significant clinical implications, as the prognosis of untreated or undertreated heart failure is poor, yet very effective proven therapies are widely available to most physicians.
- Diabetes can cause heart failure independently of ischemic heart disease by causing a diabetic cardiomyopathy. The incidence of heart failure is 2- to 4-fold higher in people with diabetes compared to those without.
- Generally, heart failure in people with diabetes should be treated similarly to heart failure in those without diabetes, although comorbidities such as renal dysfunction may be more prevalent in people with diabetes and may influence heart failure drug doses and monitoring of therapy.

HIGHLIGHTS OF REVISIONS

- ▶ This chapter is a new addition for 2008.

Chronic Kidney Disease in Diabetes

- Identification of chronic kidney disease (CKD) in diabetes requires screening for proteinuria, as well as an assessment of renal function.
- All individuals with CKD should be considered at high risk for cardiovascular events, and should be treated to reduce these risks.
- The progression of renal damage in diabetes can be slowed through intensive glycemic control and optimization of blood pressure. Progression of diabetic nephropathy can be slowed through the use of medications that disrupt the renin-angiotensin-aldosterone system.

HIGHLIGHTS OF REVISIONS

- ▶ The 2003 chapter “Nephropathy” has been renamed “Chronic Kidney Disease in Diabetes.”
- ▶ The screening algorithm has been revised, and figures and tables outlining the stages of CKD have been added.
- ▶ Serum creatinine clearance converted to eGFR has been added to the screening recommendations [Grade D, Consensus].
- ▶ Thiazide-like diuretics have been recommended for control of sodium and water retention, hypertension or hyperkalemia [Grade D, Consensus] in people with diabetes and CKD.
- ▶ Recommendations for stopping angiotensin-converting enzyme inhibitor, angiotensin II receptor blocker and/or diuretic therapy during times of acute illness [Grade D, Consensus] and, in women, before becoming pregnant [Grade D, Consensus] have been added.

Retinopathy

- Screening is important for early detection of treatable disease. Screening intervals for diabetic retinopathy vary according to the individual’s age and type of diabetes.
- Tight glycemic control reduces the onset and progression of sight-threatening diabetic retinopathy.
- Laser therapy reduces the risk of significant visual loss.

HIGHLIGHTS OF REVISIONS

- ▶ The treatment section has been expanded, with added information on surgical interventions and pharmacotherapy.
- ▶ Blood pressure control has been added to the recommendations for the prevention of retinopathy [Grade A, Level 1A].

- ▶ **Pharmacologic interventions [Grade B, Level 2] have been added to the recommendations for treatment of sight-threatening diabetic retinopathy.**

Neuropathy

- Exposure to higher levels of glycemia, elevated triglycerides, high body mass index, smoking and hypertension are risk factors for neuropathy.
- Intensive glycemic control is effective for primary prevention or secondary intervention of neuropathy in people with type 1 diabetes.
- In people with type 2 diabetes, lower blood glucose levels are associated with reduced frequency of neuropathy.

HIGHLIGHTS OF REVISIONS

- ▶ **A new table outlining oral medications for the management of neuropathic pain has been added.**
- ▶ **Intensified glycemic control has been recommended for people with both type 1 and type 2 diabetes to prevent the onset and progression of neuropathy [Grade A, Level 1A, for type 1 diabetes; Grade B, Level 2, for type 2 diabetes].**
- ▶ **The recommendations for medications to treat neuropathic pain have been expanded: antidepressants [Grade A, Level 1A], anticonvulsants [Grade A, Level 1A], opioid analgesics [Grade A, Level 1A] and topical isosorbide dinitrate [Grade B, Level 2].**

Foot Care

- Foot problems are a major cause of morbidity and mortality in people with diabetes and contribute to increased healthcare costs.
- Management of foot ulceration requires an interdisciplinary approach that addresses glycemic control, infection, lower extremity vascular status and local wound care.
- Uncontrolled diabetes can result in immunopathy with a blunted cellular response to foot infection.

