Guidelines for Diabetes Care in Bermuda 2009

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Guidelines for Diabetes Care in Bermuda

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Introduction

The Government of Bermuda is committed to standardize and improve health care for people with diabetes in Bermuda. The goal is to ensure the highest standard of diabetes care in Bermuda and improve the capacity to screen, refer, deliver, manage and monitor services for people with diabetes.

In 2004, a Department of Health Study determined Bermuda's health priorities and identified diabetes as the number four health problem for the country. The 2006 National Health Promotion Strategy, Well Bermuda, listed the reduction of the prevalence of diabetes and associated complications among the primary health promotion goals for the Island.

The Bermuda Diabetes Association is the lead agency in developing an action plan to address the goals in this strategy. In October 2006, the Board of the Bermuda Diabetes Association embarked on a strategic planning process and developed the Strategic Plan 2007-2010. The mission for the Bermuda Diabetes Association is to lead the Bermuda community to reduce the prevalence of diabetes and improve the lives of all people affected by diabetes.

An IDF (International Diabetes Federation) led campaign to bring diabetes out of the shadows culminated in the 2007 United Nations Resolution on Diabetes, "**unite for diabetes"**. That led to a mandate that each territory should provide local guidelines possible to actively manage this disease.

To facilitate Government's goal for diabetes, the Minister of Health appointed a Task Group of representative stakeholders from Bermuda's health professionals in October 2008. The purpose of the task group was to provide a consultative forum to review clinical guidelines from recognized diabetes organizations overseas and to develop guidelines best suited to Bermuda's needs. Five guidelines were reviewed as follows:

1. **American Diabetes Association (ADA)**: Standards of Medical Care in Diabetes – 2008, *Diabetes Care*, Volume 31, (Supplement 1): S1-104, 2008 and Standards of Medical Care in Diabetes – 2010, *Diabetes Care*, Volume 33, (Supplement 1): S11-61, 2010
2. **Canadian Diabetes Association (CDA)**: 2008 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada, *Canadian Journal of Diabetes*, Volume 32, (Supplement 1): S1-S201, 2008.
3. **Caribbean Health Research Council (CHRC)**: Managing Diabetes in Primary Care in the Caribbean. St. Augustine, Trinidad and Tobago: Caribbean Health Research Council 2006.
4. **International Diabetes Federation (IDF):** IDF Clinical Guidelines Task Force. Global Guideline for type 2 Diabetes. Brussels: International Diabetes Federation, 2005.

5. **London: Royal College of Physicians (NICE)**: National Collaborating Centre for Chronic Conditions. *Type 2 diabetes: National Clinical Guideline for Management in Primary and Secondary Care (update)*. London: Royal College of Physicians, 2008.

The Guidelines for Diabetes Care in Bermuda represent the consensus of the Diabetes Task Group based on collective analysis, evaluation and opinion on the current information available to them. These guidelines are designed to be easy to follow and serve as key tools in improving patient care. Special situations may call for modified strategies, but the most important goal is to ensure that type 1 and type 2 diabetes are managed effectively, thus reducing morbidity and mortality on the Island.

Plans are currently under review for the establishment of a Diabetes Registry for Bermuda. The benefits of a registry include more efficient clinical monitoring and outcomes management of diabetes and the potential to improve health outcomes of the patient.

Diabetes Task Group Members

Chairman of task group:

- Dr. Femi Bada, MD - Bermuda Diabetes Association Physician

Task Group members:

- Dr. Arlene Basden, MD – Director of Hospitalists, Bermuda Hospitals Board
- Maria Bootle, R.Ph – Bermuda Diabetes Resource Centre – Pharmacist
- Dr. John Cann, MD – Chief Medical Officer, Ministry of Health
- Valda Charles, RN –Department of Health, Community Health Nurse – Health Visitor
- Jane Hope, RN – Diabetes Centre Nurse Educator, Bermuda Hospitals Board
- Sara McKittrick, RD – Bermuda Diabetes Resource Centre - Dietitian
- Dr. Katherine Michelmore, MD – Bermuda Hospitals Board Employee Health Physician
- Michael Nisbett, RN – Accreditation and Quality Compliance Officer, Bermuda Hospitals Board
- Dr. Wendy Outerbridge, MD – Chief of Dialysis, Bermuda Hospitals Board
- Dr. Cheryl Peek-Ball, MD –Medical Officer, Ministry of Health
- Dr. Marion Watlington, MD – Internist, Integrative Medicine
- Dr. Louise White, MD – Family Physicians Representative
- Dr. Basil Wilson, MD – Family Physicians Representative

Coordinators of Task Group:

- Betsy Baillie, MPH – Public Health Consultant, Department of Health
- Sarah Burrows, Programme Manager – Bermuda Diabetes Association

Organization and Delivery of Care

*The person diagnosed with diabetes requires access to immediate and ongoing care. Care needs to be organized and provided in a systematic way. General principles include: immediate referral for education and treatment; annual review of control and complications; an agreed and continually updated diabetes care plan; and involvement of the multidisciplinary team in delivering that plan, centred around the person with diabetes**. The following is the vision the Diabetes Task Group has for the organization and delivery of care of diabetes in Bermuda.***

Care Team:

- Motivated patient who is well educated about diabetes
- Well-educated primary care physician who remains up-to-date with the latest developments on diabetes
- Cohesive interdisciplinary care team based in a well-funded diabetes centre

Diabetes Centre:

- Ideally based within the hospital campus
- Patient friendly hours of service, including early mornings, evenings and weekends.
- Facilities should include:
    - Reception
    - Lounge/ library/ resource room
    - Classroom(s)
    - Teaching kitchen
    - Conference / counselling rooms
    - Examination rooms

Recommended Staffing levels:

Full-time staff:	Part-time staff:	Consultant referral:
▪ Non-Medical Director	▪ Chiropodist	▪ Psychiatrist
▪ Receptionist	▪ Optician	▪ Ophthalmologist
▪ Nurse educator(s)	▪ Medical social worker	▪ Internist
▪ Dietitians	▪ Physiotherapist	▪ Wound care
▪ Psychologist(s)	▪ Occupational therapist	
▪ Physical trainer/exercise coach /kinesiologist(s)	▪ Consultant Endocrinologist	

Coordination of management:

The assumption is that the patient will be well educated about diabetes and supported by an excellent multidisciplinary care team. This will require an excellent communication network between care team members – primary care physician, diabetes centre staff and the patient. In order to optimize care, the following are required:

- The patient should be committed to **self-management** of his/her condition.
- The patient, physicians and caregivers should **agree on a care plan.**
- The primary care physician and patient should decide on a schedule of **regular follow-up visits** every three months at either the physician's office, diabetes centre or both.
- The patient should have an **annual physical examination**.
- **Computerization of data** should be a priority. Physicians and care team members should all have internet access to records, clinical data results, and patient's scheduled visits. The internet and text messages should be used to generate reminders re appointments. Patients should be able to **easily access their data and appointment schedule via the internet**.
- Individualized **Diabetes Passport** should be developed as soon as possible to help with communication of information in the interim.
- A **consultant endocrinologist** should be appointed and should organize and lead case conferences on complicated or difficult cases, liaise with health care providers and help organize the continuing education of care team staff.

Classification, Screening and Diagnosis of Diabetes Mellitus

Diabetes mellitus is a metabolic disorder characterized by the presence of hyperglycaemia due to defective insulin secretion, defective insulin action or both (CDA, WHO). The chronic hyperglyaecemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart and blood vessels (ADA). The term categories of increased risk for diabetes (also referred to as "pre-diabetes") include persons diagnosed with impaired fasting glucose (IFG) and impaired glucose tolerance (IGT).

Classification of Diabetes Mellitus (CDA):

Type 1 Diabetes (T1DM)	Type 2 Diabetes (T2DM)	Gestational diabetes (GDM)	Other specific types
Diabetes that is primarily a result of pancreatic beta cell destruction and is prone to ketoacidosis. Persons with type 1 diabetes require insulin injections	Ranges from predominant insulin resistance with relative insulin deficiency to a predominant secretory defect with insulin resistance	Refers to glucose intolerance with onset or first recognition during pregnancy (see page 80 for screening procedures for gestational diabetes mellitus (GDM))	Includes a variety of relatively uncommon conditions, primarily specific genetically defined forms of diabetes or diabetes associated with other diseases or drug use

Adapted from Canadian Diabetes Association 2008 Clinical Practice Guidelines for Prevention and Management of Diabetes in Canada (S10)

Symptoms:

Type 1 diabetes	Type 2 diabetes All individuals should be assessed annually for risk factors	
Individuals present with acute symptoms of diabetes and markedly elevated blood glucose and most cases are diagnosed soon after onset of hyperglaecemia.	Adults who are overweight (BMI $\geq$25 kg/m^2) and have one or more additional risk factors (see risk factors table on following page)	Children who are 10 years old, or who have reached puberty and are overweight: ▪ BMI >85th percentile for age and sex ▪ weight for height >85th percentile ▪ or weight >120% of ideal for height ▪ and have two additional risk factors (see risk factor table on the following page)
Symptoms: ▪ Polyuria ▪ Polydipsia ▪ Unexplained weight loss	**May or may not have symptoms:** ▪ Polyuria ▪ Polydipsia ▪ Unexplained weight loss	**May or may not have symptoms:** ▪ Polyuria ▪ Polydipsia ▪ Unexplained weight loss

Type 1 Diabetes:

- Occurs mainly in juveniles, but can occur in adults especially in those in their late 30's and 40's
- Is a catabolic disorder in which circulating insulin is very low or absent, plasma glucagon is elevated, and the pancreatic beta cells fail to respond to all insulin-secretory stimuli.
- Patients need exogenous insulin to reverse this catabolic condition, prevent ketoacidosis, decrease the raised glucagon, and normalise lipid and protein metabolism.
- Unlike people with T2DM, those with T1DM generally are not obese and may present initially with ketoacidosis (DKA)

Risk Factors for Developing Diabetes:

Type 1 diabetes	**Type 2 diabetes in adults**	**Type 2 diabetes in children**
▪ Family history ▪ Birth and early childhood conditions ▪ Ethnic background (Northern European or Mediterranean decent) ▪ Autoimmune condition where pancreas shows a lymphocytic infiltration and destruction of insulin secreting cells of the islets of Langerhans, thus causing insulin deficiency	A person who is overweight and has one or more additional risk factors: ▪ First-degree relative with diabetes ▪ Member of a high risk ethnic population (e.g. African, Aboriginal, Hispanic, Latino, Asian decent) ▪ Abdominal obesity ▪ History of Impaired Glucose Tolerance (IGT) or Impaired Fasting Glucose (IFG) ▪ Presence of complications associated with diabetes ▪ Vascular disease (coronary, cerebrovascular or peripheral) ▪ Women who delivered a baby weighing >9lb or were diagnosed with gestational diabetes mellitus ▪ Hypertension ($\geq$140/90 mmHg or on therapy for hypertension) ▪ Dyslipidaemia ▪ Polycystic ovarian syndrome (PCOS) ▪ Acanthosis nigricans ▪ Schizophrenia	A person who is overweight and has one or more additional risk factor: ▪ First-degree or second degree relative with type 2 diabetes ▪ Member of a high risk ethnic population (e.g. African, Aboriginal, Hispanic, Latino, Asian decent) ▪ Signs of insulin resistance or conditions associated with insulin resistance (hypertension, dyslipidaemia, polycystic ovarian syndrome (PCOS), acanthosis nigricans) ▪ Maternal history of diabetes or GDM

Screening Tests for Diabetes[i]:

Screening for diabetes using Fasting Plasma Glucose (FPG) or HbA1c should be performed every 1 year in individuals ≥ 40 years and all individuals of any age who have multiple risk factors for diabetes

There are three tests used to screen for diabetes: Fasting Plasma Glucose (FPG), Oral Glucose Tolerance Test (OGTT) and Haemoglobin A1c (Hba1c). The confirmation of an abnormal result should be confirmed on a subsequent visit with repeat testing. When two different tests are used and the results are discordant, the test whose result is above the diagnostic cut-off point should be repeated and the diagnosis made on the result of the confirmed test (ADA).

1. *Measurement of Morning Fasting Plasma Glucose (FPG):*

Normal glucose	**Impaired fasting glucose (IFG) or at increased risk for diabetes**	**Diabetes**
70–99 mg/dL (3.9–5.5 mmol/L)	**100–125 mg/dL (5.6–6.9 mmol/L)**	**126 mg/dL or more (7.0 mmol/L)**
▪ No OGTT testing required ▪ Screen should be repeated in three years ▪ Screen more frequently depending on risk status	Testing with 2hr PG in a 75-g OGTT should be taken in individuals with: ▪ FPG of 110–125 mg/dl ▪ FPG of 100–108 mg/dL and 1 Risk factor	▪ **Diagnosis of diabetes if hyperglyaecemia is present** ▪ In the absence of unequivocal hyperglyaecemia a **diagnosis of diabetes must be confirmed by** testing for 2hr PG in a 75-g OGTT on another day **(ADA) or for HbA1c**

2. *Measurement of 2 hour plasma glucose after 75 g OGTT on another day:*

Normal glucose	**Impaired glucose tolerance (IGT) or at increased risk for diabetes**	**Diabetes**
< 140 mg/dL (7.7 mmol/L)	**140–200 mg/dL (7.7–11.1 mmol/L)**	**> 200 mg/dL or more (11.1 mmol/L)**
Not diabetic ▪ Re-screen as required	**IFG or/and IGT** ▪ Provide preventive counselling	**Diagnosis confirmed** **Refer to Diabetes Education Programme**

[i] Measurement of Casual Plasma Glucose (PG) (any time of day without regard to interval of last meal) can be used for screening purposes only – not as a diagnostic tool.

3. *Measurement of HbA1c* (ADA)*

Normal glucose	**Impaired fasting glucose (IGF) and/ or Impaired Glucose Tolerance (IGT) (both at increased risk for diabetes)**	**Diabetes**
HbA1c 5%	**HbA1c 5.7% - 6.4%**	**HbA1c ≥6.5%**
Not diabetic	**IFG or/and IGT** ▪ Re-test every 6 months ▪ Provide preventive counselling	**Diagnosis confirmed** **Refer to Diabetes Education Programme**

HbA1c testing should be performed using a method that is certified by the National Glycohemoglobin Standardization Program (NGSP) and standardized or traceable to the Diabetes Control and Complications Trial reference assay.
Point-of-Care HbA1c assays are not sufficiently accurate at this time for diagnostic purposes.

Glucose Tolerance Categories:

Blood Glucose Levels

HbA1c	***FASTING PLASMA GLUCOSE***	***Screening tests for diabetes:***		***2-HOUR PG ON OGTT***	***HbA1c***
Diabetes Mellitus ≥6.5%	**Diabetes Mellitus > 126 mg/dL**	***Diagnosis of DIABETES***		**Diabetes Mellitus > 200 mg/dL**	**Diabetes Mellitus ≥6.5%**
Impaired Fasting Glucose > 5.7%-6.4%	**Impaired Fasting Glucose > 100 mg/dL**	***IFG* INCREASED RISK FOR DIABETES***	***IGT* INCREASED RISK FOR DIABETES***	**Impaired Glucose Tolerance > 140 mg/dL**	**Impaired Glucose Tolerance 5.7%-6.4%**
5% Normal	**< 100 mg/dL Normal**	**With increased risk for diabetes patients can be classified with IFG or IGT or both IFG and IGT*		**< 140 mg/dL Normal**	**5% Normal**

Diagnosis of Diabetes:

Diagnosis of diabetes is confirmed with the following plasma glucose and HbA1c levels (ADA)
1. Fasting Plasma Glucose ≥126 mg/dL (7.0 mmol/L)
2. 2 hr plasma glucose in a 75 g OGTT ≥200 mg/dL (11.1 mmol/L)
3. HbA1c ≥6.5%

Diagnosis of Categories of Increased Risk for Diabetes (pre-diabetes):

Hyperglyaecemia not sufficient to meet the diagnostic criteria for diabetes is categorized as either impaired fasting glucose (IFG) or impaired glucose tolerance (IGT), depending on whether it is identified through the FPG or OGTT. Both IFG and IGT are terms used to distinguish people who are at increased risk of developing diabetes (often referred to as pre-diabetes) and macro vascular complications.

Diagnosis of pre-diabetes			
Classification	**FPG**	**2 hr PG**	**HbA1c**
Impaired fasting glucose (IFG)	100–125 mg/dL (5.6–6.9 mmol/L)	<140 mg/dL (7.7 mmol/L)	5.7 – 6.4%
Impaired glucose tolerance (IGT)	<100 mg/dL (<5.6 mmol/L)	140–200 mg/dL (7.7–11.1 mmol/L)	5.7 – 6.4%
IFG and IGT	100–125 mg/dL (5.6–6.9 mmol/L)	140–200 mg/dL (7.7–11.1 mmol/L)	5.7 – 6.4%

Prevention /Delay of Type 2 Diabetes:

Randomized controlled trials have shown that individuals at high risk for developing diabetes (those with increased risk for diabetes - IFG, IGT or both) can be given interventions that significantly decrease the rate of onset of diabetes (by 60%). These interventions include intensive lifestyle management and the use of the pharmacological agent Metformin (ADA).

Management of Persons with Increased Risk for Diabetes:

In addition to referral for diabetes education programme, provide individual counselling to:

- Initiate **intensive lifestyle management** to improve glycaemic control and cardiovascular risk factors
- **Reduce body weight** by 5% to 10% with a reduced calorie diet that is low in fat, saturated fat and trans-fatty acids
- Initiate **regular moderate physical activity** (45 to 60 minutes for 5 days a week)
- Ensure individuals maintain the **same target goals** and treatments for blood pressure and lipid control as for those with established diabetes (outlined on pages 52-63)
- Prescribe **aspirin therapy** for all persons with increased risk for diabetes who are not at increased risk for gastrointestinal tract, intracranial or other bleeding
- Conduct **glucose tolerance test and microalbuminuria tests** annually and FBG, HbA1c and lipid levels twice a year

Self-Management Education

The aims of self-management education (SME) are to increase the patient's involvement in, confidence with and motivation for control over their diabetes, its treatment and effect on their lives (CDA). Unfortunately, diabetes self-management is rarely a patient's primary life concern and self-care goals can be difficult to attain so SME is should be patient centred.

SME includes skills training, coping strategies, goal-setting, problem-solving, self-monitoring of health parameters and case-management. Training should include individualized training as well as group training sessions. Family members and significant others also need training to increase their understanding of the challenges patients and their families will face and to develop coping skills.

Components of skill training must be individualized according to the type of diabetes, current metabolic stability, treatment regime, motivation, learning ability and readiness to change.

Learning ability and **readiness to change** both need to be assessed to establish training objectives and the best approach to be used in SME training of the patient and his/her family.

Learning ability:

Each patient will be at a different learning ability. The objectives for each patient should be based on the patient's level of learning.

