GUIDELINES & PROTOCOLS
ADVISORY COMMITTEE

Diabetes Care

Scope

This guideline describes the care objectives for the prevention, diagnosis and management of diabetes in non-pregnant adults. It is intended primarily for family practitioners, and focuses on approaches and systems that should be in place to improve care for the majority of patients the majority of the time.

Recommendation 1 — Patient self-management

The management of diabetes hinges on the commitment of the person with diabetes to self-management, balancing appropriate lifestyle choices, self-monitoring of blood glucose levels, and pharmacologic or insulin therapy. To support patient self-management, the physician should:

- Encourage the patient to accept responsibility for the care of their diabetes
- Reinforce the importance of lifestyle modifications including healthy eating, active living/exercise, weight management, social support and smoking cessation
- Encourage the use of diaries or logbooks
- Help the patient identify a support team
- Refer the patient to the local Diabetes Education Centre
- Define, with the patient, the best possible goals such as blood glucose concentration, A1C, blood pressure, lipids, lifestyle modifications and appropriate follow-up
- Provide the patient with appropriate, individualized education (culturally sensitive information, skills and support)

Note: Resources to support patient self-management are listed in the attached *Resources for People with Diabetes* and are available at www.healthplanning.gov.bc.ca/cdm/. Other resources are available at http://www.diabetes.ca/

Recommendation 2 — Meeting care objectives

Evidence indicates that organizational interventions such as registration, recall, and regular review can improve the care of diabetes. Physicians are encouraged to:

- Routinely prescribe regular exercise and moderate weight loss for over-weight adults, as evidence shows many cases of adult onset diabetes can be prevented
- Identify all patients with diabetes in their practice – test all patients over age 40 every three years with a fasting blood sugar
- Maintain patient registries for patients with diabetes and cooperate with regional and provincial registries whenever possible
- Use a flow sheet* for each patient with diabetes
- Use recall systems to ensure that patients with diabetes are seen at appropriate intervals
- Review patient records to ensure care objectives are met
- Consider pre-arranging for tests that need to be repeated on a regular basis, e.g. A1C q 3 months.

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* A flow sheet is a one to two page form that gathers all important data regarding a patient's diabetes. Attached to a patient's chart, the flow sheet serves as a reminder and a record of whether care objectives have been met. See attached flow sheet.

Physicians interested in knowing how their practices compare to others may wish to use performance measures. For further information, see www.healthplanning.gov.bc.ca/cdm/.

Recommendation 3 — Care objectives

Depending on the type of diabetes and therapy required, these care objectives may be more or less difficult to achieve without adverse effects. Also, there will be circumstances where the patient's condition (dementia, terminal illnesses) means that end of life care will take priority over the diabetes care objectives. Therefore, treatment goals must be tailored to the individual. (See table next page).

Practice Points

When setting goals with the patient, consider the following:

1. Minimization of symptomatic hyperglycemia or hypoglycemia may override target A1C levels.
2. More frequent lipid measurement is required for patients receiving treatment for dyslipidemia.
3. Reduction of hypertension has been shown to reduce the risk of complications and mortality rates. (See guidelines *Part I: Detection and Diagnosis of Hypertension* and *Part II: Treatment of Essential Hypertension*).
4. Several clinical trials have been published in recent years that identify patients who are most likely to benefit from statin therapy. Adverse events are more common in elderly patients (70+).
5. Co-existing depression and other psychiatric conditions are common in patients with diabetes. Treatment of these conditions may improve diabetes outcomes.

Recommendation 4 — Prevention

A large proportion of type 2 diabetes can be prevented using lifestyle modification and/or pharmacologic intervention. All individuals should be encouraged to pursue a program of lifestyle modification that includes regular physical activity (at least 150 minutes of moderate intensity aerobic exercise each week spread over 3 non-consecutive days and resistance exercise 3 times a week) and moderate weight loss (5-10% of initial body weight). Lifestyle modification is particularly important for persons considered at high-risk for diabetes. Pharmacologic therapy with metformin or acarbose should also be considered for those at high risk.

Risk Factors for Type 2 Diabetes

- Dyslipidemia
- Overweight
- Abdominal obesity
- Polycystic ovary syndrome
- Hypertension
- Schizophrenia
- Age 40 to 70 years
- First-degree relative with diabetes
- Corticosteroid and second generation antipsychotic use e.g. olanzapine, risperidone, clozapine, quetiapine
- Member of high-risk population (e.g. Aboriginal, Asian, South Asian, Hispanic or African descent)
- History of IGT or IFG
- Vascular disease
- History of gestational diabetes
- History of delivery of macrosomic infant
- Presence of complications associated with diabetes
- Acanthosis

