Manual for the Management of Hypertension and Diabetes in Dominica

A Collaboration Between the Ministry of Health, Commonwealth of Dominica and Ross University School of Medicine

March 2011

Ministry of Health
Commonwealth of Dominica

ROSS UNIVERSITY
SCHOOL OF MEDICINE

Manual

For

The Management Of

Chronic Non-Communicable Diseases

Hypertension

And

Diabetes

March 2011

First Version: (1985)
Second Version: (1990)
Third Version: (1993)
Fourth Version: (2003)

The Management of Hypertension and Diabetes

As

Major Chronic-Non Communicable Diseases

In

The Commonwealth of Dominica

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ACKNOWLEDGEMENTS

The main objective of this revised manual is to further support an improved Hypertension and Diabetes Management Programme in Dominica. The revision process was coordinated in a collaborative effort by Ross University School of Medicine and the Chronic Non-Communicable Disease Advisory Committee (CNCDAC) of the Ministry of Health, Commonwealth of Dominica:

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The Ministry of Health gratefully acknowledges the contributions of several persons to the successful revision of this manual. The following persons were responsible for the compilation and editing of the various versions of the document:

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- Ms. Kelly Fenn, Ms. Michele Mitchell, and Ms. Sarah Carsley, Interns from the Canadian Society for International Health
- Mr. Errol Thomas, Chief Pharmacist, Central Medical Stores, Ministry of Health

We also wish to acknowledge the technical support received from the following persons:

- Dr. Diana Callender, Chair, Department of Integrated Medical Education, Ross University, Hematology/Oncology
- Dr. Mary Coleman, Dean, Ross University School of Medicine
- Dr. Vanessa Davis, Associate Professor, Endocrinologist, Ross University
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- Mrs. Eleonore Lambert, Assistant Professor, Dietician, Ross University
- Dr. Bianca Roberts, Obstetrician/Gynecologist Consultant, Princess Margaret Hospital, AICM Professor, Ross University
- District Medical Officers, Family Nurse Practitioners, and other Primary Care Providers from across the seven health districts who ensured that the document would be suitable for use in Primary Care.
- Specialists and Health Care Providers from Secondary Care at Princess Margaret Hospital

We would also like to acknowledge contributors to previous editions of this manual and support from the Pan American Health Organization (PAHO) for input and resources provided.

Additionally, we would like to thank Dean Dr. Mary Coleman, Senior Associate Dean Dr. Gannady Raskin, Dean of Clinical and Community Affairs, Dr. Gerald Grell, Chair of the Integrated Medical Education Department, Dr. Diana Callender, and Director of Clinical and Community Affairs, Ms. Rosana Emmanuel at Ross University School of Medicine for their consistent support and financial assistance in preparing this document.

PREFACE

Hypertension and diabetes are major public health problems in Dominica. These diseases place a significant burden on the health and well-being of the population and are among the leading causes of death in the country. To address these important health issues in a systematic manner, this manual was developed and made available to all relevant stakeholders to promote evidence-based clinical management of diabetes and hypertension. This manual is one component of a proposed national chronic disease prevention and management strategy, which is considered in five aspects:

1. Diagnosis
2. Assessment
3. Treatment
4. Follow-up and Referral
5. Advocacy/ Health Education and Promotion

The Primary Health Care (PHC) Services in Dominica have been developed to provide an excellent network for the efficient delivery of care to all citizens. Within this framework, programmes for the management of hypertension and diabetes will continue to expand and improve. To ensure the continuing implementation of these programmes, this manual should receive the widest possible distribution and use by all relevant health care providers.

GOAL: To decrease and delay mortality, morbidity and adult disability from Hypertension and Diabetes Mellitus . It will also help to decrease health costs from these two Chronic Non-Communicable Diseases (CNCDs), , thereby increasing quality of life, life expectancy, and productivity of the population of Dominica.

OBJECTIVES:

1. To improve the quality of life among the population through the effective management of diabetes and hypertension among individuals already suffering from these diseases.
2. To reduce the incidence of long-term complications by means of a programme of therapeutic education geared towards the training of patients and family members to manage these diseases.
3. To reduce the incidence of diabetes and hypertension in the population through public awareness and preventive strategies

LIST OF ABBREVIATIONS

ACE Inhibitor – Angiotensin-Converting Enzyme Inhibitor
BMI – Body Mass Index
BP – Blood Pressure
CAREC – Caribbean Epidemiological Centre
CHRC – Caribbean Health Research Council
CNCDAC – Chronic Non-Communicable Disease Advisory Committee
CWS – Cotton Wool Spots
DME - Diabetic Macular Edema
FP – Fibrous Proliferation
FPG – Fasting Plasma Glucose
GDM – Gestational Diabetes Mellitus
HbA1c – Glycated (or glycosylated) Haemoglobin
HDL-C – High Density Lipoprotein cholesterol
HE – Hard Exudates
IFG – Impaired Fasting Glucose
IGT – Impaired Glucose Tolerance
IRMA – Intraretinal Microvascular Abnormalities
LDL-C – Low Density Liproprotein Cholesterol
MA – Micro-Aneurysms
MOH – Ministry of Health
NPDR – Non Proliferative Diabetic Retinopathy
NPH – Neutral Protamine Hagedorn
OGTT – Oral Glucose Tolerance Test
PAHO – Pan American Health Organization
PHC – Primary Health Care
PIH – Pregnancy Induced Hypertension
PMH – Princess Margaret Hospital
PRH – Preretinal Haemorrhages
SMBG – Self Monitoring of Blood Glucose
TG – Triglycerides
TRD – Tractional Retinal Detachment
VB – Venous Beading
VH – Vitreous haemorrhages
VLDL cholesterol – Very Low Density Lipoprotein cholesterol
WHO – World Health Organization

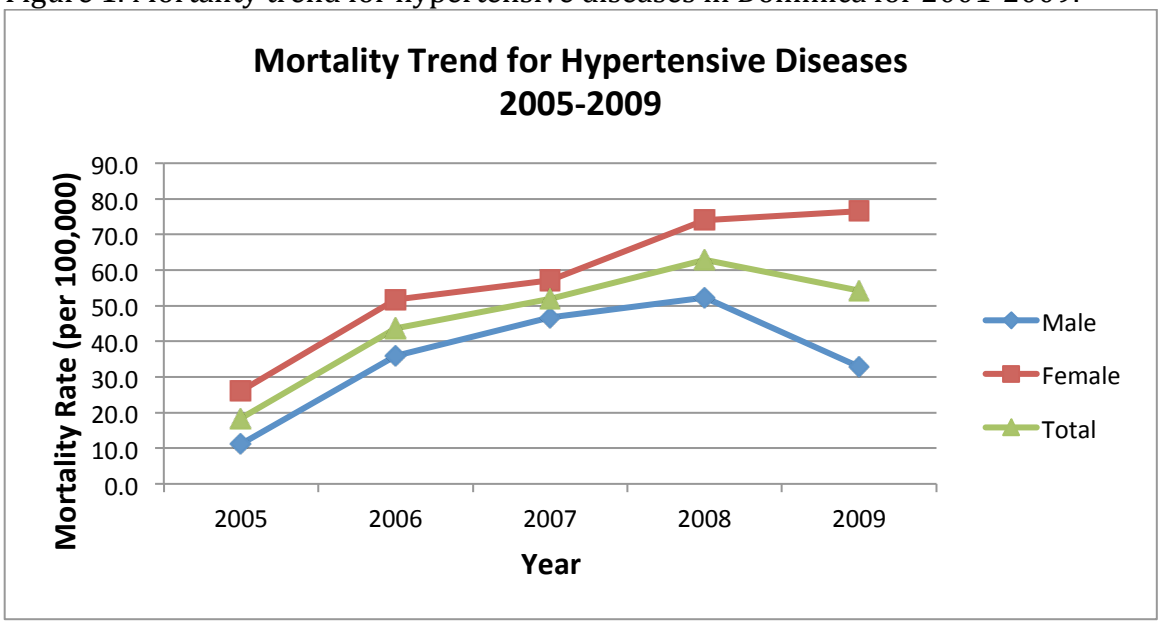
SECTION 1: MANAGING HYPERTENSION IN DOMINICA

1.1 INTRODUCTION AND OVERVIEW OF HYPERTENSION

Worldwide, hypertension is one of the most important preventable causes of premature mortality. Regional studies have estimated a 22% and 23% prevalence rate of hypertension within the adult Caribbean population (CHRC & PAHO, 2007). According to the Caribbean Epidemiological Center (CAREC), hypertension was the fifth leading cause of death in 2000. Hypertension is often termed "the silent killer" because hypertensive patients are often asymptomatic (CHRC & PAHO, 2007).

Much like the rest of the Caribbean, hypertension is a leading cause of death in Dominica. Population trends towards obesity, physical inactivity, and an aging society in Dominica suggest that the incidence of chronic non-communicable diseases (CNCDs), which includes hypertension, will increase as a leading cause of morbidity and mortality in the coming years (National Strategic Plan for Health, 2010-2019). The graph below shows the trend in mortality from hypertensive diseases in Dominica for 2001-2009.

Figure 1. Mortality trend for hypertensive diseases in Dominica for 2001-2009.



Source: Health Information Unit, Ministry of Health.

CLASSIFICATION OF HYPERTENSION

Hypertension may be classified as primary or secondary (CHRC & PAHO, 2007):

- *Primary Hypertension* (formerly known as essential hypertension) is found in the majority of hypertensive patients (95%). No specific cause is identified.
- *Secondary hypertension* is hypertension that can be attributed to an identifiable cause, including:

- Drugs
- Renal Disorders
- Endocrine disorders
- Coarctation of the aorta
- Neurological disorders

RISK FACTORS AND PREVALENCE OF HYPERTENSION

The known modifiable risk factors for hypertension include obesity, high salt intake, physical inactivity, high alcohol consumption, tobacco use and low potassium intake. Non-modifiable factors include age, race (i.e. African ancestry) and family history of hypertension or diabetes. The prevalence of hypertension is also known to increase with age.

The most recent national-level information about prevalence of hypertension among adults in Dominica comes from the 2007-2008 administration of the Pan American Health Organization STEPS Behavioural Risk Factor Survey. The STEPS Survey results revealed that 16% of respondents had been diagnosed with hypertension by a health care professional (19.9% of females and 12.4% of males). Of those participants who reported being diagnosed with high blood pressure, 66.2% had been diagnosed in the past 12 months. Approximately two thirds of respondents (63.6%) reported that they had a family history of the condition. Among those who had been diagnosed, 54% reported that they managed their condition with prescribed drugs. Almost 23% reported that they used herbal remedies to manage their condition. More than one quarter (25.8%) said that they had been advised by a health professional to follow a special diet, 32.1.0% were advised to lose weight, 45% to exercise and 7.6% to stop smoking.

In 90-95% of cases of hypertension, the cause is unknown and the disorder is euphemistically classified as "essential hypertension" (Carretero & Oparil, 2000). However, the shift in health concept from a predominately biomedical to a multidimensional concept has revealed that individual, social, economic and cultural environmental factors interact to contribute to disease. Worse, the disease is silent until the late stages when target organs are damaged (refer to Table 1).

Table 1: Signs and Symptoms of End-Organ Damage

Organ	Signs/Symptoms
Heart	• Displaces and thrusting apex beat • Left ventricular hypertrophy on ECG • Angina or prior myocardial infarction • Congestive heart failure
Brain	• Transient ischemic attack

	• Stroke
Kidney	• Proteinuria • Raised blood urea or creatinine
Eyes	Classification of Hypertensive Retinopathy: • Grade 1 – generalized arteriolar constriction and or tortuosity • Grade 2 – grade 1 + arteriovenous nipping (AV nicking or nipping) • Grade 3 - grade 2 + haemorrhages, hard exudates and or cotton wool spots • Grade 4 – grade 3 + papilloedema
Vascular System	• Asymmetrical, absent or irregular pulses

Source: CHRC& PAHO, Managing Hypertension in Primary Care in the Caribbean, 2007

It is clear that hypertension is a major public health issue in Dominica. Major consequences include hypertensive heart disease, renal failure, stroke and Ischemic Heart Disease. ABC analysis by the Central Medical Stores reveals that the chronic diseases including hypertension account for the major portion of the expenditure on drugs. This is against the background of a population demographic which has an increasing proportion of persons over 60 years of age.

A comprehensive national health promotion and disease prevention strategy implemented through the primary and secondary care systems as well as non-governmental organizations will provide the most effective way of tackling the problem.

The strategy is considered in five aspects:

1. Adequate measurement of BP
2. Assessment and treatment
3. Follow-up and referral
4. Case-finding and research
5. Advocacy and education

1.2 ESTABLISHING THE DIAGNOSIS OF HYPERTENSION

DEFINITION AND CLASSIFICATION

Blood pressure (BP) is recorded by systolic and diastolic values. The systolic blood pressure is the maximum pressure in the arteries during contraction of the ventricles of the heart (systole). The diastolic blood pressure is the pressure during relaxation (diastole). Observed BP readings for a continuum and cut-off points can be selected at specific points along this continuum to define hypertension or high blood pressure.

Concepts defining the upper limits of "safe" blood pressure have steadily been moving downward. There is now good evidence to show that there are benefits to be derived from managing patients with blood pressure levels above 120/80 (Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 2007). The pressure values between normal and elevated are known as "borderline" and indicate that such patients need to be reviewed at least annually.

Table 2. Summary of classification of blood pressure for Adults aged 18+

Category	Systolic (mmHg)	Diastolic (mmHg)
Normal	<120	<80
Prehypertension	120-139	80-89
Stage 1 Hypertension	140-159	90-99
Stage 2 Hypertension	>160	>100
Stage 3 Hypertension	>180	<110

Source: Seventh Reports of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (USA).

Note: Table 2 is based on patients not taking drugs or acutely ill, and based on 2 or more readings on 2 or more visits after initial screening. When systolic and diastolic values fall into different stages, the higher one is used.

SCREENING FOR HIGH BLOOD PRESSURE

Considering the high prevalence of the disease in Dominica, screening for hypertension should be a routine part of every health care encounter for adults. Blood pressure monitoring should be carried out regularly in those at risk for hypertension. Those at risk include persons with a family history of hypertension, stroke, heart disease, or diabetes. In these persons, screening should also be done for diabetes (see Section 2 for information about screening for diabetes).

MEASUREMENT OF BLOOD PRESSURE BY AUSCULTATION

Standardized techniques must be used to measure blood pressure, as well as accurate instruments. These two fundamentals are of vital importance since incorrect technique and faulty machines can result in false readings, unnecessary treatment, inappropriate treatment and follow-up care.