Levels of learning (CDA):	
Survival/basic level	▪ The knowledge, skills and motivation required for self-care to prevent, identify and treat the acute short-term complications of hyperglycaemia or severe hypoglycaemia ▪ The person may or may not wish and/or need or be able to progress beyond this level
Intermediate level	▪ The knowledge, skills and motivation required for self-care to achieve recommended metabolic control, reduce the risk of long term complications and facilitate the adjustments to living with diabetes ▪ The person may or may not wish and/or need or be able to progress beyond this level
Advanced level	▪ The knowledge, skills and motivation required for self-care to support intensive diabetes management for optimal metabolic control and full integration of care into the individual's life activities and goals

** From Canadian Diabetes Association 2008 Clinical Practice Guidelines for Prevention and Management of Diabetes in Canada (S25)*

Readiness to Change:

Changing life-long behaviours is very difficult for anyone. It is important to assess your patient's "stage" of readiness to change. The term "stage" is defined as an expression of the person's intention to change. In self-care "having intention" means having the understanding of the behaviour required, the knowledge and skill to do it and the self-efficacy to support trying to learn or do it. There are five stages of change. Assessing your patient's current level of change will help you determine if they are ready for change and how best to proceed with their skills training.

Stage	Intention stage	Bottom-line	Tactics
Pre-contemplation (Uncommitted)	Not interested or no intention to change	"I won't"	▪ Not ready to change present behaviours. ▪ Raise awareness of benefits of changing by asking the patient how he/she views the diagnosis of diabetes.
Contemplation (Considering change)	Possible intention to change, but not now	"I might"	▪ Not ready to change present behaviours. ▪ Needs help to sway the decisional balance in favour of change. ▪ Ask patient how changing their lifestyle behaviours would benefit them while acknowledging the difficulties.
Preparation (Planning change)	Committed to change, taking steps to do the behaviour, but is not meeting set goals	"I will"	▪ Committed to changing soon, but needs ways to increase self-efficacy. ▪ Suggest possible simple strategies ▪ Concentrate on one easy goal to change and provide feedback on progress ▪ Ensure referred for education
Action (Changing behaviour)	Is doing the new behaviour, meeting all the agreed goals	"I am"	▪ Making changes according to goals ▪ Ensure intensive skill-training and support provided ▪ Celebrate patients success when they achieve a set goal
Maintenance (Continuing with behaviour change)	Is doing the new behaviour, meeting all the agreed goals	"I have been"	▪ Provide strategies and support to prevent relapse ▪ Suggest "action" tactics patient has not yet tried ▪ Continue to follow-up – may relapse, if so encourage "action"

Self-Management Education Skill Training (CDA):

Skills training objectives should be developed to cover the following basic lifestyle areas:

- Self-monitoring **blood glucose**
- Making appropriate **dietary changes**
- Incorporating an **exercise regime**
- Understanding when and how to make **adjustment to medications**
- Preventing and managing **hypoglycaemia and hyperglycaemia**
- Preventing, detecting and treating **diabetes complications**
- **Smoking cessation** techniques, if patient is a smoker
- Maintaining **psychological health**

Medical Nutrition Therapy

Persons with diabetes and at risk for developing diabetes should be referred to a registered dietitian *for Medical Nutrition Therapy (MNT). The dietitian will complete a comprehensive nutrition and activity assessment, make a nutrition diagnosis, work with the patient to plan and implement appropriate food and activity modifications, monitor outcomes and provide follow-up support. MNT will be individualized according to the type of diabetes, current metabolic stability, treatment regime, motivation, learning ability and willingness to change and ability to make change (as per SME).*

Goals of Medical Nutrition Therapy:

Class of diabetes:	Recommendations:
Prevention of Type 2	**Lifestyle modification to focus on:** ▪ Moderate weight loss (7% body weight) ▪ Aim to achieve BMI <30 (ideal BMI <25) ▪ Regular physical exercise (150 mins/wk) ▪ Reduced calories ▪ Reduced dietary fat
Type 1 Diabetes	▪ Integrate insulin therapy into individuals diet and exercise pattern ▪ Learn how to match insulin to carbohydrate intake ▪ When on rapid-acting insulin or insulin pump adjust meal and snack insulin doses based on carbohydrate content of meals and snacks ▪ When on fixed daily insulin doses ensure carbohydrate intake is consistent in amount and time eaten daily ▪ Adjust insulin dose for planned exercise ▪ Eat extra carbohydrate as required for unplanned exercise ▪ Understand that drinking alcohol can result in delayed hypoglycaemia (up to 24 hours)
Type 2 Diabetes	**Lifestyle modification to ensure reduced intakes of:** ▪ Calories (energy) ▪ Saturated fat/ trans fatty acids/ cholesterol ▪ Sodium ▪ Increase physical activity ▪ Reduce BMI <30 (ideal BMI <25)
Pregnancy and Lactation with T1DM	▪ Adequate calorie intake to provide appropriate weight gain ▪ Avoid ketonaemia from ketoacidosis or starvation

Class of diabetes:	Recommendations:
Gestational Diabetes (GDM)	▪ Provide education ▪ Ensure food choices for appropriate weight gain (modest calorie and carbohydrate restriction) ▪ Aim for normoglycaemia (may require insulin therapy) ▪ Ensure absence of ketones ▪ After delivery ensure lifestyle modification to prevent development of type 2 diabetes

Dietary Guidelines:

Nutrient	Recommendation
Calories	▪ Weight loss is recommended for overweight and obese individuals who have or are at risk for diabetes ▪ Behaviour modification is an important component of a weight loss programme ▪ Reduce calories - 500 calories a day reduction equals one pound of weight loss a week ▪ For weight loss, either low-carbohydrate or low-fat calorie-restricted diets may be effective in the short term (up to 1 year)
Carbohydrate (45-60% of energy)	▪ Include carbohydrate from fruits, vegetables, whole grains and low-fat milk ▪ For glycaemic control monitor carbohydrate intake by carbohydrate counting, exchanges or experienced-based estimation ▪ Use of glycaemic index may provide a modest additional benefit ▪ Sucrose-containing foods can be incorporated into a meal plan, however, care should be taken to ensure cover with insulin or other glucose-lowering medications ▪ Increase foods high in fibre ▪ Non-nutritive sweeteners and sugar alcohols are safe if consumed in moderation ▪ Reduce consumption of alcoholic drinks (limit 1 drink/ day women and 2 drinks/ day for men)
Fat and cholesterol (<35% of energy)	▪ Limit saturated fat to <7% of total calories ▪ Limit polyunsaturated fat to <10% of energy ▪ Substitute mono-unsaturated fat for saturated fats ▪ Minimize intake of trans fat ▪ Lower dietary cholesterol to <200mg/day ▪ Choose lower fat meats ▪ Consume skimmed milk and low fat dairy products ▪ Eat 2 or more servings of fish (not commercially fried) a week

Nutrient	Recommendation
Protein (15-20% of energy)	▪ Usual protein intake (15-20% calories) for patients with diabetes and normal renal function ▪ In early stages of CKD, protein intake 0.8-1.0g/kg ▪ In late stage CKD, protein intake 0.8g/kg may improve kidney function
Sodium	▪ Reduce sodium intake to 2,300 mg/day particularly in salt sensitive individuals ▪ Avoid added salt ▪ Avoid salty foods (processed foods)

Management of Obesity in Diabetes

Overweight and obesity are both labels for ranges of weight that are greater than what is generally considered healthy for a given height. The terms also identify ranges of weight that have been shown to increase the likelihood of certain diseases and other health problems. It is estimated that 80-90% persons with type 2 diabetes are overweight or obese. Weight loss of 5 - 10% can improve glycaemic control by increasing insulin sensitivity and glucose uptake, improving blood pressure and blood lipid levels as well as improving quality of life scores.

Emphasis should be placed on achieving a healthier weight and lifestyle while de-emphasizing cosmetic goals. Health care providers must help patients to accept a modest, sustainable weight change that can be realistically achieved and maintained.

Assessment of Obesity:

Anthropometric Measurements
1. Measure weight and height
2. Measure waist circumference (WC)
3. Determine BMI[2]
4. Use above information to determine body weight classification and disease risk

Guidelines for Body Weight Classification in Adults using BMI and WC:

Body Weight Classification			**Disease risk**	
Classification	**BMI (kg/m^2)**	**Obesity Class**	***WC: Men ≤40 in (102 cm) Women ≤35 in (88 cm)**	**WC: Men ≥40 in (102 cm) Women ≥35 in (88 cm)**
Underweight	< 18.5		Increased	Increased
Normal	18.5–24.9		Least	Increased
Overweight	25.0–29.9		Increased	High
Obesity	30.0–34.9	I	High	Very high
	35.0–39.9	II	Very high	Very high
Severe obesity	≥ 40	III	Extremely high	Extremely high

Table adapted from ADA/CDA guidelines
* Weight Circumference (WC) cut offs may be lower for some populations

[2] BMI does not directly measure body fat. As a result, some people, such as athletes, may have a BMI that identifies them as overweight even though they do not have excess body fat.

Medical and Psychological Assessment:

Medical and psychological assessments	Examples:
1. Identify potential medical causes	▪ Endocrine ▪ Neurological ▪ Family history, genetics ▪ Medications – antipsychotics / antidepressants / corticosteroids
2. Assess metabolic co-morbidities	▪ Hypertension ▪ Dyslipidemia ▪ Cardiovascular disease (CVD) ▪ Kidney disease
3. Identify psychological status	▪ Depression ▪ Psychotropic medications ▪ Post-traumatic stress disorder ▪ Addictive behaviour ▪ Eating disorders
4. Assess potential barriers to treatment	▪ Psychological status ▪ Physical disability ▪ Current life stresses ▪ Level of knowledge ▪ Readiness to change

Dietary assessment:

Nutritional assessment:	To identify:
1. Dieting history	▪ Previous weight loss experiences ▪ Number of times dieting tried ▪ Types of diets ▪ Basic understanding of weight loss principles ▪ Amount of weight lost ▪ Amount of time weight kept off ▪ Use of weight loss medications ▪ Use and success of alternative approaches

Nutritional assessment:	To identify:
2. Weight history	▪ Age weight increase began ▪ What were lowest and highest adult weights ▪ Weight gain and loss patterns ▪ Life event triggers/stressors ▪ Medication triggers ▪ Eating disorders
3. Current eating patterns	▪ What foods are eaten ▪ Frequency of meals and snacks ▪ Timing of meals and snacks ▪ Meal skipping patterns ▪ Portion size ▪ Use of convenience and fast foods
4. Nutritional intake (food frequency and/or 24 hour recall)	▪ Calorie intake ▪ Nutrient density and adequacy ▪ Supplement use
5. Environmental factors	▪ Socioeconomic factors ▪ Lifestyle issues ▪ Cues that trigger eating ▪ Cooking/menu planning skills ▪ Meals eaten away from home ▪ Fast food/restaurant/buffet eating ▪ Cultural influences ▪ Support systems
6. Exercise history	▪ Past activity pattern ▪ Present activity pattern ▪ Structured exercise ▪ Daily living activity ▪ Barriers to exercise
7. Readiness to change	▪ Stage of change of individual (see page 13) ▪ Learning ability ▪ Reasons for losing weight ▪ Weight loss goals

Adapted from Position of American Dietetic Association: Weight Management: J Am Diet Assoc. 2009;109:330-346

Treatment options:

1. Dietary and Behaviour Modification:

The goal of treatment is to establish achievable and sustainable dietary and activity behaviour changes to stop and prevent weight gain, and facilitate small maintainable weight loss.

Persons with diabetes require nutrition counselling by a registered dietitian. A dietitian can work with the individual to develop a plan which is sensitive to the individual's needs, culture and beliefs.

Dietary goals to ensure:	Behaviour therapy

▪ **SMART** objectives which are
  ▪ **S**pecific
  ▪ **M**easurable
  ▪ **A**ttainable
  ▪ **R**ealistic
  ▪ **T**imely
  are created and agreed upon by patient and RD
▪ Food is selected from the food groups (nutritionally adequate)
▪ Appropriate serving sizes/portions/cooking methods
▪ Adequate carbohydrate intake – 100 g/day to spare protein breakdown and muscle wasting
▪ Adequate protein to maintain lean body mass
▪ High fibre to increase satiety
▪ Decrease in saturated fats
▪ Decrease in energy dense foods
▪ Medical supervision for very low calorie diets (<900 calories per day not recommended, except with medical supervision)
	▪ Identify cues that trigger inappropriate eating and activity
	▪ Identify barriers to change eating and activity
	▪ Use problem solving tools such as:
	  ▪ Nutrition education
	  ▪ Self-monitoring – keeping food and activity diaries
	  ▪ Stimulus control – controlling cues and triggers associated with eating
	▪ Use cognitive behavioural therapy which is:
	  ▪ Goal-directed identifying measurable outcomes
	  ▪ Process-oriented assisting individuals in how to make changes
	  ▪ Based on making small obtainable changes
	▪ Use cognitive restructuring approaches to teach about and raise awareness of detrimental thought habits so patients can:
	  ▪ Identify destructive habits
	  ▪ Learn to challenge these habits
	  ▪ Substitute life-enhancing thoughts and beliefs
	▪ Identify support systems which can help facilitate weight loss:
	  ▪ Partner, friend, health professional, colleague
	  ▪ Support groups
	  ▪ Counselor
	▪ Web-based programmes

2. Pharmacology Treatment:

Pharmacologic drugs may improve weight loss and glycaemic control in overweight and obese adults with type 2 diabetes if combined with lifestyle modification.

Criteria for drug treatment	Orlistat (Xenical)	Sibutramine (Reductil)
BMI ≥30	√	√
BMI ≥27 + comorbidity or risk factor(s)	-	√
BMI ≥28 + comorbidity or risk factor(s)	√	√
Pre-therapy requirements prior to receiving 1st prescription		
	Patient is required to achieve weight loss of at least 5 lbs through lifestyle modification	Patient has been unable to lose at least 5% of body weight through lifestyle changes within last 3 months
Dosage		
	▪ One capsule (120mg) before, during or up to 1 hour after a meal ▪ Miss dose if meal is missed ▪ Maximum 3 times a day	▪ One capsule (10mg) daily ▪ Can increase to 15 mg daily at one month if less than 5 pounds lost
Side-effects and contra indications		
	▪ Oily spotting with flatus ▪ Faecal urgency & anal leakage ▪ Diet should contain less that 30% fat ▪ Contraindicated with cholestasis or malabsorptive syndrome ▪ Monitor blood levels of ciclosporin ▪ Monitor warfarin patients	Contraindicated for patients with: ▪ Cardiovascular disease ▪ Arrhythmias ▪ Uncontrolled hypertension ▪ Stroke ▪ Eating disorders ▪ Psychiatric disorders ▪ Taking antipsychotic or antidepressant drugs
Continuation therapy		
2 week criteria	-	Check pulse and BP every 2 weeks
1 month criteria	-	4 pound weight loss
3 month criteria	5% weight loss	5% weight loss
6 month criteria	10% weight loss	10% weight loss

Adapted from National Obesity Forum Guidelines - www.nationalobesityforum.org.uk

3. Surgical Treatment:

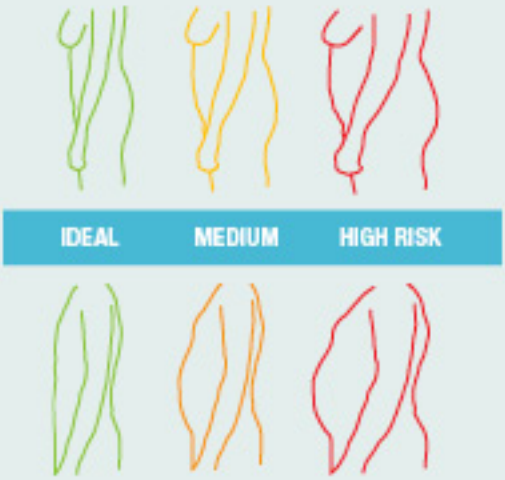
Bariatric surgery may be considered for **severely obese** (class III) individuals **(BMI ≥ 40)** with type 2 diabetes. Those obese individuals with a **BMI's ≥ 35** (class II) with **comorbidities** and who have been unable to lose weight through lifestyle intervention may also be suitable candidates for bariatric surgery.

Candidates for bariatric surgery should be well-informed, motivated patients with acceptable operative risks who should be carefully evaluated and referred to a multi-disciplinary team with medical, surgical, psychiatric, and nutritional expertise and experience with bariatric surgery. As there are risks associated with surgical procedures, further information should be sought from bariatric specialists.

Successful bariatric surgery can facilitate weight losses of 16 to 43% body weight (varying between 50 and 140 pounds) over 1 to 2 years. This can generally be maintained if the patient is closely supervised and follows an appropriate weight management plan. However, obesity surgery, like other treatments resulting in sudden weight loss, can be associated with impaired absorption of micronutrients so supplementation may be required.

Bariatric surgery consists of **three main approaches** - restrictive procedures, malabsorptive procedures or a combination of the two. The **restrictive procedures** limit food intake by creating a small gastric pouch with a narrow outlet that restricts the amount of food a patient can eat at a time. This includes Vertical Banded Gastroplasty and Laparoscopic Adjustable Gastric Banding. **Malabsorptive procedures** bypass part of the small intestine so that less food is absorbed after eating. This includes Biliopancreatic Diversion with or without Duodenal Switch. The Roux-en-Y Gastric Bypass is an example of a **combination procedure** and can be done as an open or laparoscopic procedure.

HEALTHY LIVING GUIDE



YOUR WAIST SIZE

By measuring your waist circumference you can check if you have excess fat around your waist that can put your health at risk. Measure your waist size to see if you are within the recommended range.

To measure your waist size, place a tape measure around the narrowest point of your waist (between your lower ribs and your hip bone), breathe out and measure the circumference.