Care	Objective	Target & Goals
Self-management	• Assess & discuss self-management goals, challenges & progress. • Offer diabetes/risk management education.	• Informed patient who is actively involved in care decisions. • Development of mutually acceptable management plans.
Blood glucose control over time	Measure A1C every three months. (Note that results are now reported as percent, e.g., 7.0% formerly expressed as 0.070).	Target for most patients: A1C ≤ 7.0% For patients in whom it can safely be achieved: A1C ≤ 6.0%
Blood glucose monitoring	• Reinforce patient's responsibility for regular monitoring as appropriate. • Ensure patients can use glucose meter, interpret results & modify treatment as needed. • Develop a blood glucose-monitoring schedule with patient & review records.	Target for most patients: Premeal: 4.0 – 7.0 mmol/L 2h Postmeal: 5.0 – 10.0 mmol/L For patients in whom it can safely be achieved: Premeal: 4.0 – 6.0 mmol/L 2h Postmeal: 5.0 – 8.0 mmol/L
Hypoglycemia	Review episodes of hypoglycemia at every visit	Eliminate or minimize hypoglycemia
Blood glucose meter accuracy	Verify accuracy of glucose meter annually.	Simultaneous fasting glucose meter/lab comparison within 20%.
Blood pressure	Measure and record at diagnosis and regularly thereafter. (Refer to *Detection & Diagnosis of Hypertension*)	Less than 130/80 Blood pressure control is a priority
Lipid profile	• Measure fasting lipid profile (total cholesterol, HDL-C, LDL-C, triglycerides) every one to three years as clinically indicated. **CHD ten year risk**: Use UK prospective diabetes (UKPDS) risk calculator or table provided to calculate/estimate 10-y risk of CHD available at: www.dtu.ox.ac.uk/riskengine/	Targets and goals must relate to calculated risk LDL-C(mmol/L) TC:HDL-C **High risk** (≥20% 10 y risk) < 2.5 < 4.0 **Moderate risk** (<20% 10 y risk) < 3.5 < 5.0
Body mass index & waist circumference	Calculate BMI (mass in kilograms/height in metres^2). (See table on back of flow sheet.)	Healthy body weight (target BMI 18.5-24.9 kg/m^2) Waist F ≤ 88 cm; M ≤ 102 cm
Further vascular protection	• Promote lifestyle modifications (exercise, stress reduction). • Consider low dose ASA & ACEI/ARB as clinically indicated	Reduction of risk
Exercise	Discuss & encourage aerobic resistance exercise	Aerobic: 2.5 hrs/week (50 min 3 x /wk) Resistance: 3 sessions/week
Smoking	Encourage patient to stop at each visit; provide support as needed.	Smoking cessation **Helpline: 1 877 455-2233**
Foot examination	Examine feet at least annually, more frequently for those at high risk. Reinforce patient's responsibility for regular self-examination.	Prevention of ulceration, infection, gangrene and amputation.
Nephropathy	• Screen for macroscopic proteinuria & non-renal disease with dipstick. • For protein-negative dipstick patients measure albumin/creatinine ratio (ACR). • If ACR is equivocal, repeat collection. • Treat ACR if persistently above normal threshold • Measure SCr (lab will report eGFR) at least annually. See *Identification, Evaluation and Management of Patients with Chronic Kidney Disease* Treatment may not normalize subsequent ACRs or eGFR	To detect macroscopic proteinuria & non-diabetic renal disease ACR testing thresholds: mg/mmol Normal: < 2.0 males; < 2.8 females Equivocal: 2-20 males; 2.8-28 females Abnormal: > 20 males; > 28 females Measure SCr at least annually. Normal eGFR ≥ 90
Neuropathy check	Check annually for symptoms or findings such as peripheral anesthesia or pain, erectile dysfunction or gastrointestinal disturbance.	Early detection and treatment
Retinopathy – eye exam	Ensure patient receives dilated pupil retinal examination at diagnosis, then every one to two years or as indicated.	Early detection and treatment
Influenza vaccination	Annual vaccination	Prevention of influenza
Pneumococcal vaccination	Vaccination. A single repeat vaccination is recommended if: • patient > 65 and • previous vaccination more than 5 yrs ago	Prevention of pneumococcal disease

Recommendation 5 — Diagnosis of diabetes, impaired fasting glucose and impaired glucose tolerance

Classic symptoms of polyuria, polydipsia, and unexplained weight loss with a casual PG ≥ 11.1 mmol/L are diagnostic. Casual means any time of day, without regard to the interval since the last meal.

In the absence of classic symptoms or metabolic decompensation, a fasting plasma glucose is recommended as the initial diagnostic test for diabetes. In the absence of classical symptoms a FPG ≥7.0 mmol/L is considered diagnostic, **but a confirmatory test must be done on another day.** Fasting means no caloric intake for at least 8 hours.

Testing for diabetes using a fasting plasma glucose should be performed every 3 years for individuals over 40 years of age. More frequent or earlier testing should be considered in people with additional risk factors for diabetes. See Algorithm 1.

Neither the A1C nor the 2-hour post 75 g OGTT are recommended as the initial test for diagnosis of diabetes. However, the 2-hour post 75 g OGTT should be considered in individuals with a fasting plasma glucose between 5.7 and 6.9 mmol/L and risk factors.