At the first encounter, measure blood pressure in both arms and in the supine and standing position. On repeat visits, use the same arm, preferably the right arm (BP in the right arm is consistently a few mmHg higher than in the left). Always take supine and standing (or sitting if the patient cannot stand) BP measurements in the elderly or those with autonomic neuropathy to detect postural hypotension.

The Instrument:

Mercury sphygmomanometers are preferable and should be checked for faults before use. Other methods for measuring blood pressure may include a recently calibrated aneroid manometer or a validated electronic device. All instruments used for measuring blood pressure should be properly maintained and calibrated regularly by an appropriate agency.

Most adults require a large "adult cuff". The cuff should extend at least two-thirds around the arm. The large arm cuff can be used with accuracy in all adults but a standard cuff with a large arm gives inaccurate results. Large cuffs should be purchased and made available to all major clinics and health centers. A thigh cuff may be needed for the very obese.

Every BP machine should be serviced at least bi-annually and bear a sticker showing the last check date. This servicing can be undertaken by the health provider. If this fails, the Maintenance Department at P.M.H can check the performance of the BP machines.

Training in blood pressure taking techniques should be conducted bi-annually.

The Procedure:

The procedure should be explained briefly to the patient. He/she should be warned of the minor discomfort caused by inflation and deflation of the cuff and that the measurement may be repeated several times.

The Patient:

When taking the BP the patient should be as calm and relaxed as possible, having rested for at least 5 minutes in the sitting or lying position. Care should be taken to make the patient as comfortable as possible, alleviating any factors that could raise BP, such as anxiety, pain,

or a full bladder. The patient should not have smoked, exercised, or ingested caffeine in the previous 30 minutes.

The patient's position during BP measurement should be recorded. The upper arm should be resting comfortably at heart level. One should sit up straight with back against chair, legs uncrossed and feet resting on floor.

Application of Cuff:

Center the bladder of the cuff over the brachial artery with its lower edge at 2-3cm above bend in client's elbow. Tight or restrictive clothing should be removed from the arm. The cuff should fit snugly and comfortably and be well secured.

Estimation of Systolic Pressure

1. Palpate brachial artery pulsation
2. Inflate cuff until pulsation vanishes
3. Deflate
4. Estimate systolic pressure

Auscultatory measurement of systolic and diastolic pressure

5. Place stethoscope gently over point of maximal pulsation of brachial artery
6. Inflate cuff to 30 mmHg above estimated systolic pressure
7. Reduce pressure at rate of at 2-3 mm per second or per pulse beat
8. Take reading of systolic pressure when repetitive, clear tapping sounds appear for two consecutive beats (Korotkoff 5 or K5)

Record systolic and diastolic pressures to the nearest 2mmHg. Repeat the measurement if there is uncertainty or distraction. If the blood pressure is elevated 140/90 mmHg or above, a second reading should be recorded. Allow for a few minutes in between repeats and deflate cuff completely. Blood pressure should be measured in both arms in all patients with raised blood pressure at the initial assessment.

DETECTION OF HYPERTENSION

The term hypertension describes the persistent elevation of blood pressure. For the clinician, elevated blood pressure values would be generally accepted to be a systolic pressure equal to or greater than 140mmHg and/or a diastolic pressure (K5) equal to or greater than 90mmHg. Normal blood pressures for an adult would be less than 120mmHg systolic and less than 80mmHg diastolic.

A diagnosis of hypertension should not be made on a single measurement (unless very high systolic and diastolic values are found). At least two more blood pressure reading should be taken on at least two different occasions within a month before declaring that a subject has hypertension.

1.3 EVALUATING THE PATIENT

Three main considerations need to be given to the newly diagnosed hypertensive on initial assessment:

1. The severity of the BP elevation
2. The possibility of an underlying cause
3. The presence of target organ damage (e.g retinopathy, nephropathy, cardiomegaly etc.)

CLASSIFICATION OF BLOOD PRESSURE FOR ADULTS (Ages 18+)

1. Severity of BP Elevation

Using the (K5) diastolic pressure hypertension may be classified as follows (Table 2). Note that table 2 is based on patients not taking drugs or acutely ill, and based on 2 or more readings on 2 or more visits after initial screening. When systolic and diastolic values fall into different stages, the higher one is used.

Table 2. Summary of classification of blood pressure for Adults aged 18+

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Source: Seventh Reports of the Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure (USA).

Note: Table 2 is based on patients not taking drugs or acutely ill, and based on 2 or more readings on 2 or more visits after initial screening. When systolic and diastolic values fall into different stages, the higher one is used.

2. Possibility of an Underlying Cause

It is important to remember that an underlying cause for hypertension may be found in only 5-15% of cases. The majority of hypertensives are of unknown origin thus being referred to as idiopathic or "Essential". However in history, ask about (CHRC & PAHO, 2007):

- Age, gender, employment, marital status
- Alcohol intake (drinks per day or week)
- Cigarette smoking, tobacco/high leaf (past, present – number daily etc.)

- Illegal drug use (e.g. marijuana, cocaine, crack)
- A family history of hypertension/diabetes, ischemic heart disease, high cholesterol, renal disease, cardiac failure
- Use of oral contraceptives
- Pregnancy – history of pregnancy-induced hypertension (PIH)
- Medication e.g. steroid therapy
- Non-steroid Anti-Inflammatory Drug analgesic therapy [NSAIDs]
- Other medications e.g. herbal medicines
- Episodic complaints suggestive of phaeochromocytoma (tumor of adrenal that may cause elevated blood pressure) e.g. headache, pallor, sweating palpitations
- Leg cramps (coarctation)
- Diet – 24 hour recall, main food groups
- Exercise – type, duration
- Stress – family situation, recent major life events, work, children
- Other conditions e.g. endocrine diseases such as thyroid disease, menopause.

On examination, look for clues suggesting causes:

- Pregnancy
- Renal masses: of polycystic kidneys
- Abdominal bruits: of renal artery stenosis
- Weak femoral pulses: of coarctation
- Skin lesions or dark spots: of phaeochromocytoma
- Facial puffiness: of renal disease
- Abdominal striae and obesity of Cushing's syndrome
- Edema of the legs
- Jugular distention
- Arrhythmia
- Cardiac murmur

3. Presence of Target Organ Damage

Table 3. Summary of Target Organ Damage and Features

Organ	Features
Heart	• Cardiomegaly • Congestive Cardiac Failure • Myocardial Infarction • LVH on ECG
Kidneys	• Renal failure • Proteinuria

Retina	• Hypertensive changes • Grade 1 – generalized arteriolar constriction and or tortuosity • Grade 2 – grade 1 + arteriovenous nipping (AV nicking or nipping) • Grade 3 - grade 2 + haemorrhages, hard exudates and or cotton wool spots • Grade 4 – grade 3 + papilloedema
Brain	• Amnesia, signs of neurologic deficits

LABORATORY INVESTIGATIONS AND OTHER DIAGNOSTIC PROCEDURES

Table 4 outlines a number of laboratory and other diagnostic procedures available to assist in managing the hypertensive patient.

Table 4. Summary of Laboratory Investigations and Other Diagnostic Procedures

A. Basic Investigations	• Full Blood Count • Urea, Creatinine • Electrolytes • Urinalysis (midstream)– (Protein) • Chest X-ray • Electrocardiogram
B. Additional Investigations	• Cholesterol – Fasting Lipid Profile • Uric Acid • Glucose (F.B.S) • Urine Culture and Sensitivity
C. Special Investigations	• Vanillylmandelic Acid (VMA) /serum Metanephrines • Intravenouspyelogram • Renal Ultrasound • Cortisol levels • Angiography • Echocardiography

FOLLOW-UP VISITS FOR THE HYPERTENSIVE PATIENT

A patient found to be hypertensive should be referred to the FNP or DMO for assessment and initiation of management. During the initial period of stabilization the patient should be seen as often as necessary by the FNP/DMO (e.g. weekly). Hypertensive patients should be followed up at regular intervals, depending on blood pressure control and the existence of complications or other diseases.

If it is feasible, after stabilization, routine follow-up and checking of BP at monthly intervals should be performed by the district nurse/CHA who would advise refilling of prescriptions.

At present, the patient's exercise book functions effectively as an "adult passport" for documenting BP and medication and all patients should be encouraged to carry their book with them at each visit to a health center or doctor. Compliance being a major determinant of treatment success, every effort should be made to ensure that medication is being taken regularly. Home visiting of defaulters by the district nurse as well as spot checks by pill counts at home or in clinics should be encouraged. All patients should bring along their tablets at each appointment.

If the patient misses an appointment a reminder should be sent along with a new appointment. In the case of further non-communication the district nurse/CHA should perform a home visit to re-establish contact.

Active follow-up is of great importance in preventing patient from dropping out of the therapeutic regime. Since the complications of hypertension occur more often in dropouts than those who are under regular observation, it is important to ensure continuous therapy for all patients (Table 5).

Table 5. Checklist for Follow-up Care of the Hypertensive Patient(by DMO/FNP)

Every Visit	Annual Visit
• Measure and record BP • Measure weight, BMI calculation • Elicit information on adherence to treatment, including taking medication the morning of visit • Ask about symptoms or changes since last visit • Any adverse drug effects • Stress importance of healthy lifestyle • Examination of feet	• Update medical history • Measure and record blood pressure • Measure weight, monitor BMI • Ask about lifestyle – diet, physical activity, tobacco and alcohol use. Stress importance of healthy lifestyle. • Do laboratory investigations – plasma creatinine, electrolytes, fasting lipid profile, full blood count (FBC), fasting blood sugar • Do electrocardiogram • Eye exam and referral to ophthalmologist

Whether hypertensive patients attend should be easily monitored on clinic based record card. At present, the patient's exercise book functions as a record of BP and prescriptions.

Table 6. Summary of Recommendations for Follow-Up

BP Classification	Blood Pressure (mmHg)	Follow-Up
Normal	< 120/<80	Recheck in 1-2 years.
Pre-hypertension	120-139/80-89	Repeat measurements every 6 months.
Stage 1	140-159/90-99	Repeat measurement in 3 months.
Stage 2	160-179/100-109	Repeat within 1 month or sooner if there

		is target organ damage or if risk level warrants
Stage 3	≥180/ ≥110	Repeat within 1 week or treat if there is target organ damage or if risk level warrants.
Hypertensive Emergency	>240 / 140 or >210/120 with complications	Refer for emergency management, but administer oral medication.

1.4 MANAGEMENTOF HYPERTENSION

The aim of treatment is to prevent complications. The cornerstone of treatment is lifestyle modification (non-drug therapy). All diagnosed hypertensives should be seen at three month intervals, unless otherwise indicated by their doctor and on a monthly basis by any other health professionals as a routine part of the management strategy for:

1. Assessment of blood pressure control
2. Compliance checking (i.e. asking patient about self-management of medication, nutrition habits, exercise routines)
3. Detection of complications
4. Counseling and education

In addition, continuous education should be provided for the patient and his/her family, as well as referral to a nutritionist when available. Community education programmes will focus on prevention and risk reduction and management.

MANAGEMENT ACCORDING TO STAGE

The decision to initiate drug treatment is a major step and effectively sentences the patient to a lifetime of pill taking, which may itself have undesirable and unsuspected effects.

Table 7. Summary of Hypertension Management According to Stage

Stage	BP Range	Management
Prehypertension	120-139 / 80-90)	• Emphasize lifestyle modification • Reassess at 6-12 months
Stage 1 – Uncomplicated Hypertension	140-159 / 90 – 99mmHg	• Initiate a trial of non-drug therapy for 6-9 months • If control cannot be achieved, then add drug therapy • In patients achieving lifestyle change and whose BP is then controlled over a period of 12 months, titrate drug therapy down and in a few cases it may be possible to withdraw drug therapy
Stage 2 – Uncomplicated Hypertension	≥ 160/100mmHg	• Commence non-drug and drug therapies Note: some patients in the lower limits of the range with multiple correctable risk factors may achieve significant reductions of BP on non-drug therapy alone. Such patients, if without target organ damage, may be given a trial of non-drug therapy alone. Most Stage 2

		patients however will need 2 or more drugs and lifestyle change.
Stage 3 – Uncomplicated Hypertension	>180/110mmHg	• Commence non-drug and drug therapies and review frequently
Hypertensive Emergency	>240 / 140 or >210/120 with complications	• Refer for emergency management and administer oral medication.

NON-PHARMACOLOGICAL MANAGEMENT OF HYPERTENSION

The cornerstone of treatment for both diabetes and hypertension is lifestyle modification (non-drug therapy). Changing lifestyle habits is essential for both the prevention and management of all stages of high blood pressure.

Managing hypertension efficiently is important in achieving maximum reduction in the total health risk of cardiovascular morbidity and mortality. Modification of diet, exercise, and lifestyle behaviors can have pronounced effects on blood pressure levels (see Table 8 for a summary of diet, physical activity, and lifestyle modifications and their effect on blood pressure). All risk factors and co-morbid conditions must be identified and treated. These include smoking, obesity, hypercholesterolemia, diabetes and other clinical conditions. A comprehensive nutrition assessment and review of historical and laboratory data will provide a good indication of need for nutrition intervention.

Table 8: Diet, Exercise, and Lifestyle Modifications and Approximate Systolic Blood Pressure Reduction

Modification	Recommendations	Approximate Systolic Blood Pressure Reduction
Weight Reduction	Maintain normal body weight (BMI 18.5-24.9)	5-20 mm Hg for each 10 kg weight loss
Adapt Dietary Approaches to Stop Hypertension (DASH) eating plan	Consume diets rich in fruits, vegetables, low fat dairy and low saturated fat	8-14 mm Hg
Dietary sodium reduction	Reduce sodium to no more than 2.4 g/day sodium or 6 g/day NaCl (one teaspoon)	2-8 mm Hg
Increase physical activity	Engage in regular aerobic activity such as walking (30 min/day on most days)	4-9 mm Hg
Moderate alcohol consumption	Limit alcohol to no more than 2 drinks/d for men and 1 drinks/day	2-4 mm Hg

	for women.	

Source: Canadian Hypertension Society, 2003.

Unless hypertension is at an urgent level, life-style modifications should initially be employed and form the cornerstone of treatment at all stages of high blood pressure. These include weight loss in the overweight or obese, regular physical activity, reduction in dietary sodium and reduced consumption of caffeine and alcohol. If these modifications do not achieve treatment goals or if there are signs of target organ damage, medication should be added to the treatment regimen.