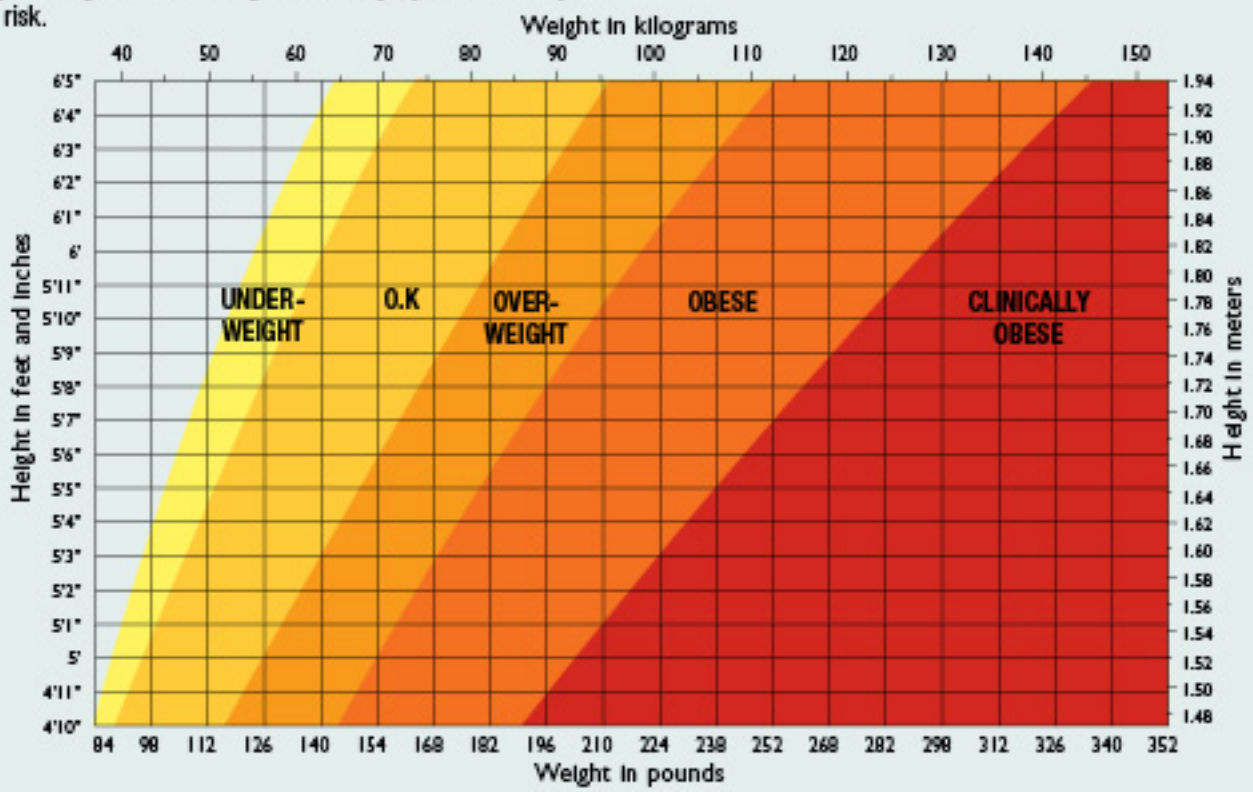
	Ideal to be below	Greatest risk if above
Women	32 inches	35 inches
Men	37 inches	40 inches

Speak to your doctor if you have any concerns

BODY MASS INDEX (BMI)

Body Mass Index (BMI) is a quick way to check if you have a healthy body weight for height. Check your BMI in the graph below, and speak to your doctor if you have any concerns. If your weight is in the orange to red range, your health may be at risk.

However, BMI may not be accurate if you are an athlete or very muscular (muscle weighs more than fat.). Use BMI together with waist circumference to calculate your risk.



For personalised information go to • www.cdc.gov/nccdphp/dnpa/bmi

Want personalised information ?

If you want more information to build a personal healthy living plan, try these reliable web sites:
www.mypyramid.gov • www.eatwell.gov.uk • www.nhsdirect.nhs.uk/magazine/interactive/calories
www.thecaloriecounter.com • www.webmd.com

Physical Activity

Lack of exercise is a major contributor to overweight and obesity. Regular exercise has been shown to improve the control of blood glucose, reduce cardiovascular risk factors, contribute to weight loss, improve cardio-respiratory fitness and improve psychological well-being. In addition, regular exercise may prevent the onset of type 2 diabetes in high-risk individuals. Higher levels of exercise intensity have been associated with greater improvements in HbA1c and in fitness. Therefore, physical activity is a key factor in the prevention and management of type 2 diabetes and in the management of type 1 diabetes (CHRC).

Assess Patient Physical Activity Level:

- Assess patient for **type, frequency and intensity** of present physical activities
- Assess patients with multiple cardiovascular risk factors for coronary artery disease – an exercise ECG stress test is recommended for previously sedentary individuals with diabetes at high risk for CVD who wish to undertake exercise more vigorous than brisk walking (CDA)
- Assess patients for conditions that might contraindicate certain types of exercise or predispose to injury (ADA)
- Consider patients age and previous physical activity level prior to making exercise recommendations

Level of activity	Activities
Inactive	▪ Sedentary job and no physical exercise
Moderately inactive	▪ Sedentary job and some but <1 hour physical exercise per week ▪ Standing job and no physical exercise
Moderately active	▪ Sedentary job and 1-2.9 hours physical exercise per week ▪ Standing job and some but <1 hour physical exercise per week ▪ Physical job and no physical exercise or cycling
Active	▪ Sedentary job and ≥3 hours physical exercise per week ▪ Standing job and 1-2.9 hours physical exercise per week ▪ Physical job and some but <1 hour physical exercise per week ▪ Heavy manual job

** Adapted from NHS General Practice Physical Activity Questionnaire (GPPAQ) - A screening tool to assess adult physical activity levels, within primary care*

Indicators assigned to level of intensity of walking*:		Activity level
0	Breathing easily, conversation is easy	Light activity
1	Breathing lightly and talking easily but heart rate increases	
2	Still talking comfortably but breathing more quickly body warming up	Moderate activity
3	Breathing more deeply and harder, talking with a little more difficulty	
4	Breathing very hard and short of breath, difficult to carry on a conversation	Vigorous Activity

Recommendations for Exercise (CDA, ADA):

- Advise patients about the benefits of regular physical activity
- Physical activity should be incorporated into daily living and be affordable, enjoyable, convenient and accessible
- A formal exercise programme is not required to meet the requirements for physical activity
- **Regular aerobic activity** should be sustained for **30-60 minutes** at least **5 times a week** (minimum of 150 minutes)
  - There should be no more than **2 consecutive days** without exercise
  - Activity can be broken into manageable **chunks of 10 minutes** throughout the day
- Note: 300 minutes of activity a week may be required to achieve weight loss goals
- The **level and intensity** of physical activity should be guided by the age and ability of the patient
- Previously sedentary individuals should gradually build up their amount of exercise
- Patients with type 2 diabetes (without contraindications) should be encouraged to perform **resistance exercise** 3 times a week (initial instruction by an exercise specialist is recommended)
- Provide guidelines for adjusting medications (insulin) and /or adding carbohydrate for physical activity (see section following "exercise when glycemic control is not optimal")

<table>
<tr><th colspan="4">Aerobic exercise:</th></tr>
<tr><th>Definition and recommended frequency</th><th>Intensity</th><th colspan="2">Examples</th></tr>
<tr><td rowspan="2">▪ Rhythmic, repeated and continuous movements of the same large muscle groups for at least 10 minutes at a time

▪ Recommended for 30-60 minutes 5 times a week or a minimum of 150 minutes per week (moderate intensity)</td><td>▪ Moderate: breathing more deeply and harder, talking with a little more difficulty or 50-70% of person's maximum heart rate</td><td>▪ Biking
▪ Brisk walking
▪ Continuous swimming</td><td>▪ Dancing
▪ Raking leaves
▪ Water aerobics</td></tr>
<tr><td>▪ Vigorous: breathing very hard and short of breath, difficult to carry on a conversation or >70% of person's maximum heart rate</td><td>▪ Brisk walking up an incline
▪ Jogging
▪ Aerobics</td><td>▪ Hockey
▪ Baseball
▪ Fast swimming
▪ Fast dancing</td></tr>
</table>

** Adapted from Canadian Diabetes Association 2008 Clinical Practice Guidelines for Prevention and Management of Diabetes in Canada (S38)*

Resistance exercise:		
Definition	**Recommended frequency**	**Examples**
▪ Activities that use muscular strength to move a weight or work against a resistant load (initial instruction and periodic supervision are recommended)	**3 times per week** ▪ Start with 1 set of 10-15 repetitions at moderate weight ▪ Progress to 2 sets of 10-15 repetitions ▪ Progress to 3 sets of 8 repetitions at heavier weight	▪ Exercise with weight machines ▪ Weight lifting

** Taken from Canadian Diabetes Association 2008 Clinical Practice Guidelines for Prevention and Management of Diabetes in Canada (S38)*

Exercise when glycemic control is not optimal (ADA):

- Persons with Type 1 diabetes who are **hyperglycaemic** can exercise provided they feel well and urine and blood ketones are negative
- Vigorous activity should be avoided in the presence of ketosis
- Physical activity in individuals taking insulin and/or insulin secretagogues can cause **hypoglycaemia** if medication dose or carbohydrate consumption is not altered. If pre-exercise **glucose levels are <100 mg/dl** give added carbohydrate
- Persons with Type 1 diabetes who exercise late in the day are at increased risk of overnight **hypoglycaemia**

Exercise in the presence of long-term complications of diabetes (ADA):

- **Retinopathy:** exercise may be contraindicated because of risk of triggering vitreous haemorrhage or retinal detachment in the presence of proliferative diabetic retinopathy (PDR) or severe non-PDR (NPDR)
- **Peripheral neuropathy:** non-weight bearing activities such as cycling, swimming or arm exercises, are recommended when severe peripheral neuropathy is present, to reduce risk of skin breakdown and infection.
- **Autonomic neuropathy:** before beginning more intense activity than what they are normally accustomed, persons with diabetic autonomic neuropathy should undergo cardiac investigation
- **Albuminuria and nephropathy:** there is no need for any specific activity restrictions for people with diabetic kidney disease.

Psychological Care

Patients coping with diabetes are more likely to be affected by mental health problems which will have an impact on diabetes management and glycaemic control (CDA, ADA). Psychological issues may be related to the diagnosis of diabetes and/or self-management of diabetes and can range from impairment to quality of life, and to anxiety disorders to clinically significant depression. Existing psychological disorders may be exacerbated due to the diagnosis of diabetes.

Psychosocial screening:

Psychosocial screening:	Common patient concerns:
▪ Attitudes about diabetes diagnosis	▪ Worry about the future and possible complications
▪ Expectations for management and outcomes	▪ Guilt and anxiety at not being on track with treatment goals
▪ Mood or affect	▪ Not knowing if mood or feelings are related to diabetes
▪ General and diabetes quality of life	▪ Scared about living with the diabetes ▪ Being constantly concerned about food and eating ▪ Feeling deprived about food
▪ Resources (social, emotional and financial)	▪ Not able to cope with the diagnosis
▪ Psychiatric history	▪ Feeling depressed about living with diabetes

When assessing psychosocial status use (CDA):

- Open ended questions about:
  - Stress
  - Social support
  - Self-care behaviours
  - Beliefs
  - Coping skills
- Direct queries "During the past month have you often been bothered by:
  - feeling down, depressed or hopeless?"
  - little interest or pleasure of doing things?"
- Standardized questionnaires, if necessary:
  - Beck Depression Inventory
  - Problem Areas in Diabetes Scale
  - Child Health Questionnaire

Smoking Cessation

Tobacco dependence is a chronic disease that should be treated. Many smokers enter and exit the health care system without receiving advice about the health risks of smoking.

Smoking Cessation Programmes:

Evidence-based clinical practice guidelines on smoking cessation indicate that:

- brief advice by medical providers to quit smoking is effective
- more intensive interventions (individual, group or telephone counselling) that provide social support and training in problem-solving skills are even more effective
- approved pharmacotherapy (nicotine patches, gum, nasal sprays etc) can also help people quit smoking, when combined with counselling and other interventions

The "5 A's" model for treating tobacco use and dependence (Motivational Interviewing)

Ask about tobacco use	▪ Identify and document tobacco use status of every patient at every visit.
Advise to quit	▪ In a clear, strong and personalized manner urge every tobacco user to quit
Assess readiness	▪ For current user, is the user ready and willing to make a quit attempt at this time? ▪ For the ex-tobacco user, how recently did they quit and are there any challenges to remaining tobacco free?
Assist	▪ For the patient willing to make a quit attempt, refer for counselling or additional behaviour treatment and offer medication to help patient quit. ▪ For the patient unwilling to quit at this time, provide motivational interventions designed to increase future attempts to quit. ▪ For the recent quitter and any with remaining challenges, provide relapse prevention.
Arrange	▪ All those receiving the previous A's should receive follow-up.

Fiore MC, Jaén CR, Baker TB, et al. Treating Tobacco Use and Dependence: 2008 Update. Quick Reference Guide for Clinicians. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service. April 2009.

Pharmacotherapy:
Drug Treatment Options to Stop Smoking:

Drugs:	Medication:	Dose
Smoking cessation drugs	Bupropion SR	150 mg once daily for 3 days then twice daily
	Varenicline	0.5 – 1 mg twice daily

Over the Counter Drugs:

- Nicotine gum
- Nicotine inhaler
- Nicotine lozenge
- Nicotine patch

Glycaemic Control

*There is compelling evidence that improved glycaemic control reduces the risks of microvascular complications in both Type 1 (T1DM) and type 2 diabetes mellitus (T2DM). In T1DM improved glycaemic control reduces the risk of cardiovascular disease. Epidemiological studies indicate that **HbA1c >7%** levels are associated with a significant increased risk of both microvascular and macrovascular complications regardless of underlying treatment.*

Recommended Glycaemic Targets:

Both fasting plasma glucose (FPG) and post-prandial glucose (2hr PG) levels correlate with the risk of complications.

Recommended Glycaemic Targets:			
	Fasting Plasma Glucose (FPG)	**2 hour Plasma Glucose**	**HbA1c**
Type 1 Diabetes (T1DM)	**72- 126 mg/dL (4.0-7.0 mmol/L)**	**90-180 mg/dL (5.0-10.0 mmol/L)**	**< 7%**
Type 2 Diabetes (T2DM)	**72- 126 mg/dL (4.0-7.0 mmol/L)**	**90-144 mg/dL (5.0-8.0 mmol/L)**	**< 7%**
	▪ FPG is directly related to cardiovascular events with the increase in risk apparent even at PG levels that are within normal range	▪ 2 hr PG is a better predictor of cardiovascular disease and all-cause mortality than FPG ▪ This association appears to be **linear** without a threshold	▪ Reliable estimate of mean PG of the previous 3-4 months ▪ Indicator of treatment effectiveness ▪ HbA1c and the development of long-term complications are correlated in T1DM and T2DM

Monitoring of HbA1c:

- Measure **HbA1c** every **3 months** when glycaemic targets are being met or when diabetes therapy is being adjusted
- When glycaemic targets are consistently achieved, **HbA1c** can be measured at **6 month** intervals
- Communicate **Hb1Ac** result to patients and involve them in decisions about their target levels and offer therapy as required
- Advise patients with high HB1Ac levels that any reduction from previous level is beneficial
- Use appropriate alternative measures when HbA1c methods are invalidated by haemoglobinopathy or abnormal haemoglobin turnover

Self Monitoring of Blood Glucose (SMBG):

SMBG is the only direct method by which a person with diabetes mellitus can be aware of her/his level of blood glucose.

Pros of SMBG:	Cons of SMBG:
▪ Highlights awareness of control	▪ Patient may lack awareness as to how to handle hypoglycaemia
▪ Cultivates the patient's independence for the health service	▪ Healthcare providers may not be interested in patient's glucose readings
▪ Enhances self-regulation	▪ Can raise patient's anxiety level
	▪ The increased self-responsibility may increase self-blame
	▪ Negative readings may increase patient's distress

Frequency of SMBG:

Ensure patients receive initial instructions in and follow-up evaluation of SMBG monitoring technique. Discuss purpose of SMBG and how to use data to adjust therapy if necessary (ADA). Blood glucose meter reading should be compared with lab measurement or FPG annually to ensure accuracy.

Establish frequency of SMBG on an individual basis based on:	
▪ **Type** of diabetes and **treatment** prescribed ▪ Patient's capacity to use the information from the results to modify behaviour or adjust medication	
▪ **T1DM**	▪ **T2DM**
▪ SMBG is an essential component of daily diabetes management	▪ Benefits and optimal frequency of SMBG are less clear than with T1DM
▪ BG measurements at lunch, after supper and at bedtime show the highest correlation with Hb1Ac	▪ Daily SMBG in patients on oral hypoglycaemic agents (OHA) is linked with lower Hb1Ac levels
▪ Multiple daily test results provide better information when correlated with Hb1Ac than with FBG levels	▪ T2DM patients on insulin therapy should test with same frequency as for T1DM

* BG meter reading should be compared with lab measurement or FPG annually to ensure accuracy

Continuous glucose monitoring (CGMS) (is used by persons using a diabetes pump):

- CGMS is used to measure average blood sugar levels for up to 3 days
- CGMS records blood sugar levels throughout the day and night providing 288 glucose measurements in 24 hours
- It is not intended for day-to-day monitoring but only used to discover trends in glucose levels in pump users

Ketone Testing Recommended:

T1DM	T2DM
▪ During periods of acute illness accompanied by elevated blood glucose	▪ Ketone testing should be considered only **if all of these symptoms (as outlined in T1DM)** are experienced by persons with T2DM
▪ When preprandial levels remain elevated	
▪ When there are symptoms of diabetic ketoacidosis	

Urine testing:

Urine testing is **NOT** recommended for evaluating control of diabetes mellitus

Hypoglycaemia

The goals of treatment of hypoglycaemia are to detect and treat low blood glucose (BG) level promptly by administering glucose to provide the fastest rise in BG to a safe level.

Causes of Hypoglycaemia:

The most common cause of hypoglycaemia is medication-induced. This occurs in about 20% of patients on insulin or insulin secretagogues. Other causes include:

- Exercising more than normal
- Too little food
- Missed or late meals
- Too much insulin or OHGA
- Alcohol consumption
- Menses
- Hot weather

<table>
<tr><th colspan="3">Hypoglycaemia is defined by low plasma glucose below 72 mg/dL (4 mmol/L)</th></tr>
<tr><th colspan="2">Autonomic symptoms</th><th>Neuroglycopenic symptoms</th></tr>
<tr><td colspan="2">▪ Trembling
▪ Palpitation
▪ Sweating
▪ Anxiety
▪ Hunger
▪ Nausea
▪ Tingling</td><td>▪ Difficulty in concentration
▪ Confusion
▪ Weakness
▪ Drowsiness
▪ Vision changes
▪ Difficulty in speaking</td></tr>
<tr><td>Hypoglycaemic unawareness</td><td colspan="2">Occurs when the threshold for the development of autonomic warning symptoms is close to or lower than the thresholds for the neuroglycopenic symptoms</td></tr>
<tr><td>Asymptomatic hypoglycaemia</td><td colspan="2">Is the presence of a biochemically documented low glucose level without any symptoms</td></tr>
<tr><td>Asymptomatic nocturnal hypoglycaemia</td><td colspan="2">Is common, often lasts more than 4 hours, and severe hypoglycaemia resulting in seizures is more likely to occur at night</td></tr>
</table>

Stages of hypoglycaemia		
Mild	**Moderate**	**Severe**
▪ Sweating ▪ Slurred speech ▪ Shaking weakness ▪ Anxiety	▪ Confusion ▪ Slurred speech ▪ Glazed eyes ▪ Poor concentration	▪ Unresponsive ▪ Combativeness ▪ Agitation ▪ Convulsions ▪ Unconsciousness
Treatment (symptoms respond to the administration of carbohydrates – using the 15 Rule)		
▪ Pure glucose (**15 mg**) as • Glucose tablets • 3 packages of sugar dissolved in water • ½ cup juice or soda ▪ Wait **15 minutes** and retest. **If BG level is still below 72 mg/dL** (4 mmol/L): ▪ Re-treat with 15 mg glucose ▪ Once hypoglycaemia is reversed, the patient should have usual meal or snack including protein source	▪ Pure glucose (20-30 mg) • Glucose tablets • 4-6 packages of sugar dissolved in water • 1 cup juice or soda ▪ Wait 15 minutes and retest. **If BG level is still below 72 mg/dL** (4 mmol/L): ▪ Re-treat with 15 mg glucose ▪ Once hypoglycaemia is reversed, the patient should have usual meal or snack including protein source	▪ This is an **acute medical emergency** where **hospital admission is indicated** ▪ Administer glucagon

Glucose Control

Oral Therapy

Type 2 diabetes mellitus (T2DM) is characterized by two problems: resistance to the action of insulin; and the inability to make enough insulin to overcome that resistance. The overall objective to treatment is to achieve and maintain glycaemic levels as close to the non-diabetic range as possible. It is now accepted that T2DM be treated with Metformin in combination with lifestyle changes at diagnosis.