> *Note: The term prediabetes refers to impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT). Individuals with prediabetes are at risk of developing diabetes and its complications. They should be monitored regularly and benefit from CVD risk factor modification.*

Recommendation 6 — Treatment

1. Vascular Protection

The first priority in prevention of complications should be reduction of cardiovascular risk by vascular protection through a comprehensive, multifaceted approach including:

- Lifestyle modification
  - Engaging in regular physical activity
  - Healthy eating habits
  - Achieving and maintaining a healthy weight
  - Stopping smoking
- Anti-platelet therapy – low dose ASA
- ACE inhibitors are indicated for any of:
  - Age 55 or over
  - Hypertension
  - Confirmed albuminuria
- Optimize BP to less than or equal to 130/80. If lifestyle modification is not sufficient, choose from the following first-line agents: a thiazide diuretic, ACEI/ARB, cardioselective B-blockers. See *Treatment of Essential Hypertension.*
- Optimize glycemic control – see below
- Calculate 10 year coronary heart disease (CHD) risk using UKPDS risk calculator or table and treat dyslipidemia per Table 1.

Table 1. Initial Treatment of Dyslipidemia	
Lipid Status	**Therapy ***
LDL-C above target	High risk: Lifestyle modifications + statin Moderate to Low risk: Lifestyle
High-risk patients with: TG level =1.5-4.4 mmol/L and HDL-C < 1.0 mmol/L and LDL-C at target	Lifestyle modifications + statin or fibrate
TG level > 4.5 mmol/L	Lifestyle modifications + fibrate
* When monotherapy plus lifestyle modification fail to achieve lipid targets, the addition of a second drug from another class should be considered.	

2. Glycemic Control –see Algorithm 2

The first step in management of hyperglycemia should be a complete clinical assessment and initiation of nutrition therapy and physical activity.

Patients with type 1 diabetes should see an experienced diabetes care team at diagnosis and at least annually.

To achieve glycemic targets in people with type 1 diabetes, multiple daily injections (3 or 4 per day) or the use of continuous subcutaneous insulin infusions (CSII) should be considered as part of an intensive diabetes management program. See Table 2.

Table 2. Types of Insulin	
Insulin type/action	Trade names
Rapid-acting analogue (clear) Onset: 10–15 min Peak: 60–90 min Duration: 4–5 h	Humalog® (insulin lispro) ‡ NovoRapid® (insulin aspart) ‡
Fast-acting (clear) Onset: 0.5–1 h Peak: 2–4 h Duration: 5–8 h	Humulin®-R † Novolin®ge Toronto †
Intermediate-acting (cloudy) Onset: 1–3 h Peak: 5–8 h Duration: up to 18 h	Humulin®-N † Humulin®-L † Novolin®ge NPH †
Long-acting (cloudy) Onset: 3–4 h Peak: 8–15 h Duration: 22–26 h	Humulin®-U †
Extended long-acting analogue Onset: 90 min Duration: 24 h	Lantus®* (insulin glargine) Δ
Premixed (cloudy) A single vial contains a fixed ratio of insulin (% rapid- or fast-acting to % intermediate-acting insulin)	Humalog® Mix25™ ‡ Humulin® (20/80, 30/70) † Novolin®ge (10/90, 20/80, 30/70, 40/60, 50/50) † NovoMix® 30 ‡

Table 2. Types of Insulin

Pharmacare coverage – valid at date of printing:

† Regular Pharmacare coverage

‡ Partial Pharmacare coverage

∆ Approved by Health Canada, but not yet reviewed by Pharmacare.

Hypoglycemia - prevention

Risk factors for severe hypoglycemia should be identified in people with type 1 diabetes so that appropriate strategies can be used to minimize hypoglycemia. All individuals on insulin should be counseled about the risk and prevention of insulin-induced hypoglycemia.

Risk Factors for Severe Hypoglycemia

- Prior episode of severe hypoglycemia
- Current low A1C (< 6.0%)
- Hypoglycemia unawareness
- Long duration of diabetes
- Autonomic neuropathy

Severe hypoglycemia is less common in persons with type 2 diabetes, but the elderly and those on insulin or secretagogues are more vulnerable.

Strategies to reduce the risk of hypoglycemia include:

- Increased frequency of SMBG, including episodic assessment during sleeping hours
- Less stringent glycemic targets
- Multiple insulin injections.

Hypoglycemia – treatment

See Table 4.