HIGHLIGHTS OF REVISIONS

- ▶ **A new section on risk assessment and preventive care has been added.**
- ▶ **Data on management have been augmented.**

Erectile Dysfunction

- Erectile dysfunction (ED) affects approximately 34 to 45% of adult men with diabetes, has been demonstrated to negatively impact quality of life among those affected across all age strata, and may be the earliest sign of cardiovascular disease.
- All adult men with diabetes should be regularly screened for ED with a sexual function history.
- The current mainstays of therapy are phosphodiesterase type 5 inhibitors. They have been shown to have a major impact on erectile function and quality of life, and should be considered as first-line therapy to men with diabetes wishing treatment for ED.

HIGHLIGHTS OF REVISIONS

- ▶ **New recommendations on hypogonadism [Grade D, Level 4] and ejaculatory dysfunction [Grade D, Consensus] have been added.**

DIABETES IN CHILDREN

“Diabetes in Children” is a new major section in 2008. It provides comprehensive guidelines on all aspects of the management of type 1 and type 2 diabetes in children and adolescents.

Type 1 Diabetes in Children and Adolescents

- Suspicion of diabetes in a child should lead to immediate confirmation of the diagnosis and initiation of insulin to prevent diabetic ketoacidosis (DKA). DKA at diagnosis is due to failure to recognize and react to symptoms of new onset diabetes.
- Children in DKA are at risk of life-threatening cerebral edema. Pediatric DKA management is different than in adults and requires use of pediatric protocols with identification of risk factors for cerebral edema.
- Children with new-onset diabetes should be referred for diabetes education and ongoing care to a diabetes team with pediatric expertise

HIGHLIGHTS OF REVISIONS

- Recommendations have been revised and updated, including the following:
 - Children <6 years should aim for glycated hemoglobin (A1C) <8.5% [Grade D, Consensus]. Targets for older children are unchanged.
 - Children with chronic poor metabolic control (e.g. A1C >10%) should be referred to a tertiary pediatric diabetes team and/or mental health professional [Grade D, Consensus].
 - Insulin type and method of insulin delivery should be re-assessed at each clinical encounter to ensure the most appropriate regimen for that child is being used [Grade D, Consensus].
 - Families and healthcare providers should be instructed in the use of mini-doses of glucagon for home management of impending hypoglycemia with inadequate oral intake [Grade D, Level 4].
 - To prevent post-diagnosis DKA, comprehensive education and support services and 24-hour telephone services should be available [Grade C, Level 3].
 - Guidelines for screening of microvascular complications and comorbid conditions (including celiac and thyroid disease) have been revised.
 - Influenza immunization should be offered as a way to avoid an intercurrent illness that could complicate diabetes management [Grade D, Consensus].

Type 2 Diabetes in Children and Adolescents

- Anticipatory guidance regarding healthy eating and active lifestyle is recommended to prevent obesity.
- Regular targeted screening for type 2 diabetes is recommended in children at risk.
- Children with type 2 diabetes should receive care in consultation with an interdisciplinary pediatric diabetes healthcare team.
- Early screening, intervention and optimization of glycemic control are essential, as onset of type 2 diabetes during childhood is associated with severe and early onset of microvascular complications.

HIGHLIGHTS OF REVISIONS

- This chapter has been revised and expanded.
- New sections have been added on immunization and comorbid conditions.
- A table of screening recommendations has been added.
- The recommendations have been substantially augmented, addressing the following topics:
 - Promotion of a healthy lifestyle as part of routine pediatric care.

- Intensive lifestyle intervention for obese children.
- Screening for type 2 diabetes in children at risk.
- Involvement of an interdisciplinary pediatric healthcare team.
- Glycemic targets.
- Treatment (antihyperglycemic agents, insulin).
- Complications (nephropathy, neuropathy, retinopathy) and comorbidities (dyslipidemia, hypertension).