Weight Loss:

There is ample evidence to show that moderate weight loss is associated with a fall in the blood pressure level. Therefore, weight reduction in the overweight and obese is an important part of non-drug measures to be used in maintaining lower BP levels. Weight reduction may be achieved by reducing the energy intake and increasing physical activity. Persons whose Body Mass Index (BMI) is greater than 26 should be referred to the FNP/Nutritionist or Health Centre/Health Promotion Resource Centre (see Appendix A for Body Mass Index Chart).

Reducing Alcohol Consumption:

Blood pressure increases with the amount of alcohol consumed daily. Therefore, hypertensives should be advised to limit alcohol consumption. Hazardous and harmful drinking behavior should also be discouraged. If alcohol is to be consumed it should be done in moderation and on the advice of the physician:

- A *standard drink* contains approximately 10g of pure alcohol (285mL/10oz full strength beer, 450mL/15oz of low alcohol (light) beer, 100mL/3.4oz wine and 30mL/1oz spirits)
- *Hazardous drinking* is defined as 40-59.9g of pure alcohol on average per day for men and 20-39.9g for women.
- *Harmful drinking* is defined as ≥60g of pure alcohol on average per day for men and ≥40 g for women.

Reducing or Eliminating Cigarette Smoking:

Smoking significantly increases the risk of cardiovascular complication. It is also associated with an increased risk of developing the more severe grades of hypertension. All hypertensives should be advised to stop smoking.

Increasing Exercise:

Regular exercise is helpful in reducing weight and is associated with rise in the level of high-density lipoprotein. It has been shown that there is a lowering of the blood pressure with regular exercise but that this beneficial effect is lost once the exercise programme is stopped. Experts recommend at least five half-hour sessions of physical activity every week. These sessions need not involve exhausting activities such as jogging or pumping iron in the gym. Any physical activity is effective as long as it is intense enough to increase the respiratory rate. This can be achieved by brisk walking, dancing, swimming, climbing stairs, cleaning windows, aerobic classes or sporting activities. (see Appendix D for a Guide to Physical Activity Levels).

Exercise can help reduce blood pressure by strengthening the heart muscle and therefore the volume of oxygen the heart delivers to the tissues at each beat, reducing its work load. Exercise may also change the hormonal climate in which the body does its work by reducing stress hormone levels. If a block of 30 minutes cannot be found for exercise, it can be divided into three ten minute sessions throughout the day. Advise patients that any increase in physical activity will be beneficial.

NUTRITIONAL AND DIET MANAGEMENT

Nutritional and diet management for both hypertensive and diabetic patients involves important lifestyle modifications. Changing lifestyle habits is essential for both the prevention and management of all stages of high blood pressure. One critical component of this is a nutritional assessment and care plan. As well as undergoing a comprehensive nutritional assessment, clients should also be counselled on their caloric intake, meal timing, and food preparation. The interpretation of food labels should form part of the counseling session with particular emphasis on portion sizes (see Appendix J for Nutritional Assessment Form).

Objectives of Nutritional Management:

- Achieve weight loss in the overweight or obese client.
- Reduce excessive intake of sodium, alcohol and caffeine.
- Increase intake of potassium and calcium.
- Education on the role of nutrition in the prevention / control of hypertension.
- Recommend a nutritionally adequate diet, balancing food intake with physical activity to achieve optimum results.
- Address other risk factors present e.g. cigarette smoking, managing stress.

Recommendations for Nutritional Treatment:

- Determine specific intervention needs of patients (e.g. reduced sodium intake, weight loss, increased potassium intake, need to lower blood lipids.)
- Determine caloric/nutrient needs to facilitate weight loss if necessary
- Provide a nutritionally balanced diet with a variety of foods from all the food groups to meet the individual diet prescription.
- Monitor sodium intake. For all clients on diuretics, a diet containing 2g of sodium per day is usually sufficient. A normal diet of 2-4 g sodium daily is usually a practical guide, but must be monitored closely and modified to meet the needs of the individual client
- Limit consumption of caffeine and alcoholic beverages. Decaffeinated beverages may be substituted for caffeinated ones.
- Modify behavior to include healthy lifestyle practices.
- Include a regular physical activity programme agreed on with the doctor.

Steps in the Nutritional Management of Persons with Hypertension:

- Assessment to identify nutritional status and dietary needs
- Set treatment goals with input from clients
- Prepare a Nutritional Care plan
- Provide education, information and care based on identified needs
- Evaluate care and education
- Take necessary corrective action
- Reassess nutritional status
- Provide necessary follow-up care
- Document activities in medical records
- Refer as necessary

SODIUM (SALT)

Excess salt intake experimentally consistently produces a rise in blood pressure in genetically susceptible animals. Thus a low salt diet is to be recommended for all hypertensives. The maximum recommended intake of sodium (salt) for hypertensive patients is between 2,400mg and 3,000mg. One level teaspoon of salt contains approximately 2,000mg of sodium per day. Examples of foods and their sodium contents include:

- 2 slices of ham = 1/3 teaspoon
- 1 oz. of mixed nuts = 1/10 teaspoon
- 1 cup baked beans =approx. ½ teaspoon
- 1 biscuit with egg and sausage = ½ to 2/3 teaspoon
- 1 oz saltfish = 1 teaspoon

- 1 packet dried soup = ¼ - ½ teaspoon
- 2 oz corned beef = ¼ teaspoon
- 2oz ham= ¼ teaspoon
- 1 frankfurter = ¼ teaspoon
- 1tablespoon soy sauce = ½ teaspoon
- 1oz cheese = ¼ teaspoon

Foods that are generally high in salt include: salt fish, salted crackers, pickled meats and herring, canned soups, canned vegetables, bacon, sausage, salted nuts, ham, corned beef, frankfurters, sardines, tuna in water, soy sauce, onion/garlic/celery salt, bohio seasonings, and bouillon cubes.

Recent studies have indicated that about one-fifth to one half of all persons with hypertension may be sodium sensitive (or salt-sensitive). For these individuals, *maintaining a diet that is low in salt and other salt compounds is a wise idea*. However, since sodium restriction only does not lower the blood pressure in half of the hypertensive people, other dietary factors MUST be considered. **Any labeled food product containing more than 400mg of sodium per serving is classified as high sodium**.

Key Salt Consumption Questions for Patients with Hypertension:

- Do you use a salt-shaker?
- Do you taste your food before you add salt?
- How often do you eat salty foods, such as chips, pretzels, salted nuts, canned and smoked foods?
- Do you read labels for sodium content?

FATS

The type and mix of fats in the diet affects blood pressure. Diets high in saturated fats are associated with hypertension. Polyunsaturated fats (mostly found in plant sources as well as fish) tend to lower blood pressure. A description of each of these types of fats follows:

- *Saturated fat* is the main dietary cause of high blood cholesterol. Saturated fat is found mostly in foods from animals and some plants. Foods from animals include beef, beef fat, veal, lamb, pork, lard, poultry fat, butter, cream, milk, cheeses and other dairy products made from whole and 2% milk. All of these foods also contain dietary cholesterol. Foods from plants that contain saturated fat include coconut, coconut oil, palm oil and palm kernel oil (often called tropical oils), and cocoa butter.

- *Polyunsaturated and monounsaturated fats* are the two unsaturated fats. They are found mainly in many fish, nuts, seeds and oils from plants. Some examples of foods that contain these fats include salmon, trout, herring, avocados, olives, walnuts and liquid vegetable oils such as soybean, corn, safflower, canola, olive and sunflower. Both polyunsaturated and monounsaturated fats may help lower blood cholesterol level when used them in place of saturated and *trans* fats. Fat intake should be between 25 – 35% of calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids such as fish, nuts and vegetable oils.

FIBER

A high fiber diet that includes 25-30 grams of fiber daily is known to lower blood pressure. Whole grain cereals, legumes, local staples, fruit and vegetables contain high to moderate amounts of fiber and should be consumed daily (see Appendix G for a list of food examples and their fiber contents).

POTASSIUM

While sodium is retained in the body, potassium is excreted. In order to maintain the sodium-potassium ratio, hypertensives, *especially those on diuretics*, should consume foods that are high in potassium. Fruit, vegetables and legumes, such as ripe bananas, apricots, mangos, passion fruits, avocados, lima beans, and lentils, which are not highly processed, contain potassium. Coconut water is especially high in potassium. **However, persons with renal failure should avoid coconut water.**

CALCIUM

Calcium affects blood pressure through its action on the muscle cells in the artery walls. In order for blood pressure to remain within the normal range, calcium intake must be adequate. A diet with an excess of calcium or low calcium will elevate blood pressure. Therefore, a diet which contains approximately 800mg of calcium daily is recommended. Dairy products are recommended because they provide not only calcium but also potassium and magnesium, which may also help keep blood pressure normal. For example, 3 glasses of skimmed/low fat milk or 3 times 3 level tablespoons of powdered skimmed milk. Dark green leafy vegetables, cheese, sardines and legumes also contain calcium.

RECOMMENDED SERVINGS OF FRUITS AND VEGETABLES

It is recommended that a person consume 2-3 servings of fruit and 3-4 servings of vegetable per day (see Appendix J for Nutritional Assessment Form). The following list provides examples of one serving of fruits and vegetables:

- Avocado – ½ fruit
- Banana – 1 medium
- Carrot – 1 large
- Cucumber – ½ cup
- Grapefruit – ½ fruit
- Guava – 1 fruit or ½ cup
- Raw leafy vegetables – 1 cup
- Squash – 125mL or ½ cup
- Tomato – 1 medium or ½ cup
- Fruit juice – 6 oz
- Vegetable juice – 6 oz
- Cooked vegetables – ½ cup

It is important that health care providers recommend a more vegetarian diet to their hypertensive patients (i.e. replace meat in the diet with fish and vegetable protein sources). However, it is important to consult with a dietician or nutritionist to ensure the appropriate amounts of protein and vitamins are consumed.

Guidelines for Self-Management:

- Discuss hypertension, its causes, risk factors and complications.
- Explain the role of good nutrition in the context of hypertension control.
- Teach persons to read food labels. This will help to avoid excessive intake of sodium in the diet.
- Encourage clients to use alternatives such as herbs and spices to flavor foods instead of salt. Suggest that they taste food before adding salt and to avoid adding salt after the food has been cooked.
- Explain the role of food intake and physical activity in achieving weight loss and in lowering blood pressure.
- Discuss sources of caffeine, e.g. coffee, cola beverages, tea and chocolate.
- Explain that it takes time to see the results of nutrition intervention so patients will be more patient in expecting results.
- Discuss the possible effects of sodium on blood pressure.
- Discuss role of self-monitoring, recording and using the information to improve management of hypertension.

PHARMACOLOGICAL MANAGEMENT OF HYPERTENSION

The purpose of the pharmacological treatment of hypertension is the reduction of morbidity and mortality through the lowering of blood pressure. Because of the long-term

duration of the management of hypertension, cost must be an important consideration in the choice of drugs. Drug treatment must also be tailored to the individual considering factors such as:

- Age and race
- The presence or absence of target organ damage
- The presence of other diseases such as diabetes, kidney disease, and heart disease
- Patient preference

See Appendix B for a flowchart of an individualized sequential approach for hypertensive drug therapy.

Antihypertensive Drugs

A wide range of drugs are available for the treatment of hypertension. The difference classes lower blood pressure by different means. The classes of antihypertensive drugs include:

Thiazide Diuretics help the kidneys eliminate salt and water and in a longer period of time dilate blood vessels. Examples of this class of drug are Bendrofluazide and Chlorothazide.

Beta-blockers decrease the force and rate of the heart's contractions by binding to beta adrenoreceptors and prevent the action of norepidephrine and epinephrine. They also cause a decreased release of renin resulting in decreased production of angiotensin II and decreased release of aldosterone. Some beta blockers (eg. Nadolol) bind to both beta 1 and beta 2 adrenoceptors and are called non-selective. Other beta blockers (atenolol or Metoprolol) bind only beta 1 adrenoceptors and are termed selective.

Angiotensin-Converting Enzyme(ACE) Inhibitors block the angiotensin-converting enzyme which converts Angiotensin I to Angiotensin II, a potent vasoconstrictor. They inhibit the breakdown of the vasodilator bradykinin. Some examples include captopril (Capoten) and enalapril (Vasotec).

Calcium Channel Blockers (CCB) are also known as calcium antagonists. They are direct vasodilators. They slow movement of calcium into cardiac and smooth muscle cells leading to decreased contractility and vasoconstriction. Drugs in this class include amlodipine (Norvasc), verapamil (Isoptin) and diltiazem (Cardizem).

Angiotensin Receptor Blockers (ARBs) are known as Angiotensin II Receptor

Antagonists. They block the action of Angiotensin II. They relax blood vessels and cause decreased peripheral vascular resistance. An example is valsartan (Diovan).

Vasodilators widen blood vessels and decrease peripheral vascular resistance. They are almost never used alone. Examples of this class include hydralazine (Apresoline) and minoxidil (Loniten).

PRINCIPLES OF TREATMENT:(WHO International Society of Hypertension, 1999)

- Begin therapy with the lower dose range available for a particular agent, in an effort to reduce adverse effects. If there is good response but the pressure is still short of adequate control, it is reasonable to increase the dose of the same drug, provided that it has been well tolerated.
- The use of appropriate drug combinations to maximize hypotensive efficacy while minimizing side effect. It is often preferable to add a small dose of a second drug rather than increasing the dose of the original drug.
- Changing to a different drug class altogether if there is very little response or poor tolerability in the first drug used, before increasing the dose of the first drug used or adding a second drug.
- The use of long-acting drugs providing 24-hour efficacy on a once daily basis. The advantages of such drugs include improvement in adherence to therapy and minimization of blood pressure variability, as a consequence of smoother, more consistent blood pressure control.

Table 9.Pharmaceuticals for the Management of Hypertension

Drug Name	Drug Information
A)Bendrofluazide (Aprinox®) – *first line drug*	• **Dosage for hypertension -** 1.25 – 2.5mgonce daily in the morning(greater doses are rarely more effective, but more likely to produce adverse reactions) • **Contraindications:** Severe renal and haptic impairment, care in pregnancy. • **Side Effects:** Hyperuricema, hyperlipidemia, hyperglycemia, hypokalemia (These side effects are less with recommended low daily doses of 2.5 mg daily) less commonly rashes, photosensitivity. • **Advantages:** Most effective drug in blacks and elderly, cheap, once daily dosage, additive effect with most other hypertensives. • **Disadvantages:** Impaired glucose tolerance, may precipitate gouty attack. • **Recommendations:** Annual check of blood glucose, uric acid and electrolytes.
B) Atenolol – *first line drug*	• **Dosage:** Hypertension – 50 -100mg once daily (Dosage above 100mg daily does not result in additional control of BP).