Stages of Management:

The primary objective is to achieve and maintain glycaemic levels as close to non-diabetic level as possible. Interventions should be changed as soon as titration of medications allows.

1. Introduce **oral Metformin** in combination with lifestyle changes (medical nutrition therapy MNT and exercise).
   If glycaemic levels are not maintained then:
2. Add a **second medicine**: oral medicine or insulin
3. Add **third medicine**: insulin (basal or intensified therapy)

See page 45 for a list of Oral Hypoglycaemic Drugs

Insulin Therapy

Insulin therapy is the mainstay of glycaemic control in patients with Type 1 Diabetes mellitus (T1DM). Insulin is used in patients with type 2 diabetes (T2DM) whose metabolic control is chronically inadequate (Hb1Ac >6.5% despite appropriate diet, weight reduction, exercise and maximum dosage of hypoglycaemic agents). Insulin is also used in acute illness, surgery, pregnancy and certain other situations.

Insulin Regimes (CHRC):

1. **Combined oral agents and insulin**
   Morning: Oral agents – Metformin/sulphonylureas/Thiazolidinedioneas
   Bedtime: Glargine or NPH insulin

2. **Twice daily regime of both regular and NPH insulin**
   Use the rule of thirds
   1/3 short-acting insulin and 2/3 long-acting
   2/3 of daily dose in morning and 1/3 in evening

3. **Multiple dosing regime**
   Short-acting immediately before each main meal with
   Long-acting insulin at bedtime

Management of Insulin:

See page 50 for a list of Insulin Drugs

Insulin therapy should be tailored to the individual's age, diet, lifestyle, motivation, general health, hypoglycaemia awareness and ability to self manage. Each patient should be put through a structured programme employing active insulin dose titration that encompasses (NICE):

- Structured education
- Telephone support
- Frequent self monitoring
- Dose titration to target
- Dietary understanding
- Management of hypoglycaemia
- Management of acute changes in plasma glucose control
- Support from an appropriately trained and experienced healthcare professional

Insulin therapy for T2DM

Why insulin therapy:	Why reluctance at insulin therapy:
▪ T2DM is a progressive disease ▪ It characterised by relentless deterioration of the pancreatic beta-cell function ▪ More patients will develop severe insulin deficiency due to the increasing incidence of T2DM especially amongst younger individuals who will live longer ▪ Therefore, it is reasonable to conclude that most patients with T2DM will eventually need exogenous insulin ▪ Insulin is considered to be the most effective treatment for lowering extremely high glucose ▪ There is an increasing body of evidence showing that early and effective intervention with insulin is more important than had been previously believed ▪ Insulin may actually protect against endothelial damage	▪ Concern about hypoglycaemia from physicians and patients ▪ Patient's willingness and/or ability to inject insulin ▪ Perception that insulin therapy is too complex to manage ▪ Prescribing information provided by manufacturers has been somewhat vague regarding initial dosing and titration

Injectable insulins are categorised based on the duration of action as:

Basal insulins:	Bolus (meal-time insulins):
▪ NPH (neutral protamine Hagedorn) ▪ Isophane insulin (Novolin N, Humulin N) ▪ Ultralente (extended insulin suspension) ▪ Insulin analogue glargine	▪ Regular insulin (Novolin R, Humulin R) ▪ Analogue aspartate (NovoLog) ▪ Analogue lispro (Humalog)

Options for Treatment:

Traditional insulins: **(Regular, NPH, Ultralente)**	**Analogue insulins:** **(Glargine, Aspart, Lispro)**
▪ Absorptions are erratic thus creating day-to day fluctuations in glycaemic control ▪ Delayed onset of action and peak activity requires co-ordination of injection and food	▪ With analogue insulins, 1 to 3 amino acids have been substituted in the human insulin protein to produce altered absorption rates and more reliable absorption profiles ▪ Therefore avoiding the problems of traditional insulins

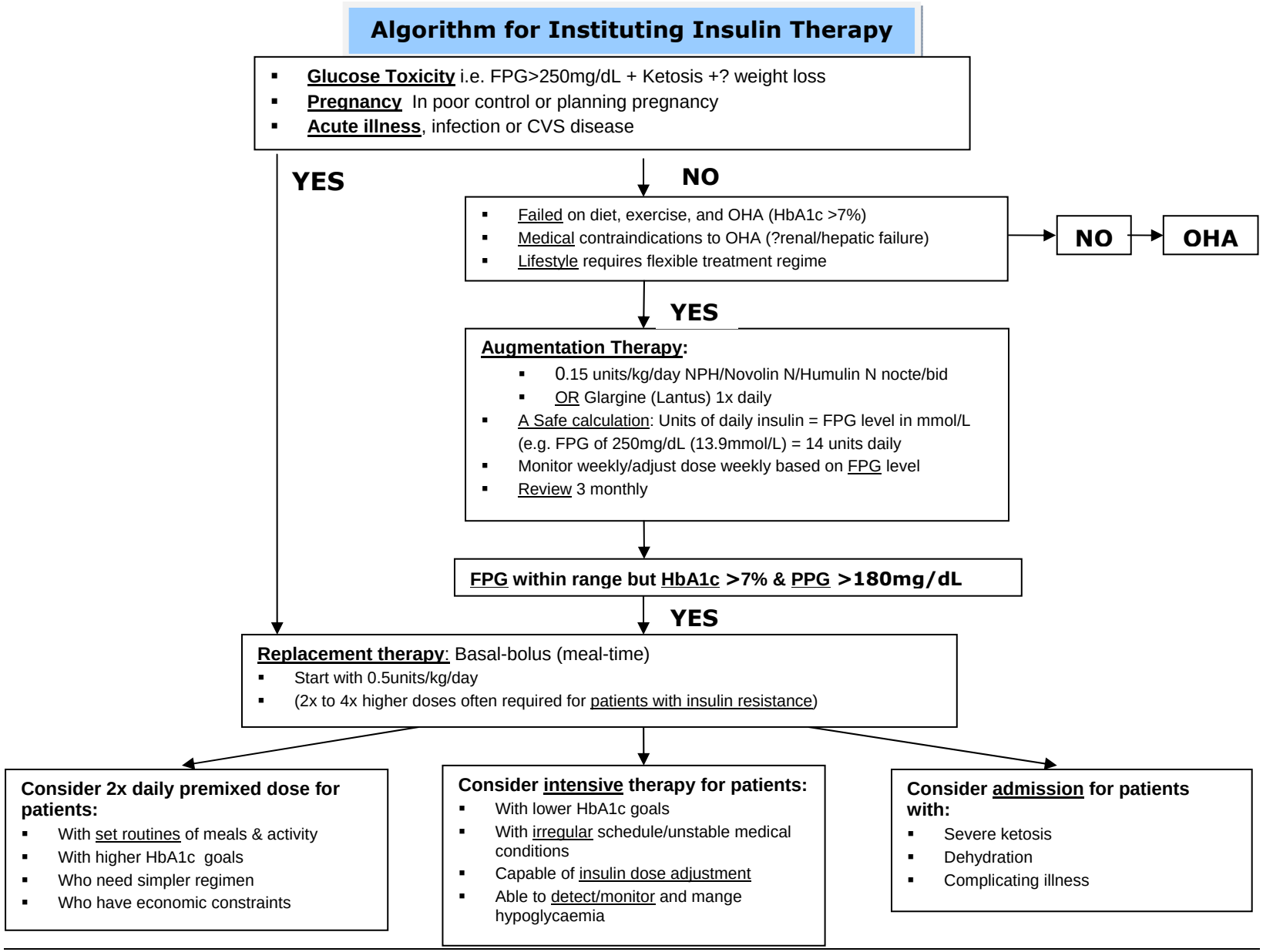
Indications for Insulin Therapy:

- Insulin therapy can **always achieve glycaemic control**
- May be **initiated at any time**
- Most common **indications for insulin therapy** include:
    - Failure to achieve glycaemic control with diet, exercise and oral medications
    - For patients with contraindications to an OHA
- Studies indicate that:
    - An HbA1C of 7% or less was found to decrease the risk of microvascular outcomes, though not CVS disease (in the UKPDS)
    - Within 3 years of diagnosis, only 33% of patients treated with Metformin and Sulfonylureas maintain an HbA1C of less than 7%

Dosing of Insulin:

- See the algorithm for instituting insulin therapy on following page.
- There is no limit to the amount of insulin that can be used safely.
- U-500 (500 units/ml) regular insulin is available for use in patients who require large amounts of insulin.
- Volumes greater than 0.5ml (50 units of U-100 insulin) should be divided and injected in separate sites to facilitate absorption.

Algorithm for Instituting Insulin Therapy



Intensive Insulin Therapy:

Intensive Insulin Therapy (IIT) is also referred to as Flexible Insulin Therapy (FIT) in the USA.

- IIT favours flexible meal times, variable carbohydrate intake, and flexible physical activities
- This requires an increase from the usual 2 or 3 daily insulin injections to 4 or more daily injections.
- Both UKPDS and DCCT studies showed that IIT achieved blood glucose levels closer to levels in non-diabetic people.
- This was associated with reduced frequency and severity of blood vessel damage.
- Reduces morbidity and mortality in critically ill patients in:
  - Surgical intensive units
  - With myocardial infarct
- Reduces morbidity and mortality in:
  - Pregnant women with poorly controlled T2DM
  - Glucose toxicity – i.e.: FPG >250mg/dL+Ketonuria+Weight loss + symptomatic hyperglycaemia

Methods of intensive insulin therapy include:

Multiple daily injections (MDI):	**Insulin Pump:**
▪ Meal time injections of rapid-acting insulin before each meal in an amount proportional to the meal ▪ Basal insulin is provided as a 1x or 2x daily injection of long-acting insulin	▪ The pump can be programmed to infuse a steady amount of rapid acting insulin under the skin ▪ The steady infusion is termed the basal rate and is designed to supply the background insulin needs ▪ Each time the patient eats, he/she must press a button on the pump to deliver a specified dose of insulin to cover the meal ▪ Extra insulin is also given the same way to correct a high glucose reading

Advantages of IIT/FIT:	**Disadvantages of IIT/FIT:**
▪ Greater flexibility of meal times ▪ Greater flexibility of carbohydrate quantities ▪ Flexibility of physical activities ▪ Better glycaemic control ▪ Reduction in the incidence and severity of diabetes complications	▪ Requires greater amount of education and efforts to achieve the goals ▪ Substantially increases the daily costs of diabetes care

Contraindications and Adverse Effects of IIT:

- There are no medical contraindications to insulin therapy.
- FDA drug category ratings for use in pregnancy indicate:
  - No insulin has a category A (controlled studies show no risk) pregnancy classification; Regular and NPH insulin have been used extensively in pregnant women.
  - Lispro has category B (no evidence of risk in humans), whilst Aspart and Glargine have category C (risk can not be ruled out).
- Most serious ADR is hypoglycaemia, but severity is less in T2DM than T1DM. The risk increases when A1C is less than 7.4%.
- Hypoglycaemic risks can be minimised with the use of analogue insulin, careful injection timing, meals, exercise, frequent self-monitoring of blood glucose levels, patient education about dose adjustment, and management of hyperglycaemia.
- Weight gain is a common side effect and this risk is minimized by increasing exercise, restricting calories and giving Metformin concurrently

Misconceptions:

- That patients experience more episodes of hypoglycaemia. However, this is not so if insulin is used correctly.

Helpful advice for initiating insulin therapy:

- Discuss the possibility of insulin therapy with patient well in advance, so that he/she can address fears and obtain more information.
- Have available several insulin start-packs with instructions sheets.
- Consider the use of other devices that do not require syringes, e.g. pens.
- Liaise closely with the Diabetes Centre (KEMH) and the Bermuda Diabetes Association's Diabetes Resource Centre.
- Tailor insulin type and regimen to fit patient's lifestyle and budget.
- Follow up after a week and subsequently to offer support, advice and further education.
- Always ask for and review the Self-Monitoring Blood Glucose Log Book.
- Encourage and praise patient's efforts.

Algorithm for Starting Glargine (Lantus) Therapy in T2DM Patients:

Patient has **NOT taken insulin before**:

- 10 units/0.15units/kg once daily

or

Patient **has taken NPH insulin before**:

- Use **80%** of the total daily dose of the NPH insulin

↓

- **Inject the insulin** at the SAME TIME every day

↓

Monitor FPG:

- If <80/dl (4.4mmo/L) on **three(3)** consecutive days
  - **or >=3 times** in a week:
    - DECREASE Glargine by 2 units

↓

Review FPG 1x weekly:

- Increase insulin dose based on the past **2 days**
- Do NOT increase the dose more than once a week.

↓

Guide to dose adjustment:

Mean SM FPG for preceding 2 days	Insulin dose increase
> 180 (10)	8 units
140 (7.7) to 180	6 units
120 (6.7) to 140	4 units
100 (5.6) – 120 (6.7)	4 units

↓

Glargine effects last **16 to 24 hrs**

Insulin sensitive patients may require 2x daily schedule to maintain target BG levels

Bolus (Mealtime) Insulin:

Four factors to consider when establishing mealtime bolus can be remembered with the word "SAFE":

S	A	F	E
▪ **S**upplemental insulin (or Correctional insulin): is added or subtracted to bring the premeal/bedtime glucose level into the desired range. ▪ Insulin-sensitive patients require 1 unit of insulin to change the blood sugar by 50mg/dL.	▪ **A**ctivity: the dose should be decreased by: • 30% for post prandial exercise of less than 1hr, • 40% for 2hr • 50% of more than 2hrs.	▪ **F**ood: insulin to cover anticipated meal intake based on the patient's insulin/carbohydrate ratio.	▪ **E**xperience: the SMG and insulin injections provide a way of learning what works for each patient. ▪ Blood glucose and insulin logs should be reviewed weekly until patients reach their goals.

Factors to consider when combining oral medications plus insulin:

- The synergistic effect of OHA with insulin may allow the insulin to be reduced by up to 50%.
- Metformin + Insulin decreases weight gain, hypoglycaemia, and diabetes-related end points.
- Metformin does not need dose adjustment when given with insulin.
- Thiazolidinediones drugs + insulin can decrease the total insulin dose by up to 50%.
- However, Thiazolidinediones may cause oedema and are contraindicated in patients with CCF.
- Suphonylureas + insulin may lower HbA1c and reduce daily insulin requirement if some beta-cells function remain.
- They are better absorbed if the glucose levels have been normalised with insulin.
- In most cases insulin + OHA is more cost effective compared to oral triple therapy.

Sliding Scale Therapy: The Hospitalised Patient

- Sliding scale therapy = Bolus insulin without basal insulin
- It is often blamed for erratic glycaemic control in the hospital settings.
- An observational study shows: Hospitalised patients with unspecified diabetes types found **those with sliding scale therapy were at 3x higher risk of hyperglycaemia.**
- Patients too sick to use OHA should receive **basal insulin with periodic bolus adjustments** (see notes above on supplemental or corrective insulin therapy, and intensive insulin therapy)
- Most convenient basal-bolus regimen: Split-mixed NPH + Regular insulin before breakfast and dinner. This requires **rigid adherence to a set meal size and time**

Oral Hypoglycaemia Agents:

Metformin

Class / dose	Drug (brand name)	Actions
Metformin *Start with 500 mg once or twice daily with meals*	**Biguanide:** (Glucophage, Glumetza)	▪ A euglycaemic which may restore blood sugar to normal or non-diabetec levels ▪ Main site of action is at the liver ▪ Ideal for the overweight as it does not cause weight gain ▪ **Possible side effects** include: gastric upset or colic, which is usually transient. Take with food to reduce side effects ▪ **Metformin therapy** should be reviewed if serum creatinine exceeds **130 mmol/L or GFR is below 45 mL/min** ▪ Lactic acidosis (rare fatal side-effect) may affect people with renal or hepatic disease or heart failure

Insulin secretagogues

Class / dose	Drug (brand name)	Actions
Insulin secretagogues *Start with low dose and increase as necessary*	**Sulfonylureas:** Glyburide (Glynase®), Glipizide (Glucotrol®), Glimepiride (Amarly®)	▪ Stimulates the beta cells to secrete insulin ▪ Relatively rapid BG lowering response ▪ Usually taken once or twice a day
	Glinides: Repaglinide (Gluconorm®) Nateglinide (Starlix®)	▪ Stimulates the beta cells to secrete insulin ▪ They do not work as long as sulfonylureas do ▪ Have to be taken 30 minutes before eating
	All **insulin secretagogues** listed above:	▪ **Possible side effects:** • Hypoglycaemia (especially with Glyburide) • Weight gain (especially with Glyburide) ▪ **Contraindicated** in patients with renal or hepatic disease ▪ Over time, secretagogues may not work as well and additional therapy will be necessary

Insulin sensitizers:

Class / dose	Drug (brand name)	Actions
Insulin sensitizers *Can be used as mono-therapy or in various combinations*	**Thiazolidinediones TZD** (Glitazones®)	▪ Lowers BG by increasing the muscle, fat and liver sensitivity to insulin ▪ A slow acting euglycemic that can take several weeks for effects to be seen
	Rosiglitazones (Avandia®) and **Pioglitazone** (Actos®)	▪ Beneficial effects on lipids and blood pressure ▪ **Mono-therapy** for overweight patients inadequately controlled by diet and exercise for whom Metformin is inappropriate ▪ **Dual therapy** with **Metformin** in overweight patients with insufficient glycaemic control despite maximum tolerated dose of Metformin ▪ **Dual therapy** with **sulfonylurea** in patients with Metformin intolerance or contraindicated with insufficient glycaemic control despite mono-therapy with a sulfonylurea ▪ **Triple therapy** with **Metformin** and **sulfonylurea** especially in overweight patients with insufficient glycaemic control despite dual oral therapy ▪ **Pioglitazone** is now licensed for combination with insulin in T2DM patients with insufficient control on insulin or when Metformin is inappropriate
	All **insulin sensitizers** listed above:	▪ **Possible side effects:** • Weight gain • Fluid retention • Anaemia • Increased LDL cholesterol • Increased risk of congestive heart failure • Increased risk of ischaemic heart disease • Increased osteoporosis and fractures in females • Upper respiratory infections (Rosiglitazones)

Starch blockers:

Class / dose	Drug (brand name)	Actions
Starch blockers *Start with a low dose – 25 mg 2-3 times daily (at start of meal)*	**Alpha-glucosidase inhibitor**: Acarbose (Glucobay®)	▪ Inhibits the intestinal digestive enzyme, a-glucosidase ▪ Reduces intestinal absorption of carbohydrates ▪ Minimal effect on HbA1c, as does not reduce the amount of absorbed glucose although it helps lower post-prandial glucose **Possible side effects:** ▪ Flatulence: to reduce this increase dose slowly and ensure similar carbohydrate intake daily ▪ Can cause hypoglycaemia when taken with an insulin secretagogue or insulin ▪ Hypoglycaemia due to Acarbose must be treated with pure glucose or dextrose **Contraindicated** in patients with intestinal, renal or hepatic conditions