RECOMMENDATION 7 **Additional practice points**

- Otherwise healthy elderly people with diabetes should be treated to achieve the same glycemic, blood pressure and lipid targets as younger people. In people with multiple comorbidities, high level of functional dependency or limited life expectancy, the goals should be more conservative.
- Aerobic exercise and/or resistance training may benefit elderly people with type 2 diabetes and should be recommended if not contraindicated.
- Consider an ECG stress test for previously sedentary people with risk factors for CVD who wish to undertake exercise more vigorous than brisk walking.
- Early recognition and treatment of retinopathy can prevent blindness.
- Tricyclic antidepressants and/or anticonvulsants should be considered for relief of painful peripheral neuropathy.
- Patients with anaesthetic neuropathy are at very high risk of foot problems.
- Discuss alcohol use with the healthcare team.
- Those on intensive insulin treatment regimen should receive education on matching insulin to carbohydrate content (carb counting).
- Ask about erectile dysfunction

In elderly people with type 2 diabetes:

- Polypharmacy-review the medication list of an older adult with DM who presents with depression, falls, cognitive impairment or urinary incontinence

- Alpha-glucosidase inhibitors are modestly effective
- Thiazolidinedione insulin sensitizers are effective, but should be used with caution in those at risk for fluid retention.
- Sulfonylureas should be used with caution because the risk of hypoglycemia increases exponentially with age. In general initial doses should be half of those for younger people and increased more slowly.
- In elderly people, the use of premixed insulins and prefilled insulin pens should be considered to reduce dosage errors and potentially improve glycemic control.
- People with clinically significant autonomic dysfunction should be appropriately assessed and referred to a specialist experienced in managing the affected body system.

Commonly overlooked comorbid conditions include: cataracts, entrapment neuropathy (carpal tunnel), tendon problems and dental problems.

Rationale

Diabetes is a serious health problem with significant impacts on individuals, families, communities and health services. It is one of the most common chronic diseases, affecting approximately five per cent of Canadians.[1] Because many cases are undiagnosed, the true prevalence of diabetes is substantially underestimated. Moreover, diabetes prevalence is expected to increase dramatically due to an ageing population and increased rates of obesity. In B.C., approximately 200,000 people have been diagnosed with diabetes; this number is expected to grow to 325,000 by 2010. Diabetes poses a significant financial burden for both patients and society; this burden will increase with the rise in prevalence.

Although diabetes is associated with many serious complications, these are largely preventable through proper diabetes management. Diabetes is a significant cause of death in Canada and the most common cause of end-stage renal disease, new cases of blindness in the working age population and non-traumatic lower limb amputations.[2] It is also a major risk factor for cardiovascular disease, the leading cause of death in Canada.[1] Diabetes often disables people in their most productive years, and people with diabetes die younger than those not affected by it.

Evidence clearly indicates that efforts to control hyperglycemia, hypertension and dyslipidemia can prevent or postpone the development of complications in persons with diabetes.[3,4] *The Canadian Diabetes Association's 2003 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada*[1] are based on such evidence and have been widely disseminated. However, levels of care for persons with diabetes remain suboptimal and practitioners often are challenged to organize care in accordance with published guidelines.[5] In recent years, a wide range of interventions targeting professional behavior or the structure of care have been designed to improve care delivered to persons with diabetes.[6-9] A recent Cochrane review showed that multifaceted interventions to improve the performance of practitioners and organizational interventions to improve recall and review can enhance the care of diabetes.[10] Several clinical trials have been published in recent years that identify patients who are most likely to benefit from statin therapy. Adverse events are more common in elderly patients (70+)[11-16]. A multifactorial intervention in patients with type 2 diabetes and microalbuminuria has shown a significant reduction in cardiovascular disease, nephropathy, retinopathy and autonomic neuropathy[17].

This guideline outlines strategies which may help the primary care practitioner meet the complex needs of persons with diabetes.

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Grateful recognition is given to the Canadian Diabetes Association for permission to use tables and wording from their 2003 Diabetes Care guideline.

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- to encourage appropriate responses to common medical situations
- to recommend actions that are sufficient and efficient, neither excessive nor deficient
- to permit exceptions when justified by clinical circumstances.

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List of Abbreviations and Terms:

A1C	glycosylated hemoglobin, formerly known as HbA1C
ACEI	angiotensin-converting enzyme inhibitors
ACR	albumin/creatinine ratio
ARB	angiotensin II receptor blockers
ASA	acetylsalicylic acid
BID	to be taken twice a day
BMI	body mass index
BP	blood pressure
CPS	Compendium of Pharmaceuticals and Specialties
CVD	cardiovascular disease
DM	diabetes mellitus
ECG	electrocardiogram
eGFR	estimated glomerular filtration rate
FPG	fasting plasma glucose
HDL-C	high-density lipoprotein cholesterol
IFG	impaired fasting glucose
IGT	impaired glucose tolerance
LDL-C	low-density lipoprotein cholesterol
OD	to be taken once a day
OGTT	oral glucose tolerance test
PG	plasma glucose
SCr	serum creatinine
SMBG	self-monitoring of blood glucose
TC	total cholesterol
TG	triglycerides
TID	to be taken three times a day
2hPG	2-hour plasma glucose