	• **Contraindications:** Second or third degree heart block, asthma, bronchospasm, uncontrolled heart failure, inducing-dependent (Type 1) Diabetes. • **Side Effects:** Hypotension, bradycardia, fatigue, dizziness, mental depression, bronchospasm, nausea, diarrhea. • **Advantages:** Once daily dosing, few central nervous system (CNS) adverse reactions. • **Disadvantages:** May precipitate bronchospasm, impairs physiological response to hypoglycemia in brittle diabetics, may worsen peripheral vascular disease.
C) Propranolol – *first line drug*	• **Dosage:** 160 – 480mg per day in two divided doses. • **Contraindications:** Bronchospasm, or asthma, bradycardia, second and third degree heart block, Raynauds Syndrome. • **Precautions:** Patients with hypoglycemia, congestive heart failure, peripheral vascular disease. • **Side Effects:** Bradycardia, heart failure, impotence, bronchospasm, gastrointestinal disturbances, nightmares. • **Advantages**: Cheap, has been shown to be protective in heart attacks, useful for patients with arrhythmias and angina. • **Disadvantages:** May precipitate bronchospasm, impairs physiological response to hypoglycemia in brittle diabetics, may worsen peripheral vascular disease.
D) Captopril – *first line drug*	• **Dosage:** 25 – 50mgtwo-three times daily • **Contraindications:** Pregnancy, Renovascular disease • **Precautions:** Patients on low salt diet, diuretic therapy or dialysis may experience marked hypotension; renal impairment; peripheral vascular disease. • **Side Effects:** Loss or disturbance of taste, rash, persistent dry cough, angioedema, neutropenia, angranulocytosis and proteinuria is more likely with renal impairment. • **Advantages:** Beneficial effects seen in left ventricular failure, left vent ventricular hypertrophy and diabetic nephropathy and diabetic nephropathy, cheap • **Disadvantages:** Not particularly effective as mono-therapy in Afro-Caribbeans, probably as the resting renin status is low in Black hypertensives
E) Amlodipine – *first line drug*	• **Dosage:** Hypertension or angina 2.5mg – 10mg once daily • **Contraindications:** Cardiogenic shock, unstable angina, pregnancy, lactation, significant aortic stenosis. • **Precautions:** Myocardial infarction, hepatic impairment. • **Side Effects:** Headache, edema, fatigue, nausea, flushing, dizziness, tender or bleeding gums, rash, palpitations, muscle cramps or weakness, impotence.

	• **Advice to Patients:** Avoid grapefruit juice, which may increase drug levels.
F) Methyldopa	• **Dosage:** 250mgs-500mgs at night in females. • **Indications:** Pregnancy-induced hypertension only. • **Contraindications:** Depression, active liver disease, phaeochromocytoma, porphyria. • **Precautions:** History of liver impairment, renal impairment, history of depression. • **Side Effects:** Dizziness, dry mouth, gastro-intestinal disturbances, bradycardia, impotence, sedation, headache, nasal congestion, and rarely drug-induced hepatitis. • **Advantages:** Safe in pregnancy, diabetes, asthma, heart failure and renal failure. • **Disadvantages:** Drowsiness with initial doses, may cause reduced libido and less commonly liver disease and haemolytic anemia.
G) Hydralazine – *first line drug*	• **Dosage:** 25 – 50mg two to three times daily. • **Contraindications:** Idiopathic systemic lupus erythematous, sever tachycardia, ischemic heart disease with angina. • **Precautions:** Hepatic impairment, renal impairment, coronary artery disease. • **Side Effects:** Palpitations, tachycardia, headache, dizziness, systemic lupus erythematous-like syndrome. • **Advantages:** Cheap. • **Disadvantages:** Should only be used with a beta-blocker, tachycardia and headache are common, may produce systemic lupus erythematous-like syndrome.
H) Lisinopril – *second line drug*	• **Dosage:** Initially 2.5 mg daily, usual maintenance dose 10 – 20 mg daily, maximum 40 mg daily. • **Contraindications:** Aortic stenosis, angioedema, pregnancy, lactation. • **Precautions:** Patients receiving diuretics, peripheral vascular disease. • **Side Effects:** Loss or disturbance of taste, rash, persistent dry cough, angioedema, neutropenia, agranulocytosis and proteinuria is more likely with renal impairment. • **Advantages:** Once daily dosing, beneficial effects seen in left ventricular failure, left ventricular hypertrophy and diabetic nephropathy. • **Disadvantages:** As monotherapy not particularly effective in Afro Caribbean probably as the resting renin status is low in Black hypertensives.
I) Verapamil – *second line drug*	• **Dosage:** 240 - 480mg daily in 2-3 divided doses. • **Contraindications:** Hypotension, bradycardia, second and third

	degree AV block, cardiogenic, shock, Sinoatrial block, history of heart failure or significantly impaired left ventricular function. • **Precautions:** First degree AV block, acute phase of myocardial infarction, patient on beta blockers, hepatic impairment, pregnancy, and lactation. • **Side Effects:** Constipation, less commonly nausea, vomiting, flashing headaches, dizziness, fatigue, ankle edema, myalgia, arthralgia, allergic reactions (erythema, pruitis, uticaria, angioedema, and Stevens-Johnson syndrome • **Advantages:** Slow the heart rate and Atrioventricular node conduction. • **Disadvantages:** Constipation. • **Advice to Patients:** Avoid grapefruit juice – may affect metabolism. May cause severe muscle tenderness and pain. Caffeine may result in enhanced CNS stimulation.
J) Lorsatan	• **Dosage:** 50mg daily, but elderly over 75 years initially 25mg daily; if necessary increase dose to a maximum of 100mg daily after 4-6 weeks. • **Indications:** Hypertension, prevention and treatment of nephropathy in Type 2 Diabetes. • **Contraindications:** See Captopril but causes less cough. • **Advantages:** Reserved for patients intolerable to ACE Inhibitors. • **Disadvantages:** Expensive. • **Advice to Patients:** See Captopril.
K) Acetylsalicylic Acid (Asprin) ASA	• **Dosage:** Prophylaxis for heart attack and stroke – 75mg daily. • **Contraindications:** Gastric ulceration, bleeding disorders, anticoagulant therapy. • **Precautions:** Patients with asthma, impaired renal or hepatic function. • **Side effects:** Tinnitus, nausea, gastric ulceration, hypersensitivities. • **Advantages:** Used for anti-platelet action, reduce heart attack and stroke. • **Disadvantage:** Increases risk of gastric ulceration. • **Advice to Patient:** Must be taken with food, milk, or a full glass of water.
L) Simvastatin	• **Dosage:** Initially 10mg at night, adjusted at 4-6 week intervals up to 40mg daily at nights if necessary. • **Indications:** Hypercholesterolemia, mixed hyperlipidemia, and patients at high risk of coronary disease with or without hyper-cholesterolemia. • **Contraindications:** Patients with active liver disease. • **Precautions:** Renal impairment, history of liver dysfunction.

	• **Side effects:** Mild gastrointestinal effects, myalgia. • **Advantages:** Most effective statin. • **Disadvantages:** Myalgia. • **Advice to Patient:** Avoid grapefruit juice, report unexplained muscle pain, dark urine.

COST OF DRUG THERAPIES FOR HYPERTENSION IN DOMINICA

Estimated monthly cost of anti-hypertensives based upon CMS prices as of January 2011 are listed in Table 9. It is important that the cost of medications be considered when prescribing as the drug. This is because the drug budget for health services may easily be exceeded and island-wide treatment programmes rendered ineffective through shortages which might otherwise have been avoided.

Table 10. Monthly cost of Anti-Hypertension Drugs as of January 2011

Drug Name	Dosage	Unit Cost ($)	Monthly Cost ($)
Atenolol 50mg	One tab daily	0.03	0.90
Bendrofluazide 2.5mg	One tab daily	0.02	0.60
Captopril 25mg	One tab twice daily	0.03	1.80
Amlodipine 10mg	One tab daily	0.03	0.90
Hydrallazine 25mg	One tab twice daily	0.04	2.40
Hydrallazine 50mg	One tab twice daily	0.07	4.20
Lisinopril 10mg	One tab daily	0.16	4.80
Methyldopa 250mg	0ne tab at nights	0.09	2.70
Methyldopa 500mg	One tablet at nights	0.20	6.00
Propranolol 40mg	One tab twice daily	0.03	1.80
Verapamil 40mg	One tab daily	0.10	3.00
Verapamil 80mg	One tab twice daily	0.17	10.20
Propranolol 80mg	One tab twice daily	0.06	3.60
Aspirin 81mg	One tab daily	0.03	1.14

There is no advantage to using frusemide (Lasix) in place of a thiazide in patients without edema. The aim of therapy should be to achieve casual blood pressure levels at or below 140/90mmHg. Contrary to popular patient belief, drug dosages **SHOULD NOT** be stopped once the blood pressure level is within the normal range. In fact, the drug dose, which controls the blood pressure, should be continued regularly as maintenance therapy. This should be repeated and the patient advised not to change medications or "take a rest from pills".

ADHERENCE AND EDUCATION

Successful management depends upon the cooperation between patients, health care providers, family members and other key stakeholders and supportive environments. To help ensure this, patients need to be informed about their medical conditions and the aim and purposes of anti-hypertensive therapy and availability of social support systems.

The commonality of many risk factors for Hypertension and Diabetes justifies and integrated approach to the prevention, reduction and management of both.

Thus, the reason for a single component on Health Promotion: education and advocacy, outlining the strategies for accomplishing a successful national programme of public education, screening, patient and family education and advocacy to reach those at greatest socio-economic risk (such as poverty) and to emphasize healthy lifestyles. Special clinics and workshops are needed for hypertensives and diabetics to educate persons on the necessity of drugs, nutrition, physical activity, and lifestyle changes.

GUIDELINES FOR REFERRAL

Indications for referral to a higher level of care include:

- Clinical suspicion of secondary hypertension
- All complicated hypertensives
- Patients with severe retinopathy (hemorrhage and papilledema) (emergency malignant hypertension)
- Failure to respond to treatment (resistant hypertension) or large postural drop of BP not obviously dye to a specific drug
- Raised serum creatinine or low plasma potassium (absence of a diuretic)
- Hematuria, proteinuria, or cells in urine
- Suspicion of white coat hypertension

Follow-up Visits:

- Have you changed your diet or exercise since your last visit?
- What problems did you encounter?
- Do you feel confident you can maintain the changes?
- What other changes do you still need to make to improve your health?
- How can I help with these changes?
- What one behavior could you change that would result in the most significant change in your health?
- What one or two behaviors would you be unlikely to change now?

1.5 ROLES AND RESPONSIBILITIES OFHEALTH CARE PROFESSIONALS IN MANAGING HYPERTENSION

The process of screening, diagnosing, treating, and monitoring hypertension on an ongoing basis represents a substantial workload for all members of the health care team, across both Primary and Secondary Care in Dominica. Effective and efficient provision of care for persons suffering or at risk for the disease requires clear identification of the roles and responsibilities of all health care professionals. This section aims to summarize these roles and responsibilities with the ultimate goal of working collaboratively to improve care across various professions to improve hypertension management in Dominica.

Table 11. Summary of Roles and Responsibilities of Health Care Professionals in the Diagnosis, Management, and Prevention of Hypertension

Health Care Professional	Roles and Responsibilities
A) District Nurse	1. To measure the blood pressure of all patients 18 years or over presenting to the clinic for any service. 2. To obtain routine weights and urinalysis of all hypertensives at least every three months 3. To perform monthly blood pressure checks for all hypertensives 4. To ensure that prescriptions are filled monthly and ensure that medications are taken as prescribed. This may involve the actual checking of pill containers. 5. To provide individual, family and group counseling/education 6. To provide community education with emphasis on prevention. 7. Refer clients to appropriate levels. 8. Ensure follow-up of defaulters. 9. Follow-up shut-ins within one to three months.
B) Family Nurse Practitioner	1. To see referred clients/patients: for assessment, education, counseling, record keeping, referrals and stabilization 2. To see clients/patients discharged from the hospital for follow-up care and maintenance therapy 3. To see hypertensive patients at least three monthly intervals: (a) for assessment of blood pressure control and Body Mass Index (BMI); (b) check for compliance; (c) detect complications; (d) counsel on diet 4. Follow up lab investigations 5. Follow-up shut-ins every six months
C) Community Health Nurse (CHN)	1. To supervise the management of all patients 2. To assist with the coordination of patient education

	programme 3. To provide supervision and support in the use of the management protocol 4. To make appropriate referrals
D) Community Health Aides (CHA)	1. Visit clinic defaulters according to schedule 2. Visit shut-ins every month 3. Report findings from visits to district nurse every day 4. Provide education/ counseling including nutritional information for individuals and families. 5. Refer patients to district nurse. Provide other information based on individual need
E) District Medical Officer	1. To see all new, noncompliant and uncontrolled clients 2. To see patients who develop complication i.e: Cardiac failure Renal failure Stroke Angina Heart attacks 3. Refer to Medical Out-patient Department (MOPD) Clinic and refer to other specialist clinics as needed 4. To see clients/patients requiring further investigation 5. To see hypertensive patients at least at three monthly intervals for assessment of blood pressure, control check for compliance and detect complications 6. Visit shut-ins at least bi-annually
E) Medical Out-Patient Department (MOPD) / Pediatric Out-Patient Department (POPD) / High Risk Clinic PMH	**REFERRAL NORMS** 1. All new hypertensive clients/ patients should have one annual visit 2. All patients whose BP is difficult to control 3. Patients with suspected underlying causes for their hypertension 4. Patients with papilledema, exudates and hemorrhages on funduscopy 5. Patients with worsening of their clinical state and progression of their complications e.g elevated serum creatinine, proteinuria 6. All pregnant women with hypertension should be referred to high risk antenatal clinic
F) For Admission to PMH as Emergency	1. Patients with encephalopathy (drowsy, fainting) and associated severe hypertension with papilledema 2. Patients who develop an acute Myocardial Infarction (severe chest pains and other signs and symptoms) 3. Patients who develop Transient Ischemic Attack 4. Patients with persistently elevated blood pressure despite