Incretin-based treatment:

Class / dose	Drug (brand name)	Actions
Incretin-based treatment *100 mg (can be split)*	**Sitagliptin** (Januvia®)	▪ Control post-prandial glucagon levels and thus post-prandial glucose levels ▪ Lowers glucagons levels during meals and increases insulin release by the pancreas when the BG is too high ▪ **Possible side effects:** • Sore throat • Runny nose • Upper respiratory infections • Allergic reactions: swelling of mouth and throat, & rashes • No effect on weight gain/loss • Hypoglycaemia when taken with an insulin secretagogue or insulin

Class / dose	Drug (brand name)	Actions
Byetta – 5-10 mcg twice a day to be injected within 60 minutes of mealtime	**Exenatide** (Byetta®)	▪ An injectable medication for T2DM ▪ Helps prevent raised BG after eating ▪ Lowers glucagons levels, slows food emptying time from the stomach, curbs appetite and increases insulin release from the pancreas when BG is too high. **Possible side effects:** ▪ Nausea and vomiting ▪ Hypoglycaemia ▪ Pancreatitis

Amylin analogue treatment:

Class / dose	Drug (brand name)	Actions
Amylin analogue treatment *15 – 60 mcg daily to be injected prior to mealtimes*	**Pramlintide** (Symlin®)	▪ Amylin is a hormone normally released along with insulin from the pancreas ▪ Amylin levels may be reduced in T2DM ▪ Pramlintide resembles the hormone, amylin ▪ Lowers glucagons during meals, slows food emptying from the stomach and curbs appetite ▪ This is an injectable drug used for both T1DM and T2DM **Side effects:** ▪ Nausea and vomiting ▪ Headaches ▪ Hypoglycaemia when combined with an insulin secretagogues or insulin

Anti-obesity drugs:

Class / dose	Drug (brand name)	Actions
Antiobesity agents	**Orlistat** (Xenical®)	▪ **Side effects:** • Gastro intestinal • Diarrhoea ▪ **Contraindicated** in patients with cholestasis or malabsorptive syndrome
	Sibutramine (Meridia®) (Reductil®)	▪ **Side effects:** • Increase blood pressure • Increase heart rate ▪ **Contraindicated** for patients with a history of CHD, arrhythmias or uncontrolled hypertension

Insulin Therapy:

Insulin types and regimens:

Type of insulin	Drug (brand name)	Onset	Peak	Duration	Action
Fast-acting insulin	**Aspart** (NovoRapid®)	10-20 mins	1-3 hrs	3-5 hrs	▪ Larger the dose longer the duration ▪ Used in pumps
	Lispro (Humalog®)	10-15 mins	30-90 mins	< 5 hrs	
	Glulisine (Apidra®)	10-15 mins	1-3 hrs	< 5 hrs	
Regular human insulin (Actrapid® Insuman®, Rapid®)	**Humulin®**	30-60 mins	2-3 hrs	4-6 hrs	▪ Larger the dose the faster the action but the longer time to peak and the longer the duration
	Velosulin®	30 mins–1 hour	1-3 hours	2-8 hours	
Intermediate-acting insulin	**NPH human insulin**	1–4 hours	4-12 hours	14–24 hours	▪ These are absorbed more slowly and last longer ▪ Very unpredictable absorption rate and action ▪ Very small doses have an earlier peak effect and shorter duration ▪ Higher doses have longer time to peak and prolong duration of action ▪ This results in more frequent low and high blood sugars ▪ Use has declined with the availability of other long-acting insulin options
	Lente (Humulin® L Novolin® L)	1-4 hours	3-15 hours	16-24 hours	
Pre-mixed insulin **Pre-mixed insulin continued**	**Humalog** mix (75%/25%)	15 mins	30 mins–4 hours	16-24 hours	▪ Generally given twice a day before meals ▪ Pre-mixed insulins are available in vials and insulin pens ▪ Disadvantage of NPH is the insulin's unpredictable action ▪ Problems arise if the dose needs to be changed
	Humulin (50%/50%)	15–30 mins	2-8 hours	18-24 hours	

Type of insulin	Drug (brand name)	Onset	Peak	Duration	Action
	Novolin (70%/30%) **Humulin** (70%/30%) **Novolog** (70%/30%)	15-30 mins	1-12 hours	Up to 24 hours	▪ There is a risk of high and low blood sugars ▪ Mixtures do not allow for a separate correction to be made for blood sugar changes
Long-acting insulin	**Glargine** (Lantus®)	1½-2 hours	Insulin delivered at steady rate	24 hours	▪ Injected once daily at same time each day ▪ Insulin injected clumps under the skin where it is slowly released at a steady rate
	Determir (Levemir®)	1-2 hours	6-8 hours	Up to 24 hours	▪ Two injections a day at same time each day ▪ Injected insulin binds with albumin in the blood stream from where it is slowly detached
	Long-acting insulins listed above:				▪ Are slowly absorbed ▪ Have minimal peak effect ▪ Have a stable plateau lasting most of the day ▪ Are used to control blood sugar overnight, while fasting and between meals ▪ **Cannot and should not be mixed in the same syringe as other types of insulin** as they would change the actions of the insulins

Blood Pressure Control

There is a higher prevalence of hypertension among persons with diabetes compared with those without diabetes (CHRC). Hypertension is a major determinant of both micro-vascular and cardiovascular complications, increasing the risk of strokes, ischemic heart disease, retinopathy and nephropathy in persons with diabetes (CDA). Hypertension is a treatable risk factor, delay in treatment increases risk of complications. Therefore, people with diabetes should be screened regularly and aggressively treated if found to have elevated blood pressure (CDA).

Assessment and Screening of Blood Pressure:

Frequency of blood pressure monitoring of persons with diabetes:
Measure blood pressure at every routine diabetes visit
Aim for a blood pressure reading below 130/80 mmHg

Blood Pressure Monitoring Measurement Protocol (IDF)*:*

- Use a mercury sphygmomanometer or validated meter in good working condition with an appropriate sized cuff
- Measure after individual has sat quietly for at least five (5) minutes
- Ensure arm is at heart level, using first and fifth phases of Korotkoff sounds
- Record all values in record card held by person with diabetes (note BP in medical record)
- Use 24 hour ambulatory BP monitor for persons experiencing "white coat" hypertension, adjust targets down by 10/5 mmHg

Measuring Blood Pressure and Diagnosing Hypertension:

Measurement of blood pressure (BP) at initial visit			
	Normal BP	**High Normal BP**	**High BP**
Systolic BP (SBP)	**<130 mm Hg**	**130-139 mm Hg**	**>140 mm Hg**
Diastolic BP (DBP)	**<80 mm Hg**	**80-89 mm Hg**	**>90 mm Hg**
Action required	▪ No action required ▪ Monitor at office visits	▪ Confirm BP on a separate day ▪ Initiate lifestyle therapy trial for 3 months ▪ Schedule follow-up visit for 3 months	▪ Take at least two more readings at this visit ▪ Discard first reading and average other readings ▪ Schedule follow-up visit for 1 month

Measurement of blood pressure BP at follow-up visits		High normal BP retake after 3 months	High BP retake within one month of first visit
	Normal BP	**High normal BP**	**High BP**
Systolic BP (SBP)	**<130 mm Hg**	**130-139 mm Hg**	**>140 mm Hg**
Diastolic BP (DBP)	**<80 mm Hg**	**80-89 mm Hg**	**>90 mm Hg**
	▪ No action required	▪ If targets not met after 3 months initiate BP lowering medication	▪ Diagnosis of hypertension ▪ Consider secondary causes ▪ Initiate trial lifestyle modification ▪ Initiate BP lowering medication

- Perform **further investigations as indicated** on the basis of clinical suspicion following the history, physical examination and initial investigations.
- A diagnosis of **hypertension** is made if the blood pressure reading is above **130/80 mmHg**
- A classification of **high normal blood pressure** is made for systolic blood pressure readings between **130- 139** mmHg and diastolic blood pressure between **85-89 mmHg**
- For blood pressures above **140/90 mmHg** retake and calculate average of at least two more readings; make a follow-up appointment within one month to **confirm diagnosis of high blood pressure**

As part of the physical examination:

1. Elicit a full history with attention to the following:	2. Undertake investigations to assess for end-organ disease or associated:
▪ Duration of hypertension	▪ Dipstick urine
▪ Previous antihypertensive therapy (efficacy and adverse effects)	▪ Assessment of microalbuminuria
▪ History of cardiovascular disease	▪ Electrolytes
▪ Symptoms suggestive of a condition that may cause secondary hypertension	▪ Lipids
▪ Family history	▪ Liver function tests
▪ Modifiable lifestyle risk factors	▪ EKG
▪ Alcohol use	
▪ Recreational drug use	
▪ Medications	
▪ Personal and Environmental factors that can influence course	

Management of Hypertension:

	Persons with high normal BP	Persons with diagnosis of hypertension	Persons with diabetes, Chronic Kidney Disease (CKD) and high BP
Lifestyle modification	Trial for 3 months	Maintain lifestyle modification	Maintain lifestyle modification
Initiation of blood pressure medications	▪ If targets not met after 3 months initiate BP lowering medication ▪ Maintain lifestyle modification	▪ Prescribe any agent **except alpha-adrenergic blockers** ▪ Can use ACEI, A2RBs, DHP, CCBs or thiazide diuretics ▪ If **intolerant** to ACEI use A2RB ▪ Many patients will require three or more drugs to reach target BP goals (ADA)	▪ **CKD stages 1-4:** use ACEI or A2RB in combination with a diuretic ▪ **CKD stage 5: do not use** ACE inhibitor ▪ **Note:** diuretics may increase the beneficial effects of ACEI and A2RBs in CKD patients
Target blood pressure	**<130/80 mmHg**	**<130/80 mmHg**	**<130/80 mmHg**
When using ACEI, A2RBs or diuretics regularly monitor kidney function and serum potassium levels			

Management of Hypertension for Special Populations:

Special populations:	Persons with diagnosis of hypertension:
Persons of African decent	▪ ACEI and A2RBs are less effective
Pregnant women	▪ Avoid use of ACE inhibitors and A2RB ▪ Begin with CCB ▪ BP goal 110/65-129/79 mmHg
Persons with isolated systolic hypertension	▪ A long acting DHP CCB is an alternative to ACEI
Persons with albuminuria	▪ ACEI or A2RBs recommended as initial therapy ▪ If elevated BP persists add additional drugs

Drug Treatment Options for Hypertension:

1. Diuretics*:

Class of Diuretics:	Medication:	Dose
Loop diuretics	Furosemide	20-40 mg once daily
Aldosterone antagonists	Spironolactone	100-200 mg daily
Thiazides	Bendroflumethazide	2.5 mg daily
	Chlorthalidone	25-50 mg each morning
	Cyclopenthiazide	250-500 mg each morning
	Indapamide	2.5 mg each morning
	Hydrochlorothiazide	25-50 mg each morning
	Metolazone	2.5-5 mg each morning

***** *These are general guidelines only*

2. Other Drugs for Hypertension*:

Class of Drug:	Medication:	Dose
ACEI – Angiotension-Converting Enzyme Inhibitor	Ramipril	2.5-10 mg once daily
	Enalapril	5-40 mg once daily
	Lisinopril	5-40 mg once daily
A2RBs – Angiotension II Receptor Blockers	Candesartan	8-32 mg once daily
	Valsartan	80-160 mg once daily
	Telmisartan	40-80 mg once daily
	Losartan	50-100 mg once daily
A-blocker - Alpha-adrenergic blockers	Doxazosin	1-4 mg once daily
B-Blockers – Beta Blockers	Atenolol	25-100 mg once daily
	Bisoprolol	10 mg once daily
	Metoprolol	100-200 mg once or twice daily
DHP CCB – Dihydropyridine Calcium Channel Blockers	Nifedipine	30-90 mg once daily
	Amlodipine	5-10 mg once daily
Non-DHP CCB (CDA)	Verapamil	240-480 mg daily in 2or 3 divided doses
	Diltiazem	120-240 mg once daily

* *These are general guidelines only*

Notes:

- Lifestyle modification for 3 months to reduce calories, salt and alcohol intake and increase activity (see section on management starting on page 12)
- **During pregnancy treatment** with ACEI and A2RBs is contraindicated (ADA). Effective and safe hypertensive drugs for pregnant women include methyldopa, labetalol, diltiazem, clonidine, and prazosin.
- Chronic diuretic use during pregnancy has been associated with restricted maternal plasma volume.
- Consider specialist referral if **secondary hypertension** is suspected. For example, primary aldosteronism should be considered in all patients with hypertension, especially those with moderate to severe or treatment resistant hypertension and those with hypokalemia.

Resistant Cases of Hypertension:

- In **resistant cases of hypertension**, consider other medications (including complementary medicines) that patient may be taking that may increase blood pressure (see table below).

Medications that can increase blood pressure:

Medications:	**Complementary medicines**:
▪ Corticosteroids	▪ Caffeine containing products (guanara, cola, green tea)
▪ Haemopoietic agents (Epo)	▪ Ephedra
▪ Iimmunomodulators (cyclosporine, tacrolimus)	▪ Ginger
▪ MAOIs	▪ Ginseng
▪ Oral contraceptives	▪ Licorice
▪ Oral decongestants (pseudoephedrine)	▪ Sage
▪ Stimulants (amphetamines)	▪ St. John's Wort
▪ Cocaine use	

Kidney Disease

Diabetic kidney disease (DKD) is one of the most common and potentially devastating complications of diabetes which occurs in 20-40% of patients with diabetes (ADA/CDA). According to the NKF-KDOQI[3] Guidelines (National Kidney Foundation – www.kidney.org), in the US, microalbuminuria is found in 43% and macroalbuminuria in 8% of those with diabetes.

Assessment and screening of diabetic kidney disease:

All persons with diabetes should be screened annually for diabetic kidney disease (DKD)	
Type 1 Diabetes	**Type 2 Diabetes**
▪ 5 years after diagnosis then annually	▪ At diagnosis and annually thereafter

Screening for DKD should include annual measurement of:

1. Albumin-creatinine ratio (ACR) in a spot urine sample (24 hr collections are not necessary as spot urine ACR estimates the 24 hr albumin collection)
2. Serum creatinine and estimated glomerular filtration rate [eGFR]

	Urine dipstick for protein	**24 –urine collection* for albumin (mg/day)**	**Albumin to creatinine (ACR) ratio (mg/g)**
Normal	Negative	<30	<18 (men) <25 (women)
Microalbuminuria	Negative	30-300	18–177 (men) 25–248 (women)
Macroalbuminuria	Positive	>300	>177 (men) >248 (women)

* *24 hr collections are not necessary as spot urine ACR estimates the 24 hr albumin collection*

Diagnosis of DKD:

- An **elevated ACR should be confirmed** in the absence of urinary tract infection with 2 additional first-void specimens collected over the next 3 to 6 months
- To **confirm classification of kidney disease** 2 of 3 samples should fall within the microalbuminuric or macroalbuminuric range
- Note that urine dipstick for protein does not detect levels of protein under 300 mg/day

[3] **(NKF-KDOQI) National Kidney Foundation-Kidney Disease Outcomes Quality Initiative**

- In most people with diabetes, Chronic Kidney Disease (CKD) should be attributable to DKD in the presence of:
  - macroalbuminuria or microalbuminuria plus retinopathy
  - in people with type 1 diabetes, in the presence of microalbuminuria plus duration of diabetes longer than 10 years

Factors Favouring the Diagnosis of Diabetic or Nondiabetic Nephropathy (CDA):

Favours diabetic nephropathy	Favours alternate renal diagnosis
▪ Persistent albuminuria ▪ Bland urine sediment ▪ Slow progression of disease ▪ Low eGFR associated with overt proteinuria ▪ Presence of other complications of diabetes ▪ Known duration of diabetes >5 years	▪ Absence of diabetic retinopathy ▪ Rapidly increasing proteinuria or nephrotic syndrome ▪ Refractory hypertension ▪ Persistent haematuria or active urinary sediment ▪ Rapidly falling eGFR ▪ Low eGFR with little or no proteinuria ▪ Other complications of diabetes not present or relatively not as severe ▪ Known duration of diabetes ≤5 years ▪ Family history of nondiabetic renal disease (e.g. polycystic kidney diease) ▪ Signs or symptoms of systemic disease ▪ ≥30% reduction in GFR within 2-3 months after initiation of an ACEI or ARB
▪ Follow management guidelines	▪ If there is suspicion of nondiabetic nephropathy then work up or refer to nephrologists or internist

** Adapted from Canadian Diabetes Association 2008 Clinical Practice Guidelines for Prevention and Management of Diabetes in Canada (S128)*

Stages of Chronic Kidney Disease (CDA)

Stage	Qualitative description	eGFR (mL/min)
1	Kidney damage, normal GFR	≥90
2	Kidney damage, mildly decreased GFR	60-89
3	Moderately decreased GFR	30-59
4	Severely decreased GFR	15-29
5	End-stage renal disease	<15 (or dialysis)

** Taken from Canadian Diabetes Association 2008 Clinical Practice Guidelines for Prevention and Management of Diabetes in Canada (S128)*

Management guidelines for DKD and other complications:

- Adults with diabetes and **persistent albuminuria** should receive **ACEI or ARB** to delay progression of CKD **even in the absence of hypertension**
- **Refer patient to a nephrologist or an internist** with expertise in diabetic nephropathy if (CDA):
  - there is chronic progressive loss of kidney function
  - **eGFR** is **<30 mL/min**
  - **ACR** is persistently **>530 mg/g (60 mg/mmol)**
  - **>30%** increase in creatinine within 3 months of starting **ACE**

NKF KDOQI* Guidelines	**Treatment**	**Target**
Management of *hyperglycaemia* and general diabetes care in CKD		
Intensive treatment of hyperglycaemia prevents DKD & may slow progression of established kidney disease		Target **HbA1c <7.0%** irrespective of the presence or absence of kidney disease
Management of *hypertension* in diabetes and CKD		
Treatment of hypertension slows the progression of CKD	Hypertensive people with diabetes and CKD stages 1-4 should be treated with an **ACEI** or an **ARB** usually in **combination with a diuretic**	Target **blood pressure** stages 1-4 is **<130/80 mmHg**
Management of *dyslipidemia* in diabetes and CKD		
People with diabetes and CKD stages 1-4 should be treated according to current guidelines for high-risk groups	People with diabetes and CKD stages 1-4 with a **LDL ≥ 100 mg/dL** should be treated with a **statin** **Do not give statin to patients with type 2 diabetes on maintenance haemodialysis therapy with no specific cardiovascular indication for treatment**	Target **LDL** in stages 1-4 is **<100 mg/dL**
***Nutrition management* in diabetes and CKD**		
Dietary modification may reduce the progression of CKD		Target dietary **protein intake** for stages 1-4 RDA of **0.8g/kg body weight per day**

***NKF KDOQI – National Kidney Foundation-Kidney Disease Outcomes Quality Initiative**

Lipid Management

Patients with T2DM have an increased prevalence of lipid abnormalities which contributes to their high risk for developing CVD. Clinical trials indicate that aggressive therapy with high doses of statins to achieve LDL cholesterol level of <70 mg/dl resulted in a significant reduction of further events.