Table 3. Antihyperglycemic Agents for Use in Type 2 Diabetes

Class	Usual dosage ranges*	Therapeutic considerations
Alpha-glucosidase inhibitor acarbose (Prandase®) †	• 50 mg OD slowly titrating up to 100 mg TID • Always before meals • Cost: $1.05/day (3 x 100 mg)	• Not recommended as initial therapy in people with severe hyperglycemia (A1C ≥ 9.0%) • Mostly used in combination with other oral antihyperglycemic agents • Gastrointestinal side effects • Treat hypoglycemia with dextrose tablets, milk or honey
Biguanide metformin (Glucophage®, generic) †	• 250 or 500 mg BID to max 2.55 g/day (850 mg TID or 5X 500 mg in divided doses) • Always with food to decrease GI side effects • Cost: $0.64/day (3 x 850mg)	• Contraindicated in patients with renal or hepatic dysfunction, or cardiac failure • Use eGFR (see Nephropathy) to estimate creatinine clearance (< 60 mL/min indicates caution or contraindicates the use of metformin) • Associated with less weight gain than sulfonylureas and does not cause hypoglycemia • Gastrointestinal side effects
Insulin See Table 2	• Individualized • Novolin and Humulin R and NPH insulin • Cost $20 per 10 ml vial • 1 ml =100 units • Cartridge 5X3 ml $40 • Lantus® 10 ml $60	• When initiating insulin, consider adding bedtime intermediate-acting insulin, long-acting insulin or extended long-acting insulin analogue to daytime oral antihyperglycemic agents (although other regimens can be used) • Intensive insulin therapy regimen recommended if above fails to attain glycemic targets • Causes greatest reduction in A1C and has no maximum dose • Increased risk of weight gain relative to sulfonylureas & metformin
Insulin secretagogues **sulfonylureas:** • gliclazide (Diamicron®, Diamicron® MR, generic)❑ • glimepiride (Amaryl™) ◊ • glyburide (Diabeta®, Euglucon®, generic)† (note: chlorpropamide and tolbutamide are still available in Canada, but rarely used) **nonsulfonylureas:** • nateglinide (Starlix®) ◊ • repaglinide (GlucoNorm®) ◊	• gliclazide - 80 mg OD to 160 mg BID) $0.30/80 mg • gliclazide MR (modified release): 30 mg OD to 120 mg OD $0.30/ 30 mg • glimepiride - 1 mg OD to 8 mg OD (not covered) • glyburide - 5 mg OD (or 2.5 mg BID) to 10 mg BID $0.07/ 5 mg • nateglinide - 60 mg TID to 180 mg TID (always before meals) (not covered) • repaglinide - 0.5 mg TID to 4 mg QID (always before meals) $2.16/ 4 mg	• All insulin secretagogues reduce overall glycemia similarly (except nateglinide) • Postprandial glycemia is especially reduced by nateglinide and repaglinide • Hypoglycemia and weight gain are especially common with glyburide • Consider using other class(es) of antihyperglycemic agents first in patients at high risk of hypoglycemia (e.g. the elderly) • If a sulfonylurea must be used in such individuals, gliclazide and glimepiride are associated with less hypoglycemia than glyburide • Nateglinide and repaglinide are associated with less hypoglycemia in the context of missed meals
Insulin sensitizers (TZDs) • pioglitazone (Actos®) ❑ • rosiglitazone (Avandia®)❑	• pioglitazone - 15 mg OD to 45 mg OD Cost $3.06/day (30 mg) • rosiglitazone - 2 mg OD to 8 mg OD (or 4 mg BID) Cost $2.16/day (4 mg)	• Contraindicated in patients with hepatic dysfunction (ALT > 2.5 times ULN) or significant cardiac failure • Between 6 and 12 weeks required to achieve full BG-lowering effect • Triple therapy: addition of TZD to metformin plus sulfonylurea is acceptable • May induce mild edema, fluid retention • When used in combination with insulin, may increase risk of edema and CHF. The combination of a TZD plus insulin is currently not an approved indication in Canada
Combined formulation of rosiglitazone and metformin (Avandamet™)◊	• 2 mg/500 mg BID to start, not to exceed 8 mg/day of rosiglitazone or 2500 mg/d metformin	• See rosiglitazone and metformin
Antiobesity agent orlistat (Xenical®) ◊	• 120 TID Always before meals	• Associated with weight loss • Gastrointestinal side effects