	treatment. 5. Patients referred to hospital, should return to the FNP/DMO for follow-up as soon as adequate control is established or investigation is completed. Even if hospital follow-up continues, the PHC service book and referral forms should be sent to the FNP/DMO 6. All patients attending M.O.P.D/High Risk Antenatal Clinic should be advised to check with the district nurse monthly.
G) Dietician / Nutritionist	1. While drug therapy is effective, diet and lifestyles choices are essential to hypertensive management and control. Dietary modification is key for hypertensive clients. An initial nutritional assessment should be done for all hypertensive clients and this should be documented. Thereafter they should be followed to ensure that improvements and modifications have been made. The initial assessment will show: • if the diet is balanced • it should also include a biochemical analysis which will show any abnormal findings which may impact on proper nutritional diet management • plan an appropriate nutritional diet plan for the client • counsel the client regarding adherence to dietary changes • answer any questions that are raised by the client • anthropometric measurements (weight, height and waist circumference) • screening for blood lipid profile • screening for other illnesses such as diabetes, renal disease, anemia etc. • See Appendix J for Nutritional Assessment Form 2. Goal setting by collaborating with client to set new targets for behavior change and diet modification 3. Every hypertensive client should be counseled at least once a year by a diet technologist, nutritionist or dietician 4. Diet plan for pre-hypertensive and hypertensive patients should be based on economic situation, cultural beliefs, and lifestyle practices.
H) Health Educator	1. Responsible for providing hypertension education that addresses the medical and emotional needs of the individual patient and family members. Education will enable persons to take responsible actions as it relates to their behavior and as a result participate more effectively in their treatment and in prevention of complications. 2. Hypertension education is a continuous process. It should begin with the essential elements of self-care and include

	instructions to the clients and their family members on following the prescribed medical and diet regimen. Over time hypertension education should define and address the ongoing needs of prehypertensive and hypertensive clients and family members. 3. Health educator should emphasize the role of self-management. The purpose of patient education within the empowerment philosophy is to help patients make decisions about their care and obtain clarity about their goals, values, and motivations. Clients need to learn about hypertension and how to safely care for it on a daily basis. They also need information about various treatment options, the benefits and costs of each of these strategies, how to make changes in their behaviors, and how to solve problems. In addition, clients need to understand their role as a decision-maker and how to assume responsibility for their care. 4. The health educator employs various strategies to ensure that the client is well informed and has support for desired behavior 5. Works collaboratively with other health professional in providing education for patients based on needs 6. Provides individual/ group counseling to hypertensive patients.
I) Pharmacist	1. Counsel clients on correct drug therapy 2. Encourages compliance to management regimes, that is lifestyle modifications and drug therapy 3. Dispenses drugs and medical supplies 4. Refers clients to appropriate level
J) Ophthalmologist	1. Refer patients with hypertensive retinopathy who are not known hypertensive to General Practitioner for further investigations and management. 2.Provide consultation for hypertensive patients with visual symptoms

1.6 MANAGEMENT OF HYPERTENSION IN SPECIAL SITUATIONS

There are several situations in which special care is required for the effective management of hypertensive patients. These include hypertensive emergencies, elderly patients, diabetic patients, and patients with cardiac and renal failure, patients with myocardial infarction, patients with angina, pregnant patients, pregnancy-induced hypertension, and patients with osteoarthritis. Recommendations for providing care in these special situations are discussed in the sections that follow (adapted from CHRC & PAHO, 2007).

HYPERTENSIVE EMERGENCIES IN ADULTS

A hypertensive emergency is severe hypertension (high blood pressure) with acute impairment of an organ system (especially the central nervous system, cardiovascular system and/or the renal system) with the possibility of irreversible organ-damage. In case of a hypertensive emergency, blood pressure must be lowered quickly. The following procedures should be followed for treatment of hypertensive emergencies:

1. Treatment of blood pressures (diastolic) over 140mmHg
   For the control of the blood pressure before transfer to hospital, give hydralazine 10-20 IV.N.B: Do not give if patient is having signs of stroke as this may compromise cerebral perfusion and worsen the stroke.
2. Treatment for fits (convulsions) in hypertensives
   For convulsions administer 5-15mg diazepam IV.
3. Treatment for acute left ventricular failure caused by hypertension
   For acute LVF give frusemide 40-80mg IV.

THE ELDERLY

The elderly population is widely defined as those persons who are ≥65 years old. The treatment of hypertension in the elderly, up to age 80 years, confers substantial health benefits. Family members or caregivers should be involved in the management of the elderly hypertensive person. Some of the features and special problems that may apply to this age group include:

- Presence of other diseases (e.g. osteoarthritis, glaucoma, diabetes, heart disease)
- Patients are often on drug therapy for other disorders, leading to drug interactions and aggravation of hypertension e.g. by NSAIDs.
- Adherence with therapy may be poor if they are not properly instructed, cannot read

the labels or have poor memory.
- They are more susceptible to adverse drug reactions.
- They may be prone to postural hypotension. Therefore the BP of the elderly should be taken lying, sitting and then standing to check for postural effects.

Non-Drug Treatment:

- This is the same as for any other patient except that the level of physical activity is dictated by the patient's condition along with the social and physical environment. In general, advise moderate aerobic exercise for at least 20 minutes per day, preferably every day to establish a routine (see Appendix D – Guide to Physical Activity Levels)
- Restrict alcohol as even small amounts may increase postural hypotension.
- Restrict cigarette and tobacco smoking.
- Refer for nutritional assessment, in-depth counseling and support. This should be done in consultation with the patient's family members and/or caregivers. Particular attention must be paid todecreasing dietary sodium and cholesterol levels.Advise use of high-potassium foods such as bananas, oranges, tomatoes, coconut water at least once daily unless renal impairment is present (creatinine should be monitored).
- Refer to other health professionals as necessary.

Drug Therapy:

The choice of drug treatment should be individualized, but note:

- High incidence of arrhythmias, cardiac failure, cerebro-vascular disease
- High rates of impaired renal function (often associated with reduced clearance of drugs and potassium)
- Methyldopa is associated with increased risk of postural hypotension, which may be worse in the elderly.

Recommendations for Drug Therapy:

Patients without arrhythmias:

- Start drug therapy with low dose of thiazide e.g. Bendrofluazide 1.25 or 2.5 mg/day. If response is poor, add:
    - ACE Inhibitors

Patients with arrhythmias:(atrial fibrillation, other supra-ventricular arrhythmias, or ischemic heart disease)

- Stabilize the patient

- Refer for treatment as necessary (i.e. Consultant physician)
- Use a beta-blocker, preferably one given once daily (e.g. atenolol 25-50mg) or long acting calcium antagonist (e.g. verapamil, sustained release)

THE PATIENT WITH DIABETES

In the Caribbean, diabetes is present in about one-third of hypertensives. This frequent co-existence is related to:

- High rates of obesity and physical inactivity.
- Shared risk factors.

There are also high rates of chronic renal disease among hypertensive diabetic patients.

Management of the Hypertensive Diabetic Patient

Blood pressure: The target blood pressure should be lower than in the non-diabetic i.e. less than 130/80 mmHg.

Non-drug treatment:

Lifestyle modification is of paramount importance in the management of the hypertensive patient with diabetes. Efforts should be targeted at proper nutrition, **increased routine physical activity** (see Appendix D for a Guide to Physical Activity Levels), and the avoidance of tobacco and use of alcohol (see Section 2.4 Control of Blood Glucose, Blood Pressure and Blood Lipids).

Drug treatment:

- Most hypertensive diabetics will need 2 or more drugs for control, in addition to lifestyle change.
- Thiazide therapy rarely affects glycemic control **at low doses** and can be used without concern in the majority of diabetics.
- Beta-blockers may mask symptoms of hypoglycemia and may also compromise peripheral circulation.
- Postural hypotension may be very troublesome in diabetics with autonomic neuropathy.

Recommendations

- Use thiazide **at low dose**, e.g. Bendrofluazide 2.5 mg/day plus adequate dietary intake of potassium. Potassium supplements or potassium sparing/thiazide combinations are rarely needed.
- If control is inadequate add: ACE inhibitor, especially if protienurea present, Calcium

Channel Blockers (e.g. Amlodipine), Beta Blockers.

- Beta-blockers are somewhat contraindicated but water-soluble forms (e.g. atenolol, 50 mg once daily) may be used if there is no peripheral vascular disease.
- If control is **still** unsatisfactory on two drugs, use triple therapy such as thiazide plus beta blocker, plus ACE inhibitor, if proteinuria is present.
- Long acting calcium channel blockers (CCB) e.g. Amlodipine or verapamil, are useful especially if ischemic heart disease is present. Avoid short acting Nifedipine.
- ACE inhibitors are rarely effective on their own in black patients, are ineffective in older black patients and should always be added to thiazide. They may delay proteinuria, and with thiazide help control potassium balance, and should be used in patients with insulin dependent diabetes or diabetic nephropathy, or co-existent heart failure. Avoid if creatinine is 260 mmol/l or greater. ACE inhibitors (usually with a diuretic) are more effective and may be less expensive than most CCBs. In Type 2 diabetes, ARBs can replace ACE inhibitors, if not effective or if the ACE inhibitor causes cough.

THE PATIENT WITH CARDIAC FAILURE

- Start with a diuretic and low dose ACE inhibitor (e.g. generic Captopril 12.5 -50 mg twice daily or Enalapril 20 mg once or twice daily).
- Review drug therapy being taken for other diseases
- Furosemide may be needed as a diuretic. This drug is NOT a more potent antihypertensive but will be needed if there is fluid overload.
- Low dose cardio-selective beta blockers may be useful, e.g. Metoprolol 25 – 50 mg or Carvedilol. But use with caution.

THE PATIENT WITH RENAL FAILURE

- Substitute furosemide for thiazide and refer.
- After referral, ensure patient receives alpha calcidol (0.25mg daily) and calcium carbonate (dose varies – 500mg – 1g bd)
- Erythropoietin 4000IU IV/SC weekly; Regular Hb and electrolyte checks;
- Refer for nutritional assessment, development of nutritional care plan, counseling and follow-up.
- Use potassium and ACE inhibitors with caution.

THE PATIENT WITH MYOCARDIAL INFARCTION

- Both beta blockers and ACE inhibitors improve outcome and are the drugs of choice.
- A diuretic may be added if needed.

THE PATIENT WITH ANGINA

- Beta blockers and long acting, generic calcium antagonists are the drugs of choice
- Include ECG checks to investigate whether it is a stable or unstable angina.
- If unstable angina, refer to appropriate consultant.

THE PREGNANT PATIENT

- The treatment of the pregnant woman who has been under treatment for hypertension must be modified.
- Use methyldopa as the first choice and if necessary, hydralazine (with beta blocker, or tachycardia results and blood pressure goes back up!)
- Beta blockers including Metoprolol are safe in late pregnancy.
- **Diuretics, ACE inhibitors and ARBs are contraindicated.**

PREGNANCY-INDUCED HYPERTENSION

Pregnancy induced hypertension (PIH) is a condition of high blood pressure during pregnancy (>140/90 mmHg). The patient's blood pressure increases, they retain water, and protein is often found in the urine. PIH is also called toxemia or preeclampsia. The exact cause of PIH is not known.

The following factors may increase the risk of developing PIH:

- A first time mother
- Women whose mothers and sisters had PIH
- Women carrying multiple babies, teenage mothers, and women older than age 40
- Women who had high blood pressure or kidney disease before the pregnancy

Treatment of PIH generally involves an obstetrics/gynecology specialist. Treatment generally involves bed rest and treatment with methyldopa, Nefedipine.

THE PATIENT WITH OSTEOARTHRITIS

- Avoid NSAIDs.
- Use Paracetamol as the first line drug – always to be taken BETWEEN meals to achieve effective blood levels.

CASE FINDING

After ensuring that there are adequate supplies of drug, equipment and personnel, case finding programmes should be undertaken to ensure that all hypertensives in Dominica are receiving medical attention. Possible strategies include:

1. Routine checking of BP at every contact of an adult over 25 with the health service.
2. Health education in schools by the DMOs or FNP and Health Education Promotion Unit.
3. Holding a national/district “pressure week” or “pressure month” annually

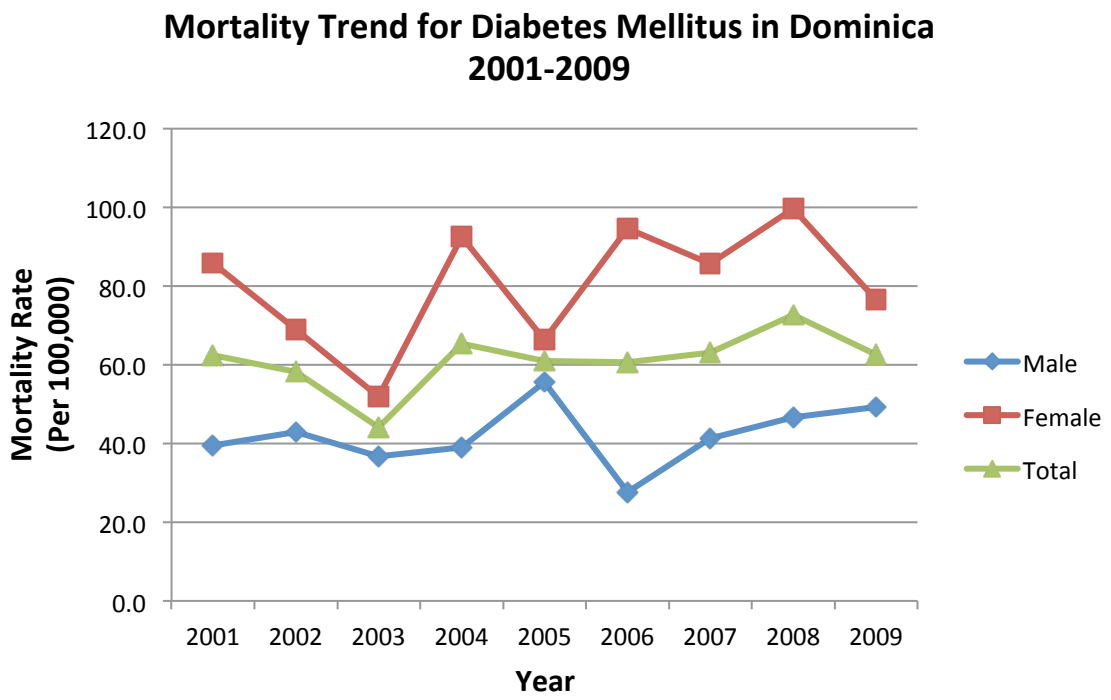
SECTION 2: MANAGING DIABETES IN DOMINICA

2.1 INTRODUCTION AND OVERVIEW OF DIABETES MELLITUS

In 2002, the World Health Organization (WHO) estimated the worldwide prevalence of diabetes in adults was around 173 million (Caribbean Health Research Council and the Pan American Health Organization Guide to Managing Diabetes in Primary Care in the Caribbean, , 2006). By 2030, there will be at least 350 million cases of Type 2 Diabetes, with about two thirds of cases originating in developing countries (CHRC &PAHO, 2006). In the Americas region, the prevalence of Type 2 Diabetes has been increasing and about 1 in 10 of the adult population of the region is affected, increasing to over 1 in 5 persons over 40 years of age. Diabetes is a leading health problem in the Caribbean, contributing significantly to morbidity and mortality and negatively impacting quality and length of life.