Assessment for CVD:

The following persons with diabetes should be considered high risk:	**Periodically assess persons with diabetes for CVD risk to include:**
▪ Men aged ≥45 years ▪ Women aged ≥50 years	▪ CV history (chest discomfort, dyspnea) ▪ Lifestyle habits (diet, exercise, smoking) ▪ Duration of diabetes ▪ Sexual function history ▪ Abdominal obesity ▪ Lipid profile ▪ Blood pressure ▪ Reduced pulses or bruits ▪ Glycaemic control ▪ Presence of retinopathy ▪ Estimated glomerular filtration rate and random albumin to creatinine ratio ▪ Periodic ECG

▪ Men aged ≤45 years } ***who have one or more of the***
▪ Women aged ≤50 years } ***risk factors listed below***
▪ ***Risk factors***
  ▪ Macrovascular disease (silent myocardial infarction (MI) or ischemia, coronary artery disease (CAD), peripheral arterial disease (PAD), carotid artery disease, stroke)
  ▪ Microvascular disease (nephropathy and retinopathy)
  ▪ Multiple additional risk factors (family history of premature coronary or cerebrovascular disease in first degree relative)
  ▪ Extreme level for single risk factor (e.g. LDL ≥5.0 mmol/L, systolic BP >180 mm Hg
  ▪ Duration of diabetes >15 years with age >30 years	

** Adapted from Canadian Diabetes Association 2008 Clinical Practice Guidelines for Prevention and Management of Diabetes in Canada (S102)*

Screening for Dyslipidaemia:

In most adult patients, measure fasting lipid profile at least **annually** or every **2 years if low risk**

Recommended Lipid levels:			
	LDL Cholesterol	**HDL Cholesterol**	**Triglycerides (TG)**
Low risk goal	**<100 mg/dL (2.6 mmol/L)**	**>50 mg/dL (1.3 mmol/L)**	**<150 mg/dL (1.7 mmol/L)**
Patients with overt CVD	**<70 mg/dL (1.8 mmol/L)**	**>40 mg/dL men (1.05 mmol/L) >50 mg/dL women (1.3 mmol/L)**	**<150 mg/dL (1.7 mmol/L)**
Alternative therapeutic goal if failure to reach recommended goal	**Reduction of ~40% from baseline LDL level**		

Treatment Recommendations:

Treatment for patients with diabetes (regardless of baseline lipid levels) with:		
	Lifestyle intervention	**Statin therapy**
▪ Overt CVD	√	√
▪ ≥40 years, with no CVD and one or more CVD risk factors	√	√
▪ ≤40 years, but no CVD with an LDL >100 mg/dL	√	√
▪ Multiple CVD risk factors	√	√
▪ **DO NOT USE STATIN IF:**		
▪ Pregnant	√	**DO NOT USE STATIN**
▪ Intolerant to statin	√	Use gemfibrozil or niacin*
▪ HDL <40 mg/dL and LDL between 100-129 mg/dL	√	Use gemfibrozil or niacin*

*Niacin is effective for raising HDL cholesterol, however, it can significantly increase blood glucose level at high doses. A dose of 750 to 2,000 mg niacin per day can be effective with only modest changes in blood glucose that can be adjusted by diabetes therapy

Lifestyle intervention:
▪ Medical nutrition therapy from registered dietitian
▪ Weight loss – 5-10% reduction in body weight can be associated in improved lipid profile
▪ Increased physical exercise
▪ Smoking cessation

Drug Treatment Options for Cardiovascular Disease*:

Class of drug	**Medication**	**Typical dose**
▪ **Statins**	Atorvastatin	10-80 mg in evening
	Fluvastatin	20-40 mg in evening
	Lovastatin	20 mg in evening
	Pravastatin	10-40 mg in evening
	Rosuvastatin	5-20 mg in evening
	Simvastatin	10-80 mg in evening
▪ **Fibrate**	Gemfibrozil	600 mg Twice daily
▪ **Cholesterol absorption inhibitors**	Ezetimibe	10 mg daily
▪ **Nicotinic acid**	Niaspan (extended-release)	500-1000 mg daily

****** These are general guidelines only*

Cardiovascular Risk Protection

Consider a person to be a high premature CVD risk for his or her age unless he or she:

- Is not overweight (assess body weight associated risk according to ethnic group)
- Is normotensive (<140/80 mmHg in the absence of antihypertensive therapy)
- Does not have microalbuminuria
- Does not smoke
- Does not have a high-risk lipid profile
- Has no history of cardiovascular disease
- Has no family history

To minimize cardiovascular risk in patients with diabetes:

- Involve patient in:
  - Achieving individual target goals
  - Lifestyle management
  - Medication use
  - Education and understanding of medication's advantage to future health

- Ensure **Self Monitoring Blood Glucose** (SMBG) and education to heightened awareness, lower HbA1c, less morbidity for micro- and macro- vascular complications

- Use of **Metformin** to achieve intense glucose control shows benefit for all causes of mortality and 42% reduction in all diabetes-related deaths

- Measure **HbA1c:**
  - Measure Hb1Ac every 2-6 months initially and every 6 months when stabilized
  - Target Hb1Ac at 6.5% (unless problem with hypoglycaemia or quality of life issues)
  - Hb1Ac reductions of even 1% reduces the risk of CVD by 10-15%

- **For established CVD** prescribe:
  - ACE-inhibitors
  - Statins
  - ASA
- **With MI** prescribe: Beta-blocker

Anti-platelet Therapy

Aspirin (ASA) has been recommended for primary and secondary prevention of cardiovascular events in high-risk diabetic and non-diabetic individuals (ADA).

Recommendations for Anti-platelet Therapy:

Patients with diabetes:	**Aspirin (ASA) Therapy:**
▪ **With CVD history** (secondary prevention)	▪ *ASA 81-162 mg daily*
▪ **At increased risk for CVD** (primary prevention) ▪ Aged ≥40 years ▪ Family history for CVD ▪ Hypertension ▪ Smoking history ▪ Dyslipidaemia ▪ Albuminuria	▪ *ASA 81-162 mg daily*
▪ **With progressive CVD**	▪ Use a combination of ASA and Clopidrogel
DO NOT USE ASA IF:	**Do not use ASA:**
▪ **Under 30** years	▪ Do not use ASA therapy as no benefit reported
▪ Under **age 21 years**	▪ Contraindicated - caution Reyes Syndrome do not use ASA therapy
▪ **Patients experience any of the following:** • ASA allergy • Bleeding tendency • On anti-coagulation therapy • Recent GI bleed • Active hepatic disease	▪ Use other anti-platelet agents

Retinopathy

Diabetic retinopathy is the most common cause of new cases of legal blindness in people of working age (CDA). Visual loss is associated with significant morbidity, including increased falls, hip fractures and a 4-fold increase in mortality. Glaucoma, cataracts, and other disorders of the eye occur earlier and more frequently with persons with diabetes (ADA). To reduce the risk or slow the progression of retinopathy it is important for individuals to optimize glycaemic control, blood pressure control (ADA) and lipid control (CDA).

Referral to ophthalmologist:

When to refer to ophthalmologist:		
Type 2 Diabetes	**Type 1 Diabetes**	**Gestational Diabetes**
▪ All should be referred to an ophthalmologist at the time of diagnosis	▪ All individuals should be referred 5 years after diagnosis of Type 1 diabetes ▪ All **pregnant women with Type 1 diabetes** in first trimester and one year postpartum	▪ Examine eyes at first pre-natal visit and each trimester thereafter; specialist ophthalmologic review can be offered throughout pregnancy
Frequency of follow-up		
▪ Annual ophthalmologic review thereafter if no or minimal unchanged retinopathy ▪ 3 to 6 months if worsening since last examination ▪ More often during pregnancy, if necessary		

Refer to Ophthalmologist Immediately for:

- Sudden loss of vision
- Retinal detachment
- Rubeosis iridis
- Pre-retinal or vitreous haemorrhage
- Maculopathy
- Decreased visual acuity

Explaining Referral to Patients with Diabetes:

- Explain the reasons and importance for referral to the ophthalmologist to dispel fear of outcome and ensure individual attends referral appointment
- Advise that good control of blood glucose, blood pressure and blood lipids can help to reduce the risk of retinopathy developing or worsening

Screening for Retinopathy:

Screening methods performed:
1. Visual acuity assessment
2. Dilated fundoscopy
3. Retinal photography through dilated pupil

Management of Retinopathy (CDA):

- Diagnose the severity of retinopathy and establish appropriate monitoring intervals
- Treat sight-threatened retinopathy with photocoagulation therapy
- Screen for other complications
- **Note:** Retinopathy is NOT a contraindication for aspirin therapy for cardiac protection, therefore aspirin can be used if indicated for the prevention of cardiovascular disease (IDF)

Glycaemic Goals / targets to Reduce Risk of Retinopathy:

- Review glycaemic, blood pressure and lipid control and adjust therapy to reach recommended targets

Referral Feedback:

- Results of the eye exam should be documented and transmitted to the referring health care professional

Neuropathy

Under-diagnosis of neuropathy is a fundamental problem in the primary care of people with diabetes and impedes the benefits of early identification. Diabetic autonomic neuropathy (DAN) often goes completely unrecognized by both patient and physician because of its insidious onset and multiple organ involvement. The organ systems that most often exhibit prominent clinical autonomic signs and symptoms in diabetes include the cardiovascular system, gastrointestinal tract system, genitourinary system, sweat glands, adrenal medullary system and the ocular pupil.

Screening for Neuropathy:

When to screen for signs and symptoms of neuropathy:		
	Distal symmetric polyneuropathy	**Autonomic neuropathy**
Type 1 Diabetes	▪ Best practice – Quarterly ▪ Minimum standard - Annually	▪ 5 years post-pubertal duration of diabetes ▪ Annually thereafter
Type 2 Diabetes	▪ Best practice – Quarterly ▪ Minimum standard - Annually	▪ At diagnosis ▪ Annually thereafter

Assessment:

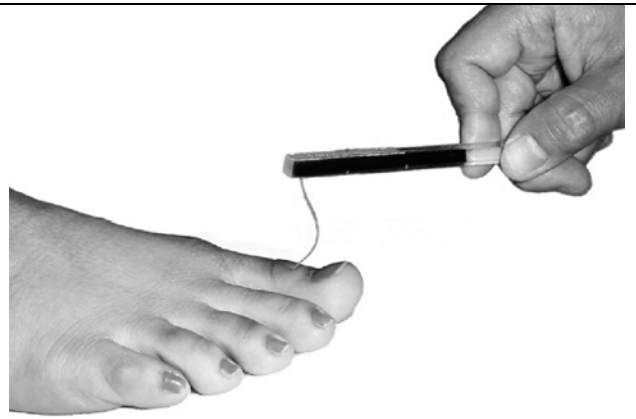
Symptoms of neuropathy:		
	Distal symmetric polyneuropathy	**Autonomic neuropathy**
Symptoms	▪ Paraesthesiae ▪ Burning sensations ▪ Shooting pains ▪ Sleep disturbance ▪ Depression	Symptoms vary depending on nerves affected, can include: ▪ Resting tachycardia ▪ Exercise intolerance ▪ Orthostatic hypotension ▪ Constipation ▪ Gastroparesis ▪ Erectile dysfunction ▪ Sudomotor dysfunction ▪ Impaired neurovascular function ▪ "Brittle diabetes" ▪ Hypoglycaemic autonomic failure ▪ (www.medscape.com/viewarticle/445092)

Clinical tests for neuropathy:		
	Distal symmetric polyneuropathy	**Autonomic neuropathy**
Clinical tests	▪ Prick sensation ▪ 1.10 g monofilament * ▪ Vibration sensitivity of great toe with tuning fork * ▪ Assessment of ankle reflexes ▪ Note: electrophysiological testing is rarely needed * See following page for screening protocol	Additional tests can include: ▪ Measurement of blood pressure ▪ Measurement of changes in heart rate ▪ Upper GI Esophagogastroduodenoscopy ▪ Isotope study ▪ Voiding cystourethrogram or other tests of bladder function

Rapid Screening for Diabetic Neuropathy

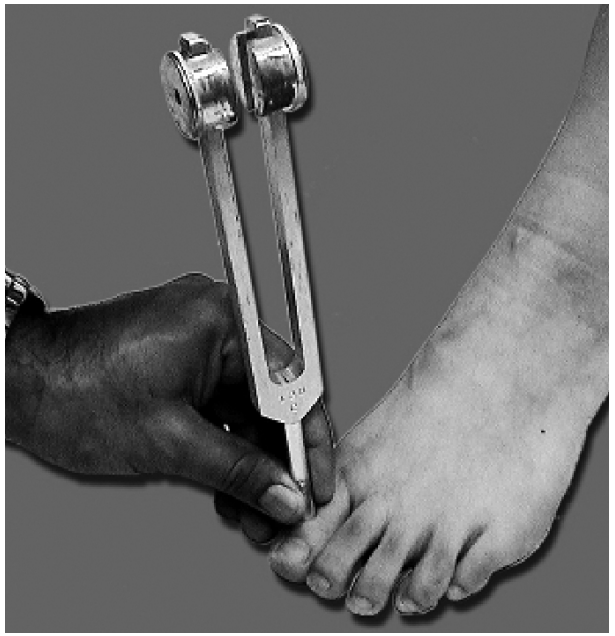
Using the 10g Semmes-Weinstein Monofilament

1. Show the patient the monofilament tool.
2. Demonstrate how the sensation will feel by touching it to the patient's forearm or hand.
3. Instruct the patient to say, "yes" when they feel the monofilament stimulus.
4. Have the patient close their eyes while you complete the test.
5. Apply the monofilament to the dorsum of the great toe near to the nail bed as shown in the illustration. Use a smooth motion to touch the skin, bend the filament for a full second, and then lift from the skin.
6. Repeat this procedure 4 times for each foot in an irregular manner so the patient does not anticipate when the procedure is to be applied.
7. Add up all the "yes" responses for a score out of 8.
8. A score of 7 or 8 responses likely rules out the presence of neuropathy.



Using the 128Hz Vibration Tuning Fork

1. Show the patient the vibration tuning fork.
2. Strike the fork against your palm hard enough that it will vibrate 40 seconds.
3. Demonstrate the sensation of vibration and how it differs from pressure by applying the tuning fork to the elbow or wrist during vibration and then when the vibration has stopped (dampened).
4. Apply the tuning fork to the dorsum of the great toe near to the nail bed as shown in the illustration.
5. Initially, conduct a sham test by applying the tuning fork without vibration (dampening of tuning fork) to ensure the patient does not mistake the pressure sensation for vibration. The patient should respond "no" to the question "is the tuning fork vibrating?"
6. Conduct testing twice on each great toe in an irregular manner so the patient does not anticipate when the procedure is to be applied.
7. Use the "on-off" method to score the patient's responses.
8. On each test, instruct the patient to identify the:
   a. beginning of the vibration feeling: "Is the tuning fork vibrating?" - On
   b. cessation of vibration on "dampening" of the tuning fork: "Tell me when the vibration stops" – Off.
9. A score of 7 or 8 responses likely rules out the presence of neuropathy. At least five incorrect responses rules in a diagnosis of peripheral neuropathy.



Adapted from Canadian Diabetes Association 2008 Clinical Practice Guidelines for Prevention and Management of Diabetes in Canada (S199)

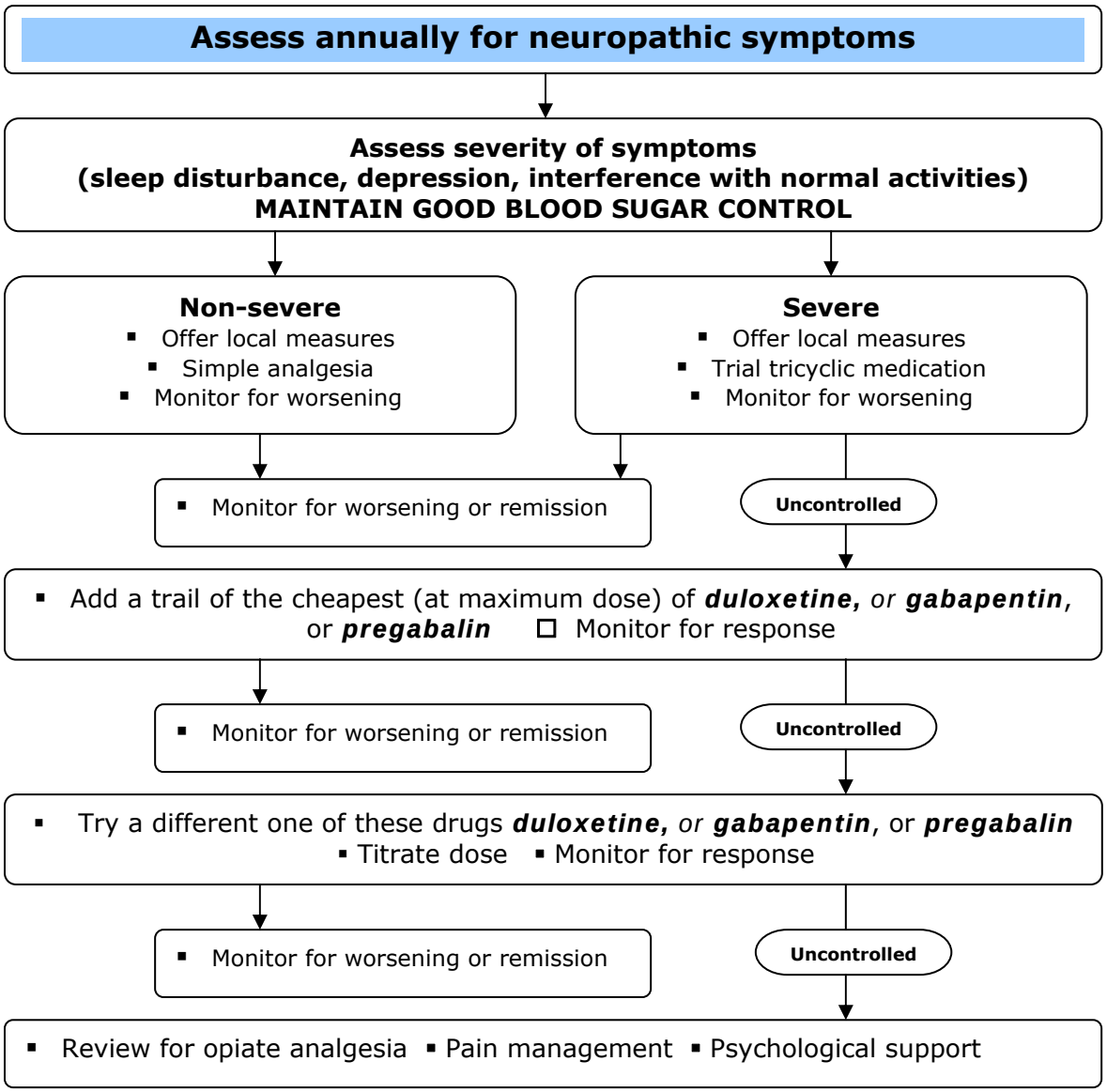
Management of Neuropathy (ADA/CDA):

- **Intensive glycaemic control** is effective in primary prevention of or secondary intervention for neuropathy in people with **type 1 diabetes**
- In **type 2 diabetes, lower blood glucose levels** are associated with reduced frequency of neuropathy
- Explain the reasons for neuropathy, the prognosis and the role of improved glucose control to patients
- Treatment/management of autonomic neuropathy will vary depending on severity and nerves affected. See Neuropathic Pain Management algorithm on next page
- Refer for **pain management** as required (in the absence of a pain team refer to anaesthesiologist or neurologist with an interest in pain control)

Drug Treatment Options for Pain Management:

Class of drug	Medication	Typical dose
Tricyclic antidepressants	Amitriptyline	10-75 mg at bedtime
	Nortriptyline	25–75 mg at bedtime
	Imipramine	25-75 mg at bedtime
Anticonvulsants	Gapapentin	300-1,200 mg TID
	Carbamazepine	200-400 mg TID
	Pregabalin	100 mg TID
Opioid analgesics	Sustained-release oxycodone	10 mg BID
Serotonin-norepinephrine antidepressants	Duloxetine	60-120 mg daily
Substance P inhibitor	Capsaicin cream	0.025-0.075% applied TID or QID

Neuropathic Pain Management (ADA/ NICE):



Drug treatment options for painful peripheral neuropathy:

Class of drug	Medication	Typical dose
Tricyclic antidepressants	Amitriptyline	10-75 mg at bedtime
	Nortriptyline	25–75 mg at bedtime
	Imipramine	25-75 mg at bedtime
Anticonvulsants	Gapapentin	300-1,200 mg TID
	Carbamazepine	200-400 mg TID
	Pregabalin	100 mg TID
Opioid analgesics	Sustained-release oxycodone	10 mg BID
Serotonin-norepinephrine antidepressants	Duloxetine	60-120 mg daily
Substance P inhibitor	Capsaicin cream	0.025-0.075% applied TID or QID

Foot Care

Foot problems are a major cause of morbidity and mortality in people with diabetes. Foot ulceration and limb amputation are among the major drivers of impaired health and health-care costs in diabetes care. Management of foot care requires an interdisciplinary approach that includes glycaemic control, lower-extremity vascular status, infection and local wound care. A specialist foot-care team includes doctors with a special interest in diabetes foot care, people with educational skills and people formally trained in foot care (podiatrists).