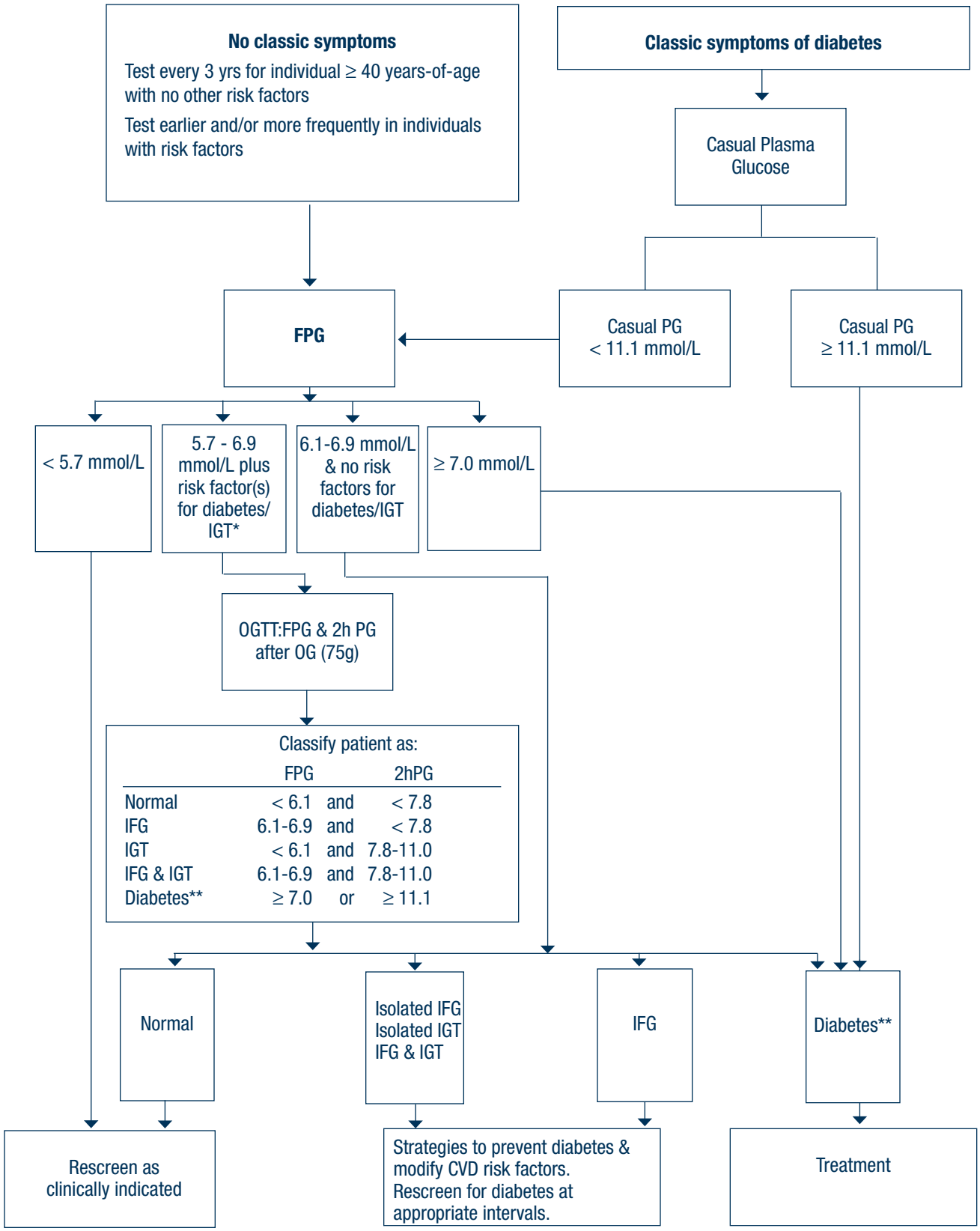
* Dosage ranges based on expert opinion and CPS.

Phamacare coverage – valid at date of printing:
† Regular Pharmacare coverage ❑ Pharmacare Special Authority ◊ No Pharmacare coverage

Table 4. Treatment of Hypoglycemia

Severity	Definition	How to treat
MILD	Autonomic symptoms present. Individual able to self-treat.	Oral ingestion of 15g of carbohydrate, preferably as glucose or sucrose tablets or solution. • 15 g glucose as tablets • 3 teaspoons or 3 packets of sugar dissolved in water • 175 ml of juice or regular soft drink • 6 life savers • 1 tablespoon honey • A snack of 15g carbohydrate can be used to prevent repeat hypoglycemia if a meal is > 1 hour away
MODERATE	Autonomic & neuroglycopenic symptoms present. Individual able to self-treat.	
SEVERE	Individual requires assistance. Unconsciousness may occur. PG typically < 2.8 mmol/L.	Conscious: Oral ingestion of 20g carbohydrate, preferably glucose tablets. Unconscious: • Seek emergency assistance • In the home situation, support persons should be taught how to administer glucagon by injection • 1 mg glucagon subcutaneously or intramuscularly