Much like the rest of the Caribbean, the prevalence of Type 2 Diabetes is on the rise in Dominica and the nation bears a heavy burden of the social and economic consequences of the disease. Analysis of mortality in Dominica (based on certificates of death) for the period 2005-2009,revealed that diabetes ranked third as the most common cause of death in the total population for both sexes and all age groups[i]. Figure 2 below illustrates the mortality trend for diabetes mellitus in Dominica for 2001-2009 (Health Information Unit, 2010).

Figure 2. Mortality Trend for Diabetes Mellitus in Dominica 2001-2009



Higher prevalence of Diabetes Mellitus in women may be related to higher levels of obesity. There is evidence to suggest that the prevalence of Type 2 Diabetes Mellitus is increasing among children and adolescents, which is again likely due to an increasing prevalence of obesity in these groups (CHRC &PAHO, 2006).

Diabetes disproportionately affects persons of lower socioeconomic status who carry a greater disease burden for many reasons including:

- Limited access to or utilization of health care
- Poor nutrition
- Sub-optimal levels of physical activity

In Caribbean populations, Diabetes Mellitus often co-exists with obesity, hypertension and dyslipidemia. The presence of one of these conditions should therefore cue health care providers to increased likelihood of the others. This manual attempts to provide a pragmatic approach to the diagnosis as well as the management of diabetes within the health care system in Dominica. The focus of the manual is on Type 2 Diabetes, which affects more than 95% of persons with Diabetes. The importance of non-drug and lifestyle management and the need to educate patients, families, communities, and health care workers is stressed.

The goal of this manual is to provide diabetes management guidelines based on current knowledge and best practice. We hope that these guidelines will be used systematically to improve care and outcomes for persons with diabetes in Dominica.

OVERVIEW OF DIABETES MELLITUS

Diabetes Mellitus is defined by the WHO as a metabolic disorder characterized by chronic hyperglycemia with disturbances of carbohydrate, fat, and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The hallmark of the disease is high blood glucose (hyperglycemia). As the diseases progresses it affects the small and large blood vessels and leads to many complications including blindness, amputations, renal failure and heart disease.

Symptoms of marked hyperglycemia include (CHRC & PAHO, 2006):

- Polyuria
- Polydipsia
- Weight loss which may sometimes be associated with polyphagia
- Blurred vision

DIABETES CLASSIFICATION

There are several types of diabetes mellitus, which can be classified as follows:

Type 1 Diabetes is seen predominantly in young persons, usually below the age of 30years. These people are unable to produce insulin in their pancreas and so they may come to the doctor with signs and symptoms of diabetic ketoacidosis. Insulin is needed for patient survival and thus, the old name of insulin dependent diabetes mellitus (IDDM) was used. This type of diabetes was also known as juvenile diabetes because it was the type of diabetes seen commonly in young people. However, with an increase in obesity in young people, 'adult type' diabetes is becoming more prevalent in this population group and so the label is not accurate.

Type 2 Diabetes was previously known as "adult onset diabetes" because it was predominantly seen in older overweight patients with a sedentary lifestyle. This type of diabetes is also seen in young persons who are overweight. These persons can produce insulin, but the insulin is ineffective as a result of insulin resistance. This is the most common type of diabetes in the Caribbean.

Gestational Diabetes is seen in the latter part of pregnancy. These women began pregnancy without diabetes and many revert back to normal after the pregnancy. Their insulin does not work well during pregnancy because other hormones antagonize the insulin. They have an underlying insulin resistance and are at risk for developing diabetes later on.

Other types of diabetes may occur. Some persons may develop diabetes because of specific medications they are taking (e.g. steroids). Some patients with other endocrine disorders may also develop diabetes.

Types 1 and 2 are the main forms of diabetes and a summary of their usual presentation is found in Table 11.

Table 12. Presentation of Types 1 and 2 Diabetes Mellitus

Features	Type 1 (Formerly insulin-dependent diabetes – IDDM)	Type 2 (Formerly non-insulin-dependent diabetes – NIDDM)
Occurrence	Accounts for about 5% of all cases of diabetes	Accounts for about 95% of all cases of diabetes
Pathogenesis	Auto-immune pancreatic beta cell destruction	Relative insulin deficiency and insulin resistance
Age of onset	Usually before age 30 years	45 years and above (but diagnosis at an earlier age appears to be increasing)
Onset	Abrupt	Gradual
Insulin	Insulin therapy required for	May initially be managed by lifestyle

requirement	survival	changes and oral glucose lowering agents, but eventually may require insulin for control
Ketosis	Ketosis prone	Ketosis resistant except with severe stress
Family history	Minor	Marked

2.2 SCREENING AND DIAGNOSIS OF DIABETES MELLITUS

Globally, at least 50% of persons with diabetes do not know that they have the condition. In developing countries, the proportion of persons with undiagnosed diabetes is known to be considerably higher. Consequent to a prolonged period of uncontrolled disease, by the time of diagnosis, most persons with Type 2 Diabetes have already developed one or more micro- or macro-vascular complication (CHRC & PAHO, 2006). It is therefore of critical importance to screen all persons at risk for diabetes to facilitate early diagnosis and treatment and so delay or prevent complications.

RISK FACTORS FOR TYPE 2 DIABETES MELLITUS

- Overweight (Body Mass Index ≥25Kg/M$^{2)}$
- Age 45 years and older
- Physical inactivity
- Diabetes in a first degree relative
- Prior gestational diabetes or history of delivering a baby >4kg (9lb)
- Polycystic ovary syndrome
- History of Impaired Glucose Tolerance (IGT) or Impaired Fasting Glucose (IFG)
- HDL-C level ≤ 35mg/dl (≤0.90 mmol/L) and/or Triglyceride level ≥250mg/dL (≥2.82 mmol/L)
- Race/ethnicity (e.g. persons of Asian and African descent)
- Presence of coronary artery disease and/or hypertension (blood pressure ≥140/90 mmHg)
- Presence of other vascular complications
- History of vascular disease (e.g. myocardial infarction, stroke, peripheral vascular disease with or without ulceration or topical changes in the foot etc.)
- Signs of insulin resistance e.g. acanthosis nigricans (darkened, thickened, velvety skin at the nape/back of the neck or axilla)

SYMPTOMS AND SIGNS OF DIABETES

When an individual is first diagnosed with diabetes he/she may present with symptoms and signs. All patients may present with the classical symptoms of:

- Polyuria: passing large volumes of dilute urine. Individuals may even wet their beds at night.
- Polydipsia: excessive thirst and constantly drinking large volumes of water in response to the large volumes of urine being lost).
- Polyphagia: tendency to eat more but experience weight loss despite their increased appetite.

In addition to the above symptoms, Type 1 diabetic patients may present with symptoms of acute insulin deficiency (Diabetic Ketoacidosis) such as vomiting, abdominal pain, severe dehydration, rapid, deep breathing and smell of ketones. In severe cases they may have altered consciousness. Pediatric patients who present with these symptoms should have serum blood glucose levels done (FBS and 2hpp).

Classical Symptoms of Diabetes:

Patients with diabetes tend to present with one or more of the following classical signs and symptoms:

- Polydipsia (excess thirst)
- Tiredness
- Pruritus vulvae or balanitis
- Polyphagia (excess eating)
- Polyuria (excess urine)
- Wasting

SCREENING FOR TYPE 2 DIABETES MELLITUS

Screening involves the testing of individuals who are at risk of having the disease. As population-based screening is expensive, priority for screening should be given to persons with identifiable risk factors. Reasons for screening include:

- Rising prevalence in Dominica
- Dominican population is, by definition, high-risk
- There is a long, latent, asymptomatic period in which the condition can be detected
- At the time of diagnosis, many individuals already have evidence of the micro-vascular complications of diabetes and may also have macro-vascular disease
- There is evidence that early treatment improves long-term outcome

The Screening Test

Fasting Plasma Glucose (FPG) is the recommended screening test. The 75gm Oral Glucose Tolerance Test (OGTT) is more sensitive for detecting glucose intolerance but is not recommended for screening as it is more expensive and less practical. Testing of glucose in urine and blood glucose testing by glucometers may play a role in initial screening but cannot be used for diagnosis. Any abnormal results must be confirmed by measurement of plasma glucose.

Oral Glucose Tolerance Test: The gold standard test for diagnosing diabetes is an oral glucose tolerance test (OGTT). To administer the test, the client must arrive at the clinic after fasting for 8 to 12 hours. Upon arrival, they are given a 75 gm glucose drink. Blood glucose is checked before and 2 hours after the drink. If the blood glucose levels are in the diabetic range (see Table 1.) then the diagnosis is made. This is a very cumbersome and expensive way to make the diagnosis. The World Health Organization has advised that this is not necessary except during pregnancy.

Fasting Blood Glucose Testing: The most efficient and informative method is the Random Blood Glucose. This test measures blood glucose after a patient has not eaten for at least 8 hours. It is often the first test done to check for pre-diabetes.

An individual may come to clinic or hospital with symptoms of diabetes. If the individual is symptomatic then one blood glucose level *> 200mg/dl* is sufficient to make the diagnosis.

If the individual is asymptomatic but is at high risk of having diabetes and may not return for follow-up it may be prudent to have the random blood glucose check. ***Two random blood glucose*** checks greater than 200mg/dl may be used to diagnose diabetes. If test results are normal but the client is 45 years or older (particularly if the client has additional risk factors), re-screening would be appropriate at 3 times a year. If the person is overweight and has additional risk factors such as a positive family history of comorbid disorders, re-screening should be done more frequently.

DIAGNOSTIC CRITERIA AND CLASSIFICATION OF DIABETES MELLITUS

The diagnosis of diabetes must be based on laboratory venous blood test results. Glycosuria and finger-prick glucose measurements using a glucometer should not be used for the diagnosis of diabetes. The HbA1c test is not recommended for diagnostic procedures. It is recommended that the diagnosis of diabetes be made using the criteria of the American Diabetes Association (Table 13).

Table 13. Criteria for the Diagnosis of Diabetes Mellitus

1. Symptoms of diabetes plus casual plasma glucose concentration ≥200mg/dL (≥11.1 mmol/L). Casual is defined as any time of day without regard to time since the last meal.
OR
2. FPG ≥126mg/dL (≥7.0 mmol/L). Fasting is defined as no caloric intake for at least 8 hours.
OR
3. 2-h post-load glucose ≥200 mg/dL (≥11.1 mmol/L) during an OGTT. The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75g anhydrous glucose dissolved in water.

In the absence of unequivocal hyperglycemia, these criteria should be confirmed by repeat testing on a different day. The third measure (OGTT) is not recommended for routine clinical use.

Table 14. Diagnostic Level for Blood Glucose (WHO Criteria, 2006)

Blood Test	Normal	Diabetes	Impaired Glucose Tolerance
Fasting Blood Glucose level	<100 mg/dl	>= 126 mg/dl	100 – 125 mg/dl
2hr postprandial (75 gm) glucose load	<140 mg/dl	>= 200 mg/dl	140-199 mg/dl

See Appendix C for values for diagnosing diabetes mellitus and other categories of hyperglycemia. The World Health Organization (WHO) has set out these criteria as a guide for the diagnosis of diabetes internationally. However, when using these guidelines, health professionals should note:

- If a random glucose value is l80mg /dl repeat every six months
- When attempting to confirm the possibility of diabetes it may be useful not to tell the patient that you suspect diabetes so that he/she may not modify the diet and thus alter the result.
- More precise diagnosis is based upon a sample 2 hours after a 75 gm oral glucose load in 250-350 mls of water performed in the morning. A full oral glucose tolerance test (OGTT) is not practical or necessary except in pregnancy.
- The identification of patients with an impaired glucose tolerance test is important for two main reasons:
    1. 2-4 % of these persons developed frank diabetes ***annually*** and;
    2. They are at an increased risk of developing atheroma (macro-vascular disease).

DIAGNOSTIC CRITERIA FOR IMPAIRED FASTING GLUCOSE AND IMPAIRED GLUCOSE TOLERANCE

If the Fasting Plasma Glucose (FPG) ranges from 100–125 mg/dL (5.6-6.9 mmol/L) or the blood sugar 2 hours after a 75 gm glucose load is between 140-199 mg/dL (7.8-11.1 mmol/L), an individual is considered to have impaired fasting glucose (IFG) or impaired glucose tolerance (IGT) respectively, and is classified as 'pre-diabetes'. Such persons are at high risk of developing diabetes and cardiovascular disease. Indeed impaired fasting glucose and impaired glucose tolerance frequently co-exist with other cardiovascular risk factors giving rise to the Metabolic Syndrome (CHRC & PAHO, 2006).

Table 15. Criteria for the Diagnosis of Impaired Fasting Glucose and Impaired Glucose Tolerance

	Fasting Plasma Glucose		2h Plasma Glucose
Normal	≤100 mg/dL (≤5.6 mmol/L)	**and**	<140 mg/dL (<7.8 mmol/L)
Impaired Fasting Glucose (IFG)	100–125 mg/dL (5.6-6.9 mmol/L)		
Impaired Glucose Tolerance (IGT)			140–199 mg/dL (7.8-11.1 mmol/L)

Source: PAHO Guideline for the Management of Diabetes in Primary Care, 2006.

THE METABOLIC SYNDROME

The Metabolic Syndrome is characterized by the co-occurrence of obesity (especially central obesity), dyslipidemia (especially high levels of triglycerides and low levels of high density lipoprotein cholesterol), hyperglycemia and hypertension(CHRC & PAHO, 2006). The diagnosis of metabolic syndrome is made if an individual has three of the characteristics shown in Table 16. There is a large overlap between Metabolic Syndrome and pre-diabetes. Persons with the metabolic syndrome are at increased risk of developing diabetes.

Table 16. Criteria for Identification of the Metabolic Syndrome

	Feature	Criterion
1	Abdominal obesity (waist circumference)	Men: >102cm (40 in) Women: > 88cm (35 in)
2	Fasting Plasma Lipids: • Triglycerides • HDL Cholesterol	 ≥150mg/dL (≥1.69mmol/L) Men: <40mg/dL (<1.03 mmol/L) Women: <50mg/dL (<1.29 mmol/L)
3	Blood pressure	≥ 130/85 mmHg
4	Fasting blood glucose	≥ 110mg/dl

Source: PAHO Guideline for the Management of Diabetes in Primary Care, 2006.

2.3EFFECTIVE DELIVERY OF CARE

The effective management of diabetic patients depends on the functioning of a multidisciplinary team, access to specialist care, appropriate facilities, necessary equipment and supplies, as well as a well-functioning information system that includes a mechanism for client recall.