DIABETES IN SPECIAL POPULATIONS

Diabetes and Pregnancy

The 2003 chapters “Pre-existing Diabetes and Pregnancy” and “Gestational Diabetes Mellitus” have been merged into 1 chapter.

Pregestational diabetes

- All women with pre-existing type 1 or type 2 diabetes should receive preconception care to optimize glycemic control, assess complications, review medications and begin folate supplementation.
- Care by an interdisciplinary diabetes healthcare team composed of diabetes nurse educators, dietitians, obstetricians and endocrinologists, both prior to conception and during pregnancy, has been shown to minimize maternal and fetal risks in women with pre-existing type 1 or type 2 diabetes.

HIGHLIGHTS OF REVISIONS

- Information has been added on the management of complications and postpartum considerations.
- All recommendations have been updated and reorganized extensively to clarify management considerations for women pre-pregnancy, during pregnancy and postpartum.

Gestational diabetes mellitus

- The suggested screening test for gestational diabetes mellitus (GDM) is the Gestational Diabetes Screen—a 50-g glucose load followed by a plasma glucose test measured 1 h later.
- Untreated GDM leads to increased maternal and perinatal morbidity, while intensive treatment is associated with outcomes similar to control populations.

HIGHLIGHTS OF REVISIONS

- Recommendations have been revised and updated to parallel many of the recommendations for women with pregestational diabetes.
- A recommendation has been added that glyburide [Grade B, Level 2] or metformin may be considered in women with GDM who are nonadherent to or who refuse insulin.

Diabetes in the Elderly

- Diabetes in the elderly is metabolically distinct from and the approach to therapy should be different than in people <60 years of age.
- Sulfonylureas should be used with caution because the risk of hypoglycemia increases exponentially with age.
- In elderly people, the use of premixed insulins as an alternative to mixing insulins minimizes dose errors.

HIGHLIGHTS OF REVISIONS

- A section on nursing homes has been added.

Type 2 Diabetes in Aboriginal Peoples

- Efforts to prevent diabetes should focus on all diabetes risk factors, including pregravid obesity, to reduce gestational diabetes mellitus, macrosomia and diabetes risk in offspring; promotion of breast-feeding; and prevention of childhood, adolescent and adult obesity.
- Routine medical care in Aboriginal peoples should include identification of modifiable risk factors (e.g. lack of physical activity, unhealthy eating habits, obesity resulting in elevated waist circumference and/or body mass index) in order to identify higher-risk individuals who would benefit from diabetes prevention strategies and counselling.
- Screening for diabetes in adults should be considered every 1 to 2 years in Aboriginal individuals with ≥ 1 additional risk factor(s). Screening every 2 years should also be considered from age 10 or established puberty in Aboriginal children with ≥ 1 additional risk factor(s).
- Treatment of diabetes in Aboriginal peoples should follow current clinical practice guidelines using Aboriginal-specific community diabetes management programs developed and delivered in partnership with the target communities.

HIGHLIGHTS OF REVISIONS

- Sections on screening and management have been added.
- Screening recommendations have been added.
- New recommendations recognize the need for Aboriginal peoples to have culturally sensitive management of prediabetes and diabetes [Grade D, Consensus], and access in their communities to a diabetes management program [Grade D, Consensus].

Type 2 Diabetes in High Risk Ethnic Populations

- There is some evidence to support the use of ethnic-specific body mass index and waist circumference cutoffs to improve risk stratification and targeted risk management.
- The complex interplay between cultural context and lifestyle supports the use of ethno-specific community-based diabetes prevention programs that focus on lifestyle modification.
- High-risk ethnic patients develop diabetes complications, particularly cardiovascular disease and renal failure, much earlier than other populations, warranting aggressive management of relevant risk factors, including hypertension and dyslipidemia.

HIGHLIGHTS OF REVISIONS

- This chapter is a new addition for 2008.