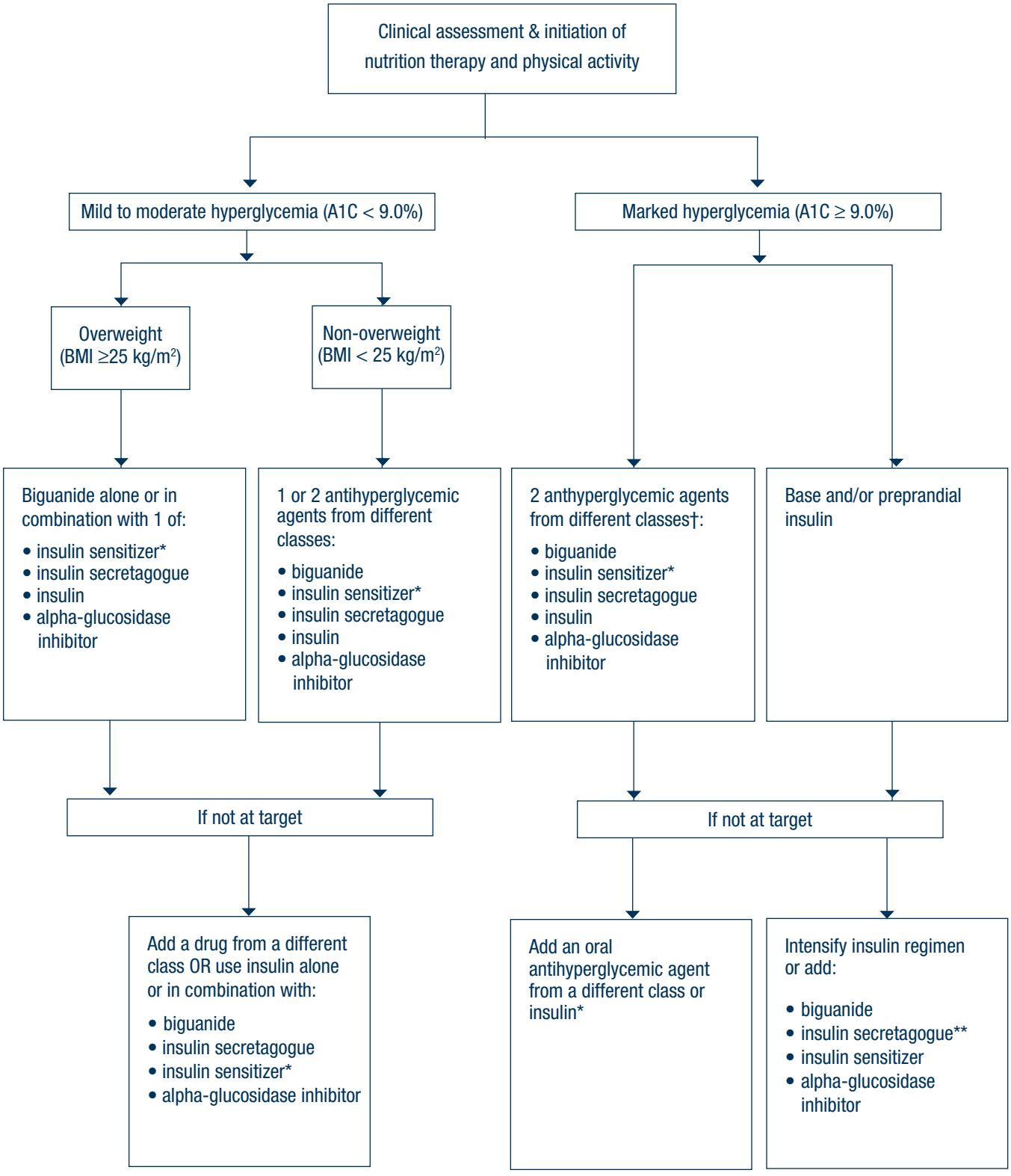
Algorithm 1. Diagnosis of diabetes, IFG and IGT



* In the absence of other risk factors, an FPG of 5.7-6.0 does not require further investigation, except routine screening at appropriate intervals.

** A confirmatory lab test must be done on another day in all cases in the absence of classic symptoms or unequivocal metabolic decompensation.

Algorithm 2. Management of hyperglycemia in type 2 diabetes



Note: Timely adjustments to and/or addition of oral antihyperglycemic agents and/or insulin should be made to attain target A1C within 6-12 months.

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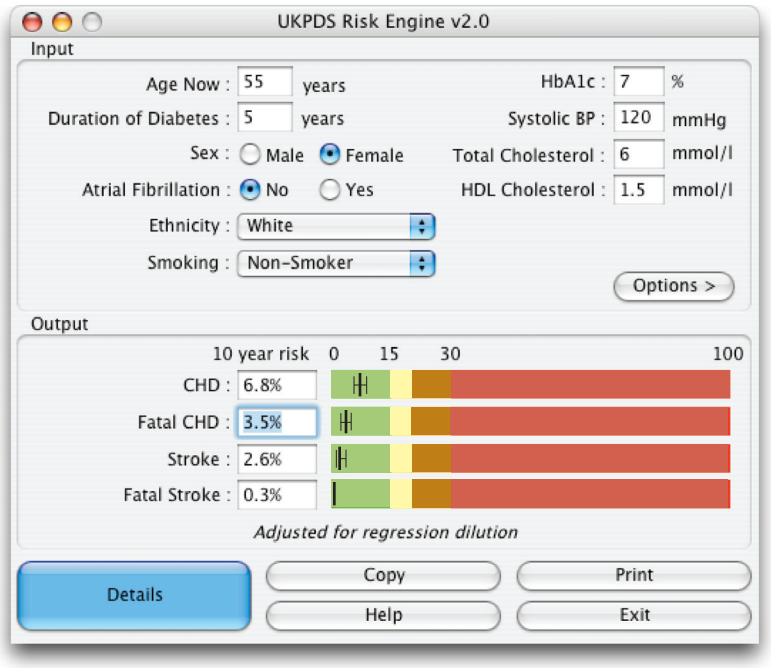
* The combination of an insulin sensitizer and insulin is currently not an approved indication in Canada.
** If using preprandial insulin, do not add an insulin secretagogue.
† May be given as a combined formulation: rosiglitazone and metformin.