Assessment:

Patients should be screened annually or more frequently depending on risk stratification to:

- **Assess for structural abnormalities:**
  - Range of motion of ankles and toe joints
  - Callus pattern
  - Bony deformities
  - Skin temperature

- **Palpate for foot pulses:**
  - Tibial posterior artery absent
  - Dorsal pedal artery absent

- **Assess for discolouration on dependency:**
  - Previous ulcer
  - Amputation

- **Evaluate for:**
  - Neuropathy (see Clinical tests for neuropathy in previous section)
  - Peripheral arterial disease
  - Ulcerations
  - Evidence of infection

- **Discuss inappropriate footwear**

Risk assessment for foot problems (IDF):

Risk classification	Assess severity	Management
No added risk	▪ No loss of sensation ▪ No signs of peripheral arterial disease ▪ No other risk factors	▪ Agree management plan ▪ Foot-care education ▪ Refer to chiropodist at diagnosis of T2DM
At risk	▪ Neuropathy ▪ Other single risk factor	**6 monthly review by foot-care team to:** ▪ Inspect both feet – ensure provision of management as indicated ▪ Evaluate footwear – provide appropriate advice ▪ Enhance foot-care education
High risk	▪ Diminished sensation ▪ Foot deformities ▪ Evidence of peripheral arterial disease ▪ Previous ulceration or ▪ Amputation (very high risk)	**3-6 month review by foot-care team to:** ▪ Inspect both feet – ensure provision of management as indicated ▪ Evaluate footwear – provide appropriate advice ▪ Consider the need for vascular assessment or referral ▪ Evaluate and ensure the appropriate provision of intensified foot-care education
Foot ulceration or infection	▪ Foot ulcer present	**Refer to multidisciplinary foot-care team* within 24 hours for:** ▪ Appropriate wound management, dressings and debridement as indicated ▪ Consideration of systemic antibiotic therapy (often long-term) for cellulitis or bone infection ▪ Optimal pressure distribution (casting if indicated and not contra-indicated) ▪ Investigation and treatment (referral) for vascular insufficiency ▪ Probing to bone, radiology and scans, MRI imaging, and biopsy where indicated for suspected osteomyelitis ▪ Optimal blood glucose control ▪ Specialist footwear and orthotic care (insoles) ** KEMH Wound Care Team will normally assess rapidly if necessary*

From International Diabetes Federation (IDF) Clinical Guidelines Task Force. Global Guideline for type 2 Diabetes. Brussels: 2005 (59)

Management of Foot Care (ADA):

- Ensure patients at **high risk** of foot ulceration receive:
  - Foot care education, including counselling to avoid foot trauma
  - Professionally fitted footwear
  - Smoking cessation strategies if they are smokers
  - Early referral to professionals trained in foot care management if problems occur
  - Aggressive treatment for any infection of a diabetic foot

- Patients who develop **foot ulcers** should be managed by a multidisciplinary healthcare team to prevent recurrent foot ulcers and amputation

Amputation (IDF):

Do not amputate unless:

- A detailed vascular evaluation has been performed by the vascular staff
- Ischemic rest pain cannot be managed by analgesia or revascularization
- A life-threatening foot infection cannot be treated by other measures
- A non-healing ulcer is accompanied by a higher burden of disease than would result from amputation

Erectile Dysfunction

Erectile dysfunction (ED) affects 34 to 45% of men with diabetes, 40% of those over age 60 have complete ED. ED negatively impacts on quality of life of those affected. In addition, ED is a side effect of many drugs commonly prescribed to men with diabetes.

Risk Factors for Erectile Dysfunction (ADA):

- Increasing age
- Increased duration of diabetes
- Poor glycaemic control
- Cigarette smoking
- Hypertension
- Dyslipidaemia
- Androgen deficiency states
- Cardiovascular disease

Screening for Erectile Dysfunction (ADA):

- Adult men should be screened for ED at diagnosis of diabetes
- Screening should be conducted annually or more frequently as required
- Screening should include a sexual function history with a validated questionnaire such as:
  - The 5-Item version of the International Index of Erectile Dysfunction (IIEF-5) is available online at
    - http://www.medalreg.com/qhc/medal/ch16/16_09/16-09-07-ver9.php3
  - Sexual Health Inventory for Men (SHIM) is available online at
    - http://www.njurology.com/_forms/shim.pdf (a copy is on page 78)
- Ejaculatory dysfunction is also a common disorder of sexual function in men with diabetes

Management and Treatment of Erectile Dysfunction (NICE):

- With a diagnosis of ED, provide patient education to address contributory factors and treatment options
- Prescribe **Phosphodiesterase type 5 (PDE5) inhibitors** as first-line of therapy if there are no contraindications
- Men who **do not respond to PDE5** therapy should be investigated for hypogonadism
- Refer men who do not respond to therapy and/or in whom PDE5 is contraindicated to a specialist in ED (in absence of a specialist refer to urologist)
- Men with ejaculatory dysfunction who wish fertility should be referred to a healthcare professional experienced in the treatment of ejaculatory dysfunction

Drug Treatment Options for Erectile Dysfunction:*

Class of drug	Medication	Typical dose	
Phosphodiesterase type 5 (PDE5) inhibitors	sildenafil	25-100 mg	½ hour before sexual activity maximum dose 1/24 hours
	vardenafil	10-20 mg	
	tadalafil	10-20 mg	

**These are general guidelines only*

SEXUAL HEALTH INVENTORY FOR MEN (SHIM)

PATIENT NAME: **TODAY'S DATE:**

PATIENT INSTRUCTIONS

Sexual health is an important part of an individual's overall physical and emotional well-being. Erectile dysfunction, also known as impotence, is one type of very common medical condition affecting sexual health. Fortunately, there are many different treatment options for erectile dysfunction. This questionnaire is designed to help you and your doctor identify if you may be experiencing erectile dysfunction. If you are, you may choose to discuss treatment options with your doctor.

Each question has several possible responses. Circle the number of the response that **best describes** your own situation. Please be sure that you select one and only one response for **each question**.

OVER THE PAST 6 MONTHS:

1. How do you rate your confidence that you could get and keep an erection?		Very Low	Low	Moderate	High	Very High
	0	**1**	**2**	**3**	**4**	**5**
2. When you had erections with sexual stimulation, how often were your erections hard enough for penetration (entering your partner)?	No Sexual Activity	Almost Never or Never	A Few Times (much less than half the time)	Sometimes (about half the time)	Most Times (much more than half the time)	Almost Always or Always
	0	**1**	**2**	**3**	**4**	**5**
3. During sexual intercourse, how often were you able to maintain your erection after you had penetrated (entered) your partner?	Did Not Attempt Intercourse	Almost Never or Never	A Few Times (much less than half the time)	Sometimes (about half the time)	Most Times (much more than half the time)	Almost Always or Always
	0	**1**	**2**	**3**	**4**	**5**
4. During sexual intercourse, how difficult was it to maintain your erection to completion of intercourse?	Did Not Attempt Intercourse	Extremely Difficult	Very Difficult	Difficult	Slightly Difficult	Not Difficult
	0	**1**	**2**	**3**	**4**	**5**
5. When you attempted sexual intercourse, how often was it satisfactory for you?	Did Not Attempt Intercourse	Almost Never or Never	A Few Times (much less than half the time)	Sometimes (about half the time)	Most Times (much more than half the time)	Almost Always or Always
	0	**1**	**2**	**3**	**4**	**5**

Add the numbers corresponding to questions 1-5. TOTAL:

The Sexual Health Inventory for Men further classifies ED severity with the following breakpoints:

1-7 Severe ED; 8-11 Moderate ED; 12-16 Mild to Moderate ED; and 17-21 Mild ED

http://www.njurology.com/_forms/shim.pdf

Gestational Diabetes Mellitus (GDM)

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance (hyperglycemia) with onset or first recognition during pregnancy. It is estimated that 7% of all pregnancies are complicated by GDM. Screening and diagnosis are warranted because of the risks to mother and neonate (ADA).

The Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) Study reported to ADA 2007 that: **"Risk of adverse maternal, fetal and neonatal outcomes continuously increased as a function of maternal glycaemia at 24-28 weeks."** (*Diabetes Care*, vol. 31, supplement 1, Jan. 2008)

Assessment Gestational Diabetes Mellitus:

All pregnant women should be assessed for risk for GDM at the first antenatal visit (ADA).

Women will fall in one of three categories:		
High risk for GDM includes:	**Higher than low risk of GDM, includes**:	**Low risk for GDM must have all the following:**
▪ Severe obesity (BMI $\geq$40 kg/m^2) ▪ Prior GDM or large for gestational age infant ▪ Presence of glycosuria ▪ Diagnosis of PCOS ▪ High risk ethnicity (e.g. African, Aboriginal, Hispanic, Latino, Asian decent) ▪ Strong family history of type 2 diabetes	▪ Those who are overweight (BMI $\geq$25 kg/m^2) but not severely obese and do not have multiple risk factors ▪ Those at high risk who were found negative at screening in early pregnancy	▪ <25 years old, normal pre-pregnancy weight ▪ Low risk ethnic group for diabetes prevalence ▪ No first-degree relatives with diabetes ▪ No history of abnormal glucose tolerance ▪ No history of poor obstetric outcome
Conduct GDM Screen on confirmation of pregnancy	Reassess at subsequent trimesters if multiple risk factors present	Reassess at subsequent trimesters if multiple risk factors present

Screening for Gestational Diabetes Mellitus:

All high risk women should be screened at confirmation of pregnancy All pregnant women should be screened at 24 – 28 weeks gestation (ADA/ IDF)		
GDM Screen: 50 gm glucose load Followed by 1 hour plasma glucose		
Normal	**Possible GDM - Further testing required**	**Diagnosis of GDM**
<140 mg/dL	**140-184 mg/dL**	**≥185 mg/dL**
If risk factors present reassess at subsequent trimesters	**100 g OGTT on another day**	
	1 hr PG ≥180 mg/dL 2 hr PG ≥155 mg/dL 3 hr PG ≥140 mg/dL	**2 values met or exceeded** immediate referral to **Diabetes Education Centre**

Diagnosis for Gestational Diabetes Mellitus:

A diagnosis of GDM is made if at least **two** of the following plasma values are met or exceeded (ADA):

- 1 hr PG: ≥180 mg/dl (10 mmol/L)
- 2 hr PG: ≥155 mg/dl (8.6 mmol/L)
- 3 hr PG: ≥140 mg/dl (7.8 mmol/L)

Management for Gestational Diabetes Mellitus (IDF)*:*

On diagnosis of GDM the pregnant woman should have an immediate referral to **Diabetes Education Centre** to:

- Receive diabetes education
- Receive medical nutrition therapy and education from a registered dietitian
- Prescribe a mineral and multivitamin supplement including Folic Acid (400 mcg), iron and calcium but no retinol (Vitamin A)
- Encourage an exercise program individualized to reflect obstetrical risks and the individual's exercise tolerance and preferences
- Weight gain should be based on pre-gravid BMI (CDA)

BMI < 20	**BMI 20-27**	**BMI > 27**
27.5–39.6 lb (12.5–18 kg)	25.3–35.2 lb (11.5–16 kg)	15.4 – 25.3 lb (7.0–11.5 kg)

- Use blood glucose self-monitoring 4 times daily
- Avoid ketosis (CDA)
- Initiate insulin therapy if indicated (if glycaemic goals are not achieved within two weeks of being on nutrition therapy)
- Use IV insulin in labour if required
- Anticipate changed insulin requirements after delivery, increase self-monitoring
- Examine eyes at first pre-natal visit and each trimester thereafter: Specialist ophthalmologic review can be offered throughout pregnancy
- Screen all women for diabetes at 6-12 weeks postpartum as per ADA for high risk populations
- Treatment with ACE inhibitors and ARBs is contraindicated if hypertensive (ADA). Effective and safe hypertensive drugs for pregnant women include methyldopa, labetalol, diltiazem, clonidine, and prazosin. Chronic diuretic use during pregnancy has been associated with restricted maternal plasma volume.
- Hyperglycemia and Adverse Pregnancy Outcomes study (2007) results demonstrated that risk of adverse maternal, foetal, and neonatal outcomes continuously increased as a function of maternal glycaemia at 24 -28 weeks, even within ranges previously considered normal for pregnancy. For most complications there was no threshold for risk.

Glycemic Goals/Targets for Gestational Diabetes Mellitus (CDA):

- Use HbA1c as an additional indicator of glycaemic control
- Aim for HbA1c <6.0%, if achievable
- Perform self-monitoring (pre- and postprandially) 4 or more times/day to achieve targets if at all possible
- Women with GDM should aim for target glucose values:
  - Fasting/preprandial PG 68-94 mg/dL (3.8-5.2 mmol/L)
  - 1 hr postprandial PG 99-139 mg/dL (5.5-7.7 mmol/L)
  - 2 hr postprandial PG 90-119 mg/dL (5.0-6.6mmol/L)
- Use self-monitoring results, HbA1c and experience of hypoglycaemia to adjust the dose of oral glucose-lowering agents or insulin. Patient may need to change from oral glucose-lowering agents to insulin if required (IDF).

Follow-up Postpartum:

- Screen all women for diabetes at 6-12 weeks postpartum using standard criteria and follow-up for subsequent screening as per high risk populations.

Type 1 Diabetes in Children

Children are not "small adults" so the management and care of children with type 1 diabetes mellitus (T1DM) is unique to them and goals should be individualized. Children with new-onset T1DM and their families require intensive diabetes education by an interdisciplinary diabetes healthcare team to provide them with the necessary skills and knowledge to manage the disease and to ensure the best long-term outcomes (CDA).

Screening and diagnosis of diabetes:

A child will present with acute symptoms of diabetes and markedly elevated blood glucose and most cases are diagnosed soon after onset of hyperglycemia. Symptoms include:

- Polyuria
- Polydipsia
- Unexplained weight loss
- Abdominal complaints
- Unexplained fatigue or vomiting

Diagnosis of diabetes is confirmed with the following plasma glucose levels* (ADA)
1. Fasting Plasma Glucose (FPG) $\geq$126 mg/dL (7.0 mmol/L)
2. 2 hr plasma glucose in a 75 g OGTT $\geq$200 mg/dL (11.1 mmol/L)
3. HbA1c $\geq$6.5%

* The confirmation of an abnormal result should be confirmed on a subsequent visit with repeat testing. When two different tests are used and the results are discordant, the test whose result is above the diagnostic cut-off point should be repeated and the diagnosis made on the result of the confirmed test (ADA).