PATIENT VISITS

The person with diabetes should have regular contact with the health system. Table 17 summarizes the assessment requirements for the initial visit with a diabetic patient.

Table 17. Summary of activities included in the initial assessment of a diabetic patient.

1. Physical measures	• Weight and height to determine BMI (see Appendix A) • Waist circumference • Blood pressure • Pulse
2. Presence of symptoms	• Weight loss • Polydipsia • Polyuria • Pruritus vulvae • Balanitis • Skin for evidence of infections, ischemia, ulcers and state of insulin injection sites • Eyes for evidence of diabetic retinopathy,glaucoma • Blurring of vision (refractive changes) • Mouth for gingivitis, periodontitis • Heart for cardiomegaly and murmurs • Abdomen for hepatomegaly • Feet for evidence of peripheral artery disease and neuropathy: o Appearance (color, evidence of atrophy, nails, ulcers) o Sensation, reflexes, vibration o Pulses – dorsalis pedis, posterior tibial • Generalized weakness • Neurological system for evidence of cranial and peripheral neuropathy
3. Presence of associated causative factors	• Alcohol • Obesity • Family history • An obstetric history from female clients • Drug history (oral contraceptive pill, steroids, diuretics,

	chemotherapy) • Lipodystrophy • Rare endocrine disorders (Cushings, Thyrotoxicosis, Acromegaly, Pheochromocytoma,) • Liver disease, pancreatic disease etc.
4. Appropriate referrals	• Dental, Ophthalmologist, Nutritionist/Dietician, Counseling

Table 18 summarizes the laboratory tests should be conducted (CHRC & PAHO, 2006) at the initial visit with the diabetic patient. Note that for Type 1 Diabetics, other auto-immune conditions may be associated. For these patients, it may be necessary to conduct a thyroid function test or screening for celiac disease, especially if the patient has poor growth or gastrointestinal symptoms.

Table 18. Summary of laboratory tests for initial visit with diabetic patient.

Area	Tests
Blood	• Hemoglobin/CBC • Fasting Plasma Glucose • HbA1c • Fasting lipid profile – low density lipoprotein cholesterol, high density lipoprotein cholesterol, triglycerides (once initial high blood glucose levels has settled) • Serum creatinine If clinically indicated: • Thyroid function tests • Liver function tests
Urine	• Ketones • Protein and/or microalbumin • Urine C/S
Other tests	• Electrocardiogram • Echocardiogram • Doppler • Funduscopy

Source: PAHO Guideline for Managing Diabetes in Primary Care in the Caribbean (2006).

THE PHYSICAL EXAMINATION

A physical examination is done in order to identify the presence of signs or complications of diabetes. Table 19 summarizes signs and complications of diabetes to be aware of during the physical examination of the diabetic patient.

Table 19. Signs and Complications of Diabetes.

Location	Signs
Oral cavity	• Gingivitis • Dental Abscess • Periodontitis • Dental cavities
Skin	• Candidiasis • Impetigo • Balanitis • Vulvitis • Dermatophytosis • Tinea corporis (Ringworm) • Tinea pedis (Athlete's foot) • Paronychia (skin infection that occurs around the nails), onychomycosis (fungal nail infection) • Poor capillary filling (>2 seconds refill time) in superior extremities • Necrobiosislipoidica (erythematous plaques with central ulceration and irregular margins on pretibial regions) • Acanthosis nigricans (hyperpigmented velvety plaques on neck, axilla or extensor surfaces) • Granuloma annulare (erythematous plaques on extremities or trunk)
CVS	• Peripheral vascular disease • Loss of foot pulses • Poor capillary filling • Cold feet • Abnormal nails
Nerves	• Peripheral neuropathy (impaired touch, vibration sensation in legs) • Loss of knee/ankle jerks • Leg pain • Leg edema • Autonomic neuropathy • Postural hypotension • Gastroparesis • Nocturnal diarrhea
Kidney	• Proteinuria • Diabetic nephropathy • Chronic Renal Failure

Table 20. Classification of Diabetic Retinopathy

Eye	Signs
Non proliferative diabetic retinopathy(NPDR)	• Microaneurysms(MA) • Dot and blot haemorrhages(H) • Hard exudates(HE)

	• Cotton wool spots(CWS) • Venous beading(VB) • Intraretinal microvascular abnormalities(IRMA)
Diabetic macular oedema(DME)	• Retinal thickening and/or hard exudates in the macular area
Proliferative diabetic retinopathy(PDR)	• Neovascularization (formation of new vessels)optic disc (NVD)and/or the retina(NVE) • Preretinal haemorrhages(PRH) • Vitreous haemorrhage(VH) • Fibrous proliferation(FP) • Tractional retinal detachment(TRD)
Cataract	
Glaucoma	

Annually, each patient should receive a complete medical assessment including neurological and funduscopic examination. Diabetic retinopathy is a micro vascular complication of both Type 1 and Type 2 Diabetes Mellitus. It is the leading cause of blindness in the working age group. It is a biomarker for micro-vascular disease in other target organs. Evidence-based treatment is available to reduce significantly the risks for blindness and moderate vision loss. Prompt treatment for sight threatening diabetic retinopathy should follow established guidelines.

<u>Schedule for First Eye Examination:</u>
Type ll diabetics: At the time of diagnosis
Type l diabetics: Five years after the onset of disease
Pregnant diabetics: Before pregnancy and in the first trimester
Gestational Diabetics: When detected
Children: From age 10

Follow-up eye appointments will be determined by the ophthalmologist based on severity of diabetic retinopathy and glycemic control. All patients with diabetes mellitus should be reminded to have their regular follow-up eye examination either by fundus photography or by the ophthalmologist. .

The ophthalmologist should document in the patients' health-book whether diabetic retinopathy is present, the type and the follow-up appointment. Therefore patients should bring their health-book when going to have their eye examination.

FOLLOW-UP VISITS

The following list outlines activities for all diabetic patients at every DMO/FNP visit. See also Appendix E for the Diabetes Management Flow Sheet.

All Patients – Every Visit in District Clinic:

- Measure weight
- Determine BMI
- Measure Blood Pressure (keep below 120/80 mmHg)
- Blood glucose every visit. Fasting blood glucose would be best but a random with a notation of the time of the last meal is also useful.
- Review self-monitoring of blood glucose results and reinforce its importance
- Elicit information on adherence to treatment
- Ask about symptoms including those of hypoglycemia
- Conduct inspection of feet
- **Counseling on nutrition and physical activity**

Insulin-Treated Patients:

- Inspection of injection sites
- Ask about occurrence of hypoglycemic attacks
- Test urine for ketones, if ill

Every 3-6 Months:

- Measure HbA1c
- Dip-stick urine at least every three months if positive

Annual Review for All Patients:

General:

- Measure weight
- Monitor BMI
- Measure waist circumference
- Measure blood pressure
- Ask about frequency of smoking and alcohol use
- Review diet – especially if overweight or plasma glucose and/or HbA1c are unacceptable
- Ask about mental health (especially depression)

Physical Examination – Pay special attention to:

- Feet
- Eyes
- Mouth
- Consider electrocardiogram for persons > 40 years

Medical Laboratory:

Quarterly:

- Hemoglobin A1C (HbA_{1C}) gives idea of blood glucose control over the preceding three (3) months

Yearly:

- Fasting lipid panel (LDL, HDL, Triglyceride) to assess comorbidity commonly seen in diabetes that is related to the risk of heart disease. The sample should be drawn after at least an 8 hour fast. Patients can drink water and take their morning medication during the fast.
- Creatinine can detect for early signs kidney failure. Creatinine clearance can be calculated from these numbers. (See Appendix C)

2.4 CONTROL OF BLOOD GLUCOSE, BLOOD PRESSURE, AND BLOOD LIPIDS

Diabetic patients play a central role in managing their own disease. Weight management, diet, and physical exercise should be the first line of treatment for Type 2 Diabetes Mellitus and should be maintained throughout the course of the disease. As well as improving glycemic control, these interventions also slow the progression of impaired glucose tolerance to overt diabetes. In order for self-management behaviours to be effective, however, the relationship between the health care team and the patient must be one of collaboration and partnership.

The life of a newly diagnosed Type 1 diabetic depends on regular injections of insulin, a regular pattern of meals, and a suitably adjusted life style. In some patients with Type 2 Diabetes, a weight reducing diet may suffice to correct the metabolic disturbance completely. But some patients may also require oral medication or even insulin at the time of diagnosis. All stabilized diabetics should be seen every three months as a routine part of the management strategy. Annually, each patient should receive a complete medical assessment including neurological and funduscopic examination. Diabetic patients should receive regular foot examinations every three months (see Appendix E for Diabetic Flow Chart). All patients with diabetes should also be referred to the Ophthalmologist as follows:

- Type 1 Diabetes Mellitus: 5 years after diagnosis.
- Type 2 Diabetes Mellitus: At the time of diagnosis, then annually.

Objectives of Management:

1. To preserve the life of the diabetic and relieve symptoms
2. To enable the patient to have as normal a social life as possible
3. Establish and maintain good metabolic control
4. Maintain healthy body weight and blood sugar (see Table 19)
5. Prevent complications such as stroke and nephropathy, retinopathy, neuropathy

Goals of Treatment:

1. To control symptoms and reduce risk of complications in diabetics.
2. To obtain as good a control of diabetes in young adults without compromising healthy development
3. To establish frequent monitoring and control of blood sugar levels in gestational diabetes and pregnant diabetics.
4. Educate patients and relatives

In gestational diabetes and pregnant diabetics, much stricter standards of control are mandatory (blood sugar less than or equal to 140 mg%) which will necessitate specialist obstetrical and medical involvement and hospitalization.

Table 21. Metabolic, blood pressure and nutritional targets for control in diabetes mellitus and associated conditions.

Measurement	Good
Blood glucose: • Preprandial • Postprandial	 90 – 130 mg/dl (5.0 – 7.2 mmol/L) <180mg/dl (<10mmol/L)
HbA1c	<6.5%
Total cholesterol	<200 mg/dl (<5.2 mmol/L)
HDL cholesterol	>40 mg/dl (>1.0 mmol/L)
LDL cholesterol	<70 mg/dl (<1.8mmol/L)
Fasting triglycerides	<150 mg/dl (<1.7 mmol/L)
Blood pressure	≤130/80 mmHg
Body mass index	18.5 – 25 kg/m^2
Waist circumference: • Women • Men	 <80 cm (<32") <94 cm (<37")

Source: Managing Diabetes in Primary Care in the Caribbean (CHRC & PAHO, 2006).

GENERAL GUIDELINES FOR THE MANAGEMENT OF DIABETIC PATIENTS

1. Patient with ***impaired glucose tolerance***
   a) The elimination of other atheroma risk factors are required, including:
      - Weight loss
      - Stop smoking
      - Increase physical activity
      - Reduce refined carbohydrates in diet
      - Low fat diet especially if cholesterol and triglycerides are elevated
   b) 2hr pp blood sugar should be done initially at six (6) months, then annually.

2. ***New patients***

(a) *Asymptomatic*: 2hrpp >200mg%

- Refer to DMO/FNP. Start on diet and increase physical activity. Repeat assessment in 3-4 weeks.
- If failure, after 2-3 months reassess diet, check compliance and consider adding oral hypoglycemic (metformin, glyburide or diamicron)

(b) *Symptomatic*: 2hrpp >200mg%

- Refer to DMO/FNP. Start on diet and physical activity, and add oral hypoglycemic (metformin, glyburide or diamicron)
- Reassess diet and check compliance and adjust medication if necessary in 1-2 weeks

(c) 2hrpp B/sugar 300-500mg%, ketones negative

- Refer to DMO. Start diet, oral hypoglycemic and increase physical activity
- Insulin therapy should be considered in these patients. The insulin can be used to overcome the initial glucose toxicity and most patients can be weaned of insulin in 3-6 months.

(*d) 2hrpp or random Blood sugar > 500mg or Ketones in urine*

- Refer to hospital immediately.

NONPHARMACOLOGICAL MANAGEMENT OF DIABETEIC PATIENTS

Nutritional Management

Nutrition has long been determined as the cornerstone of diabetes management and has remained one of the most challenging aspects of care due to the complexity of nutrition issues. While all nutrients play an important role in diabetes management, moderation in intake is usually the key. Important goals of nutrition therapy are to restore normal blood glucose and lipid levels and blood pressure, prevent complications, develop an individual meal plan, maintain persons within the normal BMI range and in addition promote growth in children (see Appendix A for a BMI Chart).

When planning the diabetic diet, caloric needs, current eating habits, cultural practices, financial status, diabetes management goals and medication schedule must be considered (see Appendix J for Nutritional Assessment Form).Input from the client in developing intervention is extremely important in ensuring that the plan is appropriate to the individual's lifestyle and cultural practices. **Calorie content** and the distribution of carbohydrate, protein and fat in the diet need to be individualized. **Calorie content** should be individually adjusted and should enable the patient to achieve and/or maintain a BMI of 18.5 – 24.9 (see Appendix A for a Body Mass Index Chart). Caloric control and physical activity also improves glycemic control and retards the progression to overt diabetes in persons with impaired glucose tolerance.

For children, the diet should also provide enough calories adequate for growth and development. It must be borne in mind that obesity in children with diabetes increases complications in adulthood.

Illness, physical activity and hypoglycemia may require special modification of the food intake of diabetics. Therefore, appropriate teaching materials for initial and in-depth continuing education should be available to the diet counselor.

Objectives of Nutritional Management for Persons with Diabetes

1. Achieve and maintain near normal blood glucose levels
2. Provide a nutritionally adequate diet:
    - A structured individualized meal plan
    - Regular mealtimes
    - Snacks as necessary to balance peak insulin activity and exercise
    - Tailored to individual requirements
    - Appropriate distribution of calories:
        - Carbohydrates 50-60%
        - Added sugars 10%
        - Protein 15-20%
        - Total fat <30%
        - Saturated fat < 10%
3. Achieve and maintain healthy body weight
4. Prevent and minimize complications
5. Provide appropriate nutrition therapy:
    - Nutrition assessment
    - Goal setting
    - Nutrition intervention
    - Monitoring
    - Evaluation
6. Facilitate normal growth and development in children and adolescents
7. Facilitate a healthy pregnancy outcome for pregnant women who have diabetes
8. Maintain desirable blood lipids

Nutrition therapy for persons with Type 1 Diabetes should include an **individualized meal plan** based on usual food intake interrelated with **exercise** and **insulin regimens.** For persons on conventional insulin therapy, care must be taken to ensure consistency in the timing and amount of food eaten and the time and action of the insulin used. Individuals should be educated to monitor their blood-glucose levels and adjust insulin where necessary.