Appendix 1 UKPDS Risk Calculator for Coronary Heart Disease Risk



This chart has been created for non-commercial use by the BC Ministry of Health, Medical Outcomes Improvements Branch, using the UKPDS Risk Engine Version 2.0. Further details of the UKPDS Risk Engine can be found at www.dtu.ox.ac.uk.

The following risk chart is provided to allow comparison of risk according to a variety of parameters. It does not include calculations based on non-white populations nor for patients with atrial fibrillation. The UKPDS calculator can provide greater precision as well as estimates of risk for Asian populations and for patients with atrial fibrillation.

10-year risk (%) of CHD for patients with 5-year history of diabetes compared to 10-year risk with no diabetes (HbA1C <6%)

♀ FEMALE			AGE 55				AGE 60				AGE 65			
Smoking	BP	TC/HDL	HbA1c(%) N	6	7	8	HbA1c(%) N	6	7	8	HbA1c(%) N	6	7	8
🚭	120	4	5	6	7	8	7	8	9	10	9	10	12	13
		5	7	8	9	10	9	10	11	13	12	13	15	17
		6	8	9	11	12	11	12	14	16	14	16	18	20
	140	4	6	7	7	8	8	9	10	11	10	11	13	14
		5	7	8	9	11	10	11	12	14	13	14	16	18
		6	9	10	12	13	12	13	15	17	15	17	19	22
	160	4	6	7	8	9	8	9	11	12	11	12	14	16
		5	8	9	10	12	10	12	13	15	14	15	17	20
		6	10	11	12	14	13	14	16	18	16	19	21	24
🚬	120	4	7	8	9	10	9	11	12	14	12	14	16	18
		5	9	10	12	13	12	13	15	17	15	17	20	22
		6	11	12	14	16	14	16	18	21	19	21	24	26
	140	4	8	9	10	11	10	11	13	15	13	15	17	19
		5	10	11	13	14	13	14	16	18	17	19	21	24
		6	12	13	15	17	15	17	20	22	20	23	25	28
	160	4	8	9	11	12	11	12	14	16	14	16	18	21
		5	11	12	14	15	14	16	18	20	18	20	23	26
		6	13	15	16	19	17	19	21	24	22	24	27	30

♂ MALE			AGE 55				AGE 60				AGE 65			
Smoking	BP	TC/HDL	HbA1c(%) N	6	7	8	HbA1c(%) N	6	7	8	HbA1c(%) N	6	7	8
🚭	120	5	12	14	16	18	15	18	21	23	21	24	27	30
		6	15	17	19	22	18	22	25	28	25	28	32	35
		7	18	20	23	25	21	26	29	32	29	33	36	40
	140	5	14	15	17	20	16	20	22	25	23	25	28	32
		6	16	18	21	23	20	24	27	30	27	30	34	38
		7	19	22	24	27	23	28	31	34	31	35	39	43
	160	5	15	17	19	21	19	21	24	27	24	27	31	34
		6	18	20	22	25	23	26	29	32	29	32	36	40
		7	21	23	26	29	27	30	33	37	34	37	41	46
🚬	120	5	16	19	21	24	21	24	27	30	27	30	34	38
		6	20	22	25	28	25	29	32	36	32	36	40	44
		7	23	26	29	33	30	33	37	41	37	41	46	50
	140	5	18	20	23	25	23	26	29	32	27	33	37	40
		6	21	24	27	30	27	31	34	38	32	39	43	47
		7	25	28	31	35	32	35	39	43	37	44	48	53
	160	5	19	22	24	27	25	28	31	35	29	35	39	43
		6	23	26	29	32	29	33	37	41	35	41	45	50
		7	27	30	33	37	34	38	42	46	40	47	51	56

- 0-14%
- 15-19%
- 20-29%
- ≥30%

Derived from: The UKPDS risk engine: a model for the risk of coronary heart disease in Type 2 diabetes (UKPDS 56) Stevens RJ et al. Clinical Science 2001; 101:671-679.

BP: Systolic Blood Pressure
TC/HDL: Ratio of Total Cholesterol (TC)/High Density Lipoprotein Cholesterol (HDL-C)
HbA1C: Glycosylated Hemoglobin (Hemoglobin A1c) N= normal HbA1C

To estimate CHD risk for 10-year history of diabetes, add 10%.

Body Mass Index