Management of Children with Type 1 Diabetes (CDA/ADA):

- Access to a multidisciplinary team of specialist starting at diagnosis
- Provide **diabetes education** promptly
- **If medically stable,** provide initial **out-patient education** and management; **assure telephone access** to medical guidance as needed
- Ensure **medical nutrition therapy** is provided at diagnosis by a registered dietitian and on going follow-up and an annual assessment are recommended
- Check **HbA1c** to determine severity and timing of onset of disease
- Children with poor glycaemic control **(HbA1c >10)** should be referred to a paediatric diabetic specialist team and/or a mental health professional for comprehensive interdisciplinary assessment
- Consider relaxing glycaemic targets in children prone to hypoglycaemia
- **Screen for co-morbidities**

Recommended Glycaemic Targets:

The goal is to maintain glucose control to as near to normal as possible; however, there are unique risks of **hypoglycaemia in children** (i.e. permanent cognitive impairment in children <5 years)

Plasma blood glucose (PG) and HbA1c goals by age-group for type 1 diabetes (ADA /CDA)				
Age group (years)	**PG goal range mg/dl (mmol/l)**			**Rationale**
	Before meals	**Bedtime /overnight**	**HbA1c**	
0-6 toddlers/preschool	100-180 (5.6-10)	110-200 (6.1-11.1)	<8.5% (but >7.5%)	High risk and vulnerability to hypoglycaemia
6-12 school age	90-180 (5-10)	100-180 (5.6-10)	<8%	Risk of hypoglycaemia and relatively low risk of complications prior to puberty
13-19 adolescent and young adults	90-130 (5-7.2)	90-150 (5-8.3)	<7.5%	▪ Risk of severe hypoglycaemia ▪ Developmental and psychological issues may arise ▪ A lower goal <7% if it can be achieved without excessive hypoglycaemia

Management of Insulin therapy:

- Factors to consider when selecting insulin regime include child's age, duration of disease, family, lifestyle, socioeconomic factors, patient and physician preferences
- During the **honeymoon period** (lasting up to two years after diagnosis) glycaemic control is usually good and insulin requirements can be low
- **After** the honeymoon period intensive management may be required to:
  - meet **glycaemic targets** (HbA1c)
  - minimize risk of **hypoglycaemia**
  - prevent **ketoacidosis**
  - allow flexibility in **carbohydrate intake**
  - allow flexibility in **daily schedule** and **activities**
- **Assess insulin therapy** at each clinical visit to ensure above targets are met
- Ensure **Self-Monitoring of Blood Glucose (SMBG).** Patients must receive initial instructions in SMBG and follow-up evaluation of monitoring technique. Discuss purpose of SMBG and how to use data to adjust therapy if necessary
- Consider **subcutaneous continuous sensors** for some individuals on intensive therapy

Insulin therapy:

Frequency of insulin therapy	Type of insulin*
Multiple daily injections (MDI)	Start with 2 daily doses of: ▪ short-acting insulin or rapid acting insulin analogues **combined with** ▪ intermediate or long acting insulin
Continuous subcutaneous insulin infusion (CSII)	▪ Computer-driven device that delivers fast-acting insulin (NovoLog, Humalog, or Apidra) in precise amounts at pre-programmed times. ▪ Considered safe and effective at all ages

* See Glucose Control Section page 36 for more detailed information about insulin

Hypoglycaemia in Children:

Stages of hypoglycaemia		
Mild	**Moderate**	**Severe**
▪ Sweating ▪ Slurred speech ▪ Shaking weakness ▪ Anxiety	▪ Confusion ▪ Slurred speech ▪ Glazed eyes ▪ Poor concentration	▪ Unresponsive ▪ Combativeness ▪ Agitation ▪ Convulsions ▪ Unconsciousness
Treatment (symptoms respond to the administration of carbohydrates)		
▪ **Pure glucose (15 mg)** as • Glucose tablets • 3 packages of sugar dissolved in water ▪ Wait 15 minutes and retest. **If BG level is still below 72 mg/dL (4 mmol/L)** ▪ Re-treat with 15 mg glucose and retest until hypoglycaemia is reversed ▪ Once hypoglycaemia is reversed, the patient should have usual meal or snack including protein source	▪ **Pure glucose (20-30 mg)** • Glucose tablets • 4-6 packages of sugar dissolved in water ▪ Wait 15 minutes and retest. **If BG level is still below 72 mg/dL (4 mmol/L)** ▪ Re-treat with 15 mg glucose retest until hypoglycaemia is reversed ▪ Once hypoglycaemia is reversed, the patient should have usual meal or snack including protein source	▪ **Administer glucagon** subcutaneously or intramuscularly in an unconscious child • 12 year and over **1 mg glucagon** • >5–12 years **0.5 mg glucagon** • ≤5 years **0.3 mg glucagon** • Discuss with caregiver and adjust insulin dose as required ▪ When **IV access is available** administer **dextrose 0.5 to 1 g/kg over 1 to 3 minutes**

Diabetic Ketoacidosis (DKA):

DKA is the leading cause of morbidity and mortality in children with diabetes. DKA occurs in 15 – 67% of newly diagnosed children with diabetes and is increased with poor control, and previous episodes. Strategies are required to prevent the development of DKA including:

- Public awareness campaigns to educate parents and caregivers about early symptoms of diabetes
- Comprehensive diabetes education and support services, including 24 hour telephone hotline (CDA)
- Treatment recommendations, related to minimizing risk of cerebral edema:
  - Avoid rapid administration of hypotonic fluids
  - Advise gradual replacement of extra-cellular fluid volume over 48 hours
  - Avoid IV insulin bolus, using instead IV infusion of short-acting insulin at 0.1 units/kg/hour and not started until 1 hour after starting fluid replacement therapy
  - Maintain insulin infusion rate until plasma anion gap normalizes
  - Once PG reaches 14 to 17 mmol/L, IV glucose should be started to avoid hypoglycaemia;
  - Avoid sodium bicarbonate except in extreme circulatory compromise. (CDA)

Screening and management of chronic complications:

Nephropathy (ADA)		
Age	**Screen**	**Treatment**
▪ >10 years of age and had diabetes for 5 years or more ▪ Then screen annually	▪ Microalbuminuria ▪ Albumin to creatinine ratio ▪ **Confirm** when 2 of 3 additional urine levels are elevated	▪ Treat with ACEI ▪ Adolescents treat as per adult protocol
▪ Pre-pubertal children with diabetes less than 5 years	▪ Low risk for Microalbuminuria	

Hypertension (ADA)		
Age	**Screen**	**Treatment**
▪ Screen at every clinical visit	▪ Systolic or diastolic BP >90%ile for age, sex and height	▪ Lifestyle intervention
	▪ Systolic or diastolic BP >95%ile for age, sex and height	▪ ACEI and Lifestyle intervention

Dyslipidemia (ADA)		
Family history	**Screen - Fasting lipid profile**	**Treatment**
▪ Family history of hypercholesterolaemia (Chol >240) ▪ Cardiovascular event before 55 yrs ▪ Family history unknown	▪ >2 years screen after diagnosis and once glucose control has been established	▪ Optimize glucose control ▪ Medical nutrition therapy (MNT) ▪ Diet to reduce saturated fat
▪ If family history is not a concern	▪ At puberty (≥10 years) if: ▪ LDL Cholesterol >160 mg/dL (4.1 mmol/L) ▪ LDL Cholesterol > 130 mg/dl (3.4 mmol/l) and one or more CVD risk factors	▪ MNT and lifestyle changes ▪ Consider adding Statin ▪ LDL cholesterol goal <100 mg/dL (2.6 mmol/L) ▪ If lipid profile abnormal screen annually ▪ If normal, screen every five years
▪ Regardless of family history	▪ All children diagnosed at or after puberty should be screened once glucose control has been established	

Retinopathy (ADA)		
Age	**Screen**	**Treatment**
▪ 10 years and has had diabetes for 3-5 years ▪ Annual routine follow-up there after	▪ Visual acuity assessment ▪ Dilated fundoscopy ▪ Retinal photography through dilated pupil	▪ Refer to paediatric ophthalmologist ▪ Counsel child and parent on importance of early prevention/ intervention (glucose control)

Neuropathy (CDA)		
Age	**Screen**	**Treatment**
▪ Post-pubertal adolescents with poor control should be screened once they have had diabetes for 5 years	▪ Question and examine for symptoms of numbness, pain, cramps, as well as skin sensation (see page 66 for neuropathy)	▪ Intensive glycaemic control

Other disorders		Screen
Celiac Disease	▪ Celiac disease is more common in patients with T1DM (1-16%)	▪ Patients with celiac symptoms should be tested for celiac disease
Autoimmune thyroid disease	▪ Auto-immune thyroid disease is the most common autoimmune disorder associated with T1DM (17-30%)	▪ Screen for thyroid peroxidase and thyroid antibodies at diagnosis ▪ Measure thyroid-stimulating hormone (TSH) once glucose controlled

Type 2 Diabetes in Children

The prevalence of type 2 diabetes (T2DM) in children and adolescence is growing world wide. Distinction between type 1 and type 2 diabetes in children can be difficult as patients with features of type 2 diabetes (such as obesity and acanthosis nigricans), can also have symptoms of ketosis and autoantigens. Treatment should focus on physical and psychological well-being and the prevention of long-term complications.

Screening:

Screening		
Criteria (ADA/CDA)	**Risk factors**	**Symptoms**
Children who are 10 years or reached puberty who are overweight: ▪ BMI >85th percentile for age sex ▪ weight for height >85th percentile, ▪ or weight >120% of ideal for height AND ▪ have two additional **risk factors** (see risk factors listed in column 2)	Children who are overweight and have **any two** of the following risk factors: ▪ First-degree or second degree relative with type 2 diabetes ▪ Member of a high risk ethnic population (e.g. African, Aboriginal, Hispanic, Latino, Asian decent) ▪ Signs of insulin resistance or associated with insulin resistance: (hypertension, dyslipidemia, Polycystic ovarian syndrome (PCOS), acanthosis nigricans) ▪ Maternal history of diabetes or GDM	May or may not have symptoms: ▪ Polyuria ▪ Polydipsia ▪ Unexplained weight loss

Diagnosis of type 2 diabetes:

Diagnosis of diabetes is confirmed with the following plasma glucose levels* (ADA)
1. FPG $\geq$126 mg/dL (7.0 mmol/L)
2. 2 hr plasma glucose in a 75 g OGTT $\geq$200 mg/dL (11.1 mmol/L)
3. HbA1c $\geq$6.5%

* The confirmation of an abnormal result should be confirmed on a subsequent visit with repeat testing. When two different tests are used and the results are discordant, the test whose result is above the diagnostic cut-off point should be repeated and the diagnosis made on the result of the confirmed test (ADA).

Management of Children with Type 2 Diabetes (CDA/ADA):

- Access to a multidisciplinary team of specialist starting at diagnosis to provide **diabetes education** promptly
- Implement **intensive lifestyle intervention –** family lifestyle, diet, exercise and weigh control. This requires **MNT** at diagnosis by a registered dietitian; with ongoing follow-up every 6–12 months recommended
- The ideal is to maintain normoglycaemia. However, a **Hb1Ac <7** is acceptable
- Referral to a mental health professional may be required to address psychological well-being
- **Screen for co-morbidities** as for children with type 1 diabetes (see above)
- Ensure **Self-Monitoring of Blood Glucose (SMBG).** Patients must receive initial instructions in and follow-up evaluation of SMBG monitoring technique. Discuss purpose of SMBG (ADA). Daily fasting and 2 hour postprandial glucose measurements recommended.

Seniors

The generally accepted definition for elderly is that it is a concept that reflects an age continuum starting sometime after age 60 which is characterized by a slow, progressive frailty that continues until death (CDA). It is estimated that 20% of persons over the age of 65 have diabetes (ADA).

Prevention of Diabetes (CDA):

In the high risk elderly population (those with impaired glucose tolerance and impaired fasting glucose) lifestyle modification can be effective in the prevention of diabetes. Treatment with acarbose and rosiglitazone may also prevent the development of diabetes in the high risk, however, Metformin will not.

Management of Diabetes in Seniors:

	Seniors who are functional, cognitively intact and have significant life expectancy	**Seniors who do not fit the functional criteria**
Glycaemic goals	▪ As for younger adults (see page 30)	▪ Glycaemic targets may be more relaxed depending on individual circumstances ▪ Avoid hyperglycaemia leading to symptoms or risk of complications ▪ Avoid hypoglycaemia
Management	▪ As for younger adults ▪ Encourage self-management	▪ Individualized
Screen for complications	▪ Individualized ▪ Focus on complications that may lead to functional impairment	
Assess for geriatric syndromes	▪ Polypharmacy ▪ Depression ▪ Cognitive impairment ▪ Urinary incontinence ▪ Injurious falls ▪ Persistent pain	

Lifestyle modification: Nutrition
▪ Refer to registered dietitian for Medical Nutrition Therapy (MNT) ▪ Nutrition therapy should be tailored to patients and address • Health Issues • Personal preferences • Controlling blood glucose levels, blood pressure, cholesterol and other risk factors -

Lifestyle modification: Physical Activity
▪ Physical activity (aerobic exercise) should be implemented unless contraindicated (150 minutes a week) ▪ Resistance training can improve glycaemic control, strength, body composition and morbidity ▪ Comorbid conditions can prevent physical activity and resistance training ▪ Physical activity goals should be individualized

Management of Drug Therapy:

Use of oral hypoglycaemic agents (OHA)
▪ Special care is required when prescribing and monitoring OHA ▪ Metformin may be contraindicated because of renal insufficiency or significant heart failure ▪ Use thiazolidinediones (TZDs) with caution – although they are effective they can cause fluid retention leading to or exacerbating heart failure ▪ Use sulfonylureas with caution as they can cause hypoglycaemia (which increases exponentially with age) ▪ Meglitinides (repaglinide and nateglinide) have a lower frequency of hypoglycaemia in elderly compared to glyburide and are better for those with irregular eating habits ▪ Start drugs at a low does and titrate up gradually until targets are reached or side effects developed

Use of Insulin
▪ Insulin therapy should be individualized ▪ To minimize dose errors use: • Prefilled insulin pens instead of conventional syringes • Premixed insulins instead of mixing insulins ▪ Multiple daily injections (MDI) have been associated with greater improvements in glycaemic control, health status and mood than administering twice-daily injections

Management of *hypertension* in seniors with diabetes
▪ Treatment of hypertension is associated with a significant reduction in CV morbidity and mortality. The following drugs can be used as required (see section on Hypertension page 52): • Thiazide-like diuretics • Long-acting calcium channel blockers (CCB) (Caution – CCB may be associated with increased risk of CHF (CDA)) • Angiotensions-Converting Enzyme Inhibitors (ACEI) • Angiotension II Receptor Blockers (A2RBs)

Management of *dyslipidaemia* in seniors with diabetes
▪ Treatment with statins for primary and secondary prevention has been shown in most studies to reduce CV morbidity and mortality

Nutrition in Long-term Facilities:

- The imposition of dietary restrictions on elderly patients with diabetes who are in log-term care facilities is not warranted.
- Residents should be given regular meals with consistency in the amount and timing of carbohydrate. There is no evidence to support "no sugar added" or "no concentrated sweets" diet prescriptions.
- Institutionalized elderly are more likely to suffer from undernutrition, so caution is advised when prescribing weight loss diets.

Hospital Care

Because diabetes is not necessarily the primary reason of a hospital admission, diabetes care and glycaemic control may not be adequately addressed. It is important that diabetes does not complicate the management of whatever condition resulted in hospital admission and that the patient's diabetes status on discharge is not worse than what it was on admission (IDF). Insulin has been identified as 1 of the top 5 "high-risk medications" in the hospital setting (ADA).

Organization of Care:

All patients with diabetes admitted to the hospital should have (ADA/ IDF/ CDA):

- their diabetes clearly **identified in their medical record** (ADA)
- a **diabetes care person** be in charge of their diabetes related matters while in hospital (IDF)
- an order for **blood glucose monitoring** (ADA)
- **an HbA1c test,** if there is no record of a Hb1Ac for the previous 2-3 months (ADA)
- **blood glucose results** available to all members of the health team (ADA)
- permission to **self-manage** in hospital, if they successfully self-manage at home, and are at a stable level of consciousness, and have the physical skills to self-manage (administer insulin and self-monitor blood glucose) (CDA)
- their **pre-hospitalization** oral antihyperglycaemic agents or insulin regimes continued **if their medical condition, dietary intake and glycaemic control are acceptable** (CDA)
- patients using insulin or insulin secretagogues must have access to an appropriate form of glucose at all times, especially when NPO or during diagnostic procedures (CDA)
- an individualized **treatment plan for hypoglycaemia** (ADA)

Recommended glycaemic targets:

Critically ill patients:	**Non-critically ill patients:** data suggests outcomes are better if the following goals can be safely achieved:
▪ Maintain BG as close as possible to 100 mg/dL (6.1 mmol/L)	▪ Fasting glucose < 126 mg/dL (7.0 mmol/L)
▪ < 140 mg/dL (7.8 mmol/L)	▪ All random glucose <180-200 mg/dL (10-11.1 mmol/L)
▪ Require an intravenous insulin protocol that has demonstrated efficacy and safety in achieving the desired glucose range without increasing risk for severe hypoglycaemia	

Glycaemic targets for surgical patients (CDA):

Intraoperative	Postoperative ICU patients	Perioperative
▪ 99–180 mg/dL (5.5–10 mmol/L)	▪ (80-110 mg/dL) 4.5–6.0 mmol/L	▪ (90-198 mg/dL) 5.0–11 mmol/L
▪ When undergoing by-pass surgery ▪ Use continuous IV insulin alone ▪ Or with glucose and potassium	▪ Use continuous IV infusion for: ▪ Postoperative ICU patients with hyperglycaemia ▪ Medical ICU patients	▪ Frequently monitor BG and manage according to protocols (minor and moderate surgery)

Hyperglycaemia Emergencies:

There should be a high index of suspicion of diabetic ketoacidosis (DKA) or hyperosmolar hyperglycaemia state (HHS) in ill patients with diabetes. DKA and HHS are diabetic emergencies with overlapping features:

Diabetic ketoacidosis	Hyperosmolar hyperglycaemic state
Risk factors:	**Risk factors:**
▪ New diagnosis of diabetes mellitus ▪ Insulin omission ▪ Myocardial infraction ▪ Infection ▪ Abdominal crisis ▪ Trauma ▪ Possible treatment with insulin pump	▪ DKA's precipitating factors ▪ Cardiac surgery ▪ Certain drugs including diuretics, glucocorticoids, lithium, and atypical antipsychotics
Clinical presentation includes:	**Clinical presentation includes:**
▪ Symptoms of hyperglycaemia ▪ Kussmaul respiration ▪ Acetone-odoured breath ▪ ECFV contraction ▪ Nausea, vomiting and abdominal pain	▪ More profound extracellular fluid volume (ECFV) contraction ▪ Decreased level of consciousness ▪ Possible seizures and a stroke-like state
Management:	
▪ Immediate hospitalization is required (patients with DKA and HHS are best managed in an ICU or a step down unit with specialist care) ▪ Restoration of normal ECFV and tissue perfusion ▪ Resolution of ketoacidosis ▪ Correction of electrolyte imbalances and hyperglycaemia ▪ Diagnosis and treatment of co-existing illness and precipitating factors ▪ The use of bicarbonate therapy in DKA remains controversial; however, it is recommended that if the arterial ph is below 7.0 after an hour of hydration, bicarbonate should be used and repeated until the pH is greater than 7.0	

Management of hyperglycaemia (ADA/CDA):

- Patients should be **monitored** by staff trained in diabetes management
- Using appropriate **diabetes protocols**
- Stable patients should be able to maintain their **normal** out of hospital regime of basal insulin
- **Bolus** (prandial) insulin users may need to adjust insulin depending on patients illness and ability to eat
- **Correction dose** (supplemental) insulin may be required to treat unanticipated hyperglycaemia
- It is best to **prevent hyperglycaemia** rather than use "sliding scale" insulin administration
- Use of **intravenous insulin** profusion (regular crystalline insulin) may be beneficial (CDA) to achieve prompt glycaemic control – close supervision is required and NPO patients not receiving enteral or parenteral nutiriton should have a dextrose infusion
- **Transition** from intravenous to subcutaneous insulin will require administration of subcutaneous insulin (process specific to type of insulin regime) prior to discontinuing intravenous insulin.
- **For more detailed information** see section on **Hyperglycaemic Emergencies in Adults** in *Canadian Diabetes Association 2008 Clinical Practice Guidelines for Prevention and Management of Diabetes in Canada* (S65)

Preventing hypoglycaemia:

Hypoglycaemia is a major limiting factor in hospitalized patients achieving glycaemic control, not only in patients with type 1 and 2 diabetes, but also in patients without diabetes (ADA/CDA):

- hospitals should have **standardized treatment plans** to address mild, moderate and severe hypoglycaemia (CDA)

Immunisations:

Studies indicate that administering influenza vaccine to high risk individuals, including those with diabetes, can reduce hospitalizations by approximately 40%

- All patients with diabetes over 6 months of age should be given an annual influenza vaccine.
- Adults with diabetes should be given at least one lifetime pneumococcal vaccine.
- Those patients over 65 who had pneumococcal immunisations prior to aged 65 and more than 5 years earlier.