The aim of nutrition therapy in Type 2 Diabetes is to achieve glucose, lipid and blood sugar control. Many persons with type 2 diabetes are overweight; therefore a weight loss diet usually improves short-term blood glucose control. For long-term control, several strategies in addition to weight loss can be implemented to achieve and maintain near-normal control. Dietary recommendations should be based on a nutritionally adequate diet determined by individual assessment with a reduction in fat, especially saturated fat, and

an increase in physical activity.

Nutritional Recommendations For Type 2 Diabetics

1. Assess diet history, physical activity.
2. Determine appropriate caloric level based on height, weight, age, sex, activity level, height, weight.
3. Distribute calories appropriately:
4. Time meals appropriately, keeping mealtimes constant from day to day.
5. Provide three (3) main meals per day plus snacks as appropriate to balance the peak activity of insulin and exercise
6. Encourage intake of complex (higher fiber) carbohydrate foods such as corn, brown rice, yam, green bananas, cassava and ground provisions.
7. Limit the intake of simple sugars. Approximately 5-10% of total calories may be included as simple sugars.
8. Control intake of salt. Salt intake should be limited to no more than 6 g (1 tsp) per day. In the presence of hypertension, more severe restriction may be necessary.
9. Recommend less fried and high fat foods, cholesterol and saturated fats. Total dietary fat intake should be less than 30% of total calories.

CARBOHYDRATES:

Carbohydrate intake may provide up to 55-60% of total calories. This should be based on the individual's eating patterns, blood glucose, lipid profiles and physical activity level. Unrefined or complex carbohydrates (local ground provisions e.g. sweet potato, green banana, plantain, dasheen, whole grains cereals; legumes, - dried peas and beans, should be substituted for refined foods like- cakes, sweet biscuits, jams, honey etc.). See Appendix G for dietary guidelines and examples.

FIBER:

Dietary fiber plays an important role in the proper management of diabetes. High fiber diets help to lower blood glucose and insulin levels. This action in turn helps to keep the blood sugar near normal.

A high fiber meal slows down the rate of absorption of food, thereby preventing blood glucose from rising too rapidly. Low fiber foods tend to have a high glycemic index. They are absorbed quickly causing blood glucose levels to spike, which causes insulin surges. These surges may cause reactive hypoglycemia, increasing hunger and a desire to eat simple carbohydrates in a vicious cycle (Cho craving). In addition, excessive insulin

enhances the growth and proliferation of arterial smooth muscle cells, promoting atherosclerosis.

Insulin accelerated the conversion of calories to triglycerides which may contribute to hypertriglyceridemia, further weight gain. Insulin may also raise the secretion of lipoprotein lipase increasing the uptake of fat into the cells leading to weight gain. Over time the same people insulin surges may lead to insulin resistance causing diabetes type II. See Appendix G for examples of the amounts of fiber according to foods of various serving sizes.

FATS:

Total fat should be restricted to less than 30% of calories. Cholesterol intake should be less than 240mg (6.2mmol) per day. As always, this recommendation needs to be individualized, since 30% or less fat may not be palatable for all. All efforts must be made to restrict the use of trans-fatty acids to 0.5gm per day.

PROTEIN:

12 -20% of the total calories should come from protein. As a safe guideline the Recommended Dietary Allowance (RDA) of protein for adults is 0.6g/kg and 0.75g/kg for children. Intake may be modified for pregnant and lactating women, children, the elderly and people with certain medical conditions such as renal and hepatic impairments.

VITAMINS AND MINERALS:

An individual with diabetes needs vitamin and mineral supplements ONLY in the following situations:

- Is on a very low calorie diet
- Is pregnant or lactating
- Has unusual circumstances or eating patterns

SODIUM:

Since many adults with diabetes also have High Blood Pressure, it is important to:

- Limit salt intake
- Use alternate seasonings like herbs, lime juice, spices
- Use less salt, salty seasonings and salty snacks

ALTERNATIVE SWEETENERS:

The following alternative sweeteners are acceptable:

- Non-caloric sweeteners (aspartame and saccharin)
- Caloric sweeteners (fructose and sorbitol)

ALCOHOL:

If used, alcohol:

- Should be taken no more than once or twice per week
- Should not be consumed on an empty stomach
- May cause specific problems with hypoglycemia, neuropathy, glycemic control obesity, hyperlipidemia
- Should be avoided in persons who have high serum triglycerides, gastritis, pancreatitis, heart ,liver and kidney disease
- May cause headache, nausea and flushing of face for persons on medication.

For individuals with Type 2 Diabetes, alcohol should be substituted for fat exchanges because alcohol is high in calories (7 calories / gram) and is metabolized like fat. One drink is equal to approximately 112 calories which is equal to 2 1/2 fat substitutes.

Physical Activity

It is important to elicit a complete medical history including present disease status, cardiac history, and family history, as well as a physical examination before recommending an exercise program to the diabetic patient. The history and physical examination should reveal any precautions that must be taken. Contraindications to exercise include (CHRC & PAHO, 2006):

- Uncontrolled hyperglycemia
- BP >200/100 mmHg
- Febrile illness
- Unstable angina
- Acute heart failure

Physical inactivity and overeating leading to obesity are major contributors to the increasing levels of Type 2 Diabetes around the world. Physical activity has many beneficial effects for diabetics and is therefore a key factor in the prevention and management of Type 2 Diabetes. It is therefore of critical importance that health care professionals

involved in the management and care of patients with diabetes routinely assess physical activity levels. It is also important to advise diabetic patients and their family members about the benefits of regular physical activity which include (CHRC & PAHO, 2006):

- Improvement in glycemic control
- Prevention of cardiovascular disease
- Reduction in hypertension
- Reduction in levels of VLDL and increase in HDL cholesterol levels
- Enhancement of weight loss of maintenance of weight
- Improvement in mental health (helps counter anxiety and depression)

Meeting the requirements for physical activity does not require a formal exercise regime. Regular aerobic activity should be sustained for 30-60 minutes at least 5 times weekly. The level and intensity of the activity should be guided by the age and ability of the patient (see Appendix D for a Guide to Physical Activity Levels). Examples of such activities include: brisk walking, dancing, swimming, climbing stairs, aerobics and sporting activities. Physical activity need not involve exhausting activities such as jogging or pumping iron in the gym. **If a block of 30 minutes cannot be found for sustained physical activity, it can be divided into three ten minute sessions.**The following list outlines several helpful tips for patients when they are beginning an exercise program:

- Warm up before and cool down after exercise
- Wear proper footwear
- Monitor feet closely for blisters or any other damage to feet
- If exercising away from home, wear identification
- Ensure adequate intake of fluids
- Eat appropriately and modify insulin as necessary

There is a chance of hypoglycemic reaction of a diabetic with a low blood glucose level who begins to exercise. The diabetic should be advised by their doctor about how to manage their diet before intense physical activity.**Generally, the diabetic will have to eat more food or take less insulin or a combination of the two in order to prevent a hypoglycemic reaction if the activity lasting for longer than an hour.**

Smoking is a risk factor for heart disease. Since cardiovascular risk is increased in these patients, they should be advised to quit smoking or not to begin.

TYPE 1 DIABETES MELLITUS

The effects of the diagnosis of Type 1 Diabetes on the young persons and his or her family are always momentous. The goals for the nutritional management of Type1 Diabetes in

childhood and adolescence must be agreed upon by doctor and family. The physician must take the socio-economic status of the family into account, the appropriate ethnic and cultural traditions and the normal physical activity of the child/ adolescent. The aim therefore should be to:

- Promote a normal growth rate
- Enable and encourage normal physical activity for age
- Maintain acceptable blood glucose levels without frequent episodes of hypoglycemia or hyperglycemia.

PHARMACOLOGICAL MANAGEMENT OF DIABETES MELLITUS

Currently, the main therapeutic options for the treatment of Type 2 Diabetes are (CHRC & PAHO, 2006):

1. **Biguanides** – increase insulin sensitivity, suppress hepatic glucose production, Increase peripheral glucose uptake, reduce absorption of glucose from Gastrointestinal tract.
2. **Thiazolidnediones** – increase insulin sensitivity
3. **Sulfonylureas** – increase insulin resistance
4. **Meglitinides** – increase insulin resistance
5. **Alpha-glucosidase inhibitors** – modify intestinal absorption of carbohydrates
6. **Insulins** – replace insulin

However, it should be noted that at the time of this manual (March, 2011), only numbers 1, 3, and 6 are available in Dominica.

Combinations of these classes of drugs are frequently required for optimal control. Low dose combination therapy could be considered early in the disease as it improves the efficacy of therapy and minimizes side effects.

Therapy with oral glucose lowering agenda should be introduced when the blood sugar is not controlled by diet and exercise after 4-6 weeks. The majority of persons with diabetes, even if initially controlled on non-pharmacological measures, will eventually require drug therapy in increasing dosages and often in multiple dosing regimens. Many subsequently require the addition or substitution of insulin for glycemic control, the so-called "secondary failure". A subset of patients with apparent Type 2 Diabetes may require insulin for control somewhat earlier than expected – "primary failure" of response to oral therapy (CHRC & PAHO, 2006). Table 22 outlines the pharmaceuticals available in Dominica from Central Medical Stores for the management of diabetes mellitus.

Table 22. Pharmaceuticals for the Management of Diabetes Mellitus

Drug Name	Drug Information
GLYBURIDE/GLIBENCLAMIDE (Daonil®) – *first line drug*	• **Dosage:** 1.25-20mg/day • **Contraindications:** Type 1 Diabetes Mellitus, diabetic ketoacidosis, pregnancy, breastfeeding; severe hepatic impairment. • **Precautions:** elderly patients and those with liver or kidney disease require decreased dosage or do not use. • **Side Effects:** Nausea, diarrhea, constipation, hypoglycemia. • **Advantages:** Low cost, effective; less risk of disulfuram (alcohol) reaction; once daily dosing improves patient compliance. • **Disadvantages:** Long duration of action plus active metabolite (especially in cases of renal impairment) and the consequent hazard of hypoglycemia. • **Advice to patients:**Avoid the use of alcohol and keep away from direct sunlight.
METFORMIN (Glucophage®) – *first line drug*	• **Dosage:** 1 – 1.5 gm /day initially, increasing to a maximum of 2.50gm/day, in 2-3 divided doses. • **Contraindications:** Hepatic or renal impairment, pregnancy, breastfeeding. • **Precautions:** In patients predisposed to lactic acidosis (e.g. severe dehydration, infection, shock, heart failure, hepatic impairment, alcohol dependency). • **Side Effects:** Anorexia, nausea, vomiting, diarrhea, abdominal pain, metallic taste; rarely lactic acidosis (to prevent lactic acidosis, the medication should not be used in patients with renal impairment and should be temporarily stopped in patients who are undergoing radiological test that require the infusion of contrast media). • **Advantages:**Do not cause weight gain, lower LDL cholesterol, do not cause hypoglycemia. • **Disadvantages:** Gastrointestinal problems. • **Advice to patients**: take after meals or with meals to decrease gastric distress, may cause metallic taste.
Glicazide (Diamicron) – 80mg tab *Second line drug (not available in Public sector)*	• **Dosage:** Initially 40-80mg up to 160mg once daily with breakfast. Maximum daily dose 320mg in divided dose. • **Contraindications:** Severe hepatic and renal

	impairment, porphyria, pregnancy, lactation. • **Precautions:** Mild to moderate hepatic and renal impairment. • **Side Effects:** Gastrointestinal upset, nausea, hypoglycemia, weight gain, dizziness, constipation. • **Advantages:** Good for elderly diabetics. • **Disadvantages:** weight gain.
Human Insulin(first line drug)	• **Dosage and Administration:** Insulin is administered subcutaneously. Regular insulin may be given IM or IV if needed. Dosage is highly variable. • **Indications:** Diabetes Mellitus Types 1 & 2. • **Contraindications:** Severe renal impairment. • **Precautions:** Patients with impairment of renal or hepatic function, congestive heart failure, acidosis, infection. • **Adverse Reactions:** Hypoglycemia, hypersensitivity reactions, local reactions at site of injection. • **Use during pregnancy and lactation:** Insulin is indicated to control diabetes in pregnant mothers. Not excreted in breast milk.

Source: Central Medical Stores, Ministry of Health, Commonwealth of Dominica

Table 23. Insulin Products

Type of Insulin	Onset (hrs)	Peak (hrs)	Duration (hrs)
Insullin Regular (Soluble Human)	0.5 – 1	1 – 3	5 – 8
Insulin NPH (Isophane Human)	1 – 4	2 – 12	24 – 48
Insulin Regular (Soluble) 30% NPH (Isophane) 70% Human	0.5 – 1	2 – 8	24 – 28
Note: Insulin should be injected subcutaneously 15-30 minutes before a meal for the onset of action to coincide with food absorption			

Source: Managing Diabetes in Primary Care in the Caribbean (CHRC & PAHO, 2006)

Table 24. Cost of Drugs for Diabetic Patients

Drug Name	Dosage	Unit Cost	Monthly Cost
Metformin 500 mg tablet	One tablet 2x daily	0.07	$4.20
Glibenclamide 5mg tab (Glyburide) Gliclazide 80mg tabs	One tablet daily	0.02	$0.60
Isophane Insulin (Human Insulin)	1,000 units	17.36	$17.36
Regular Human Insulin (soluble)	10,000 units	17.36	$17.36
70/30 insulin (Isophane / Regular)	1,000 units	17.36	$117.36

Human			

Source: Central Medical Stores, Ministry of Health, Commonwealth of Dominica

INSULIN

The indications for insulin treatment are:

- All Type 1 Diabetic patients
- Patients with Type 2 Diabetes whose metabolic control is chronically inadequate evidenced by an HbA1c > 6.5% despite adequate diet, weight reduction, exercise and maximum dosages of oral hypoglycemic agents.
- To cover acute illness, surgery, or pregnancy
- Treatment of diabetic ketoacidosis or hyperglycemic/hyperosmolar non-ketotic diabetic states
- Post- myocardial infarction

Patients with Type 2 Diabetes who are failing or have failed oral therapy can be safely and effectively started on insulin in the outpatient setting, with proper advice and training by the health care team.

Dosing guidelines for patients new to insulin:

- Patient weight in kg
- Dosage 0.6units/kg
- B.I.D dosing regimen
- 2/3 TDD before breakfast, 1/3 TDD before evening meal

*Example **Twice Daily** Insulin Dosing Regimen for Type 2 Diabetic:*

Assuming a total dose of 45 units of insulin is required per day for control

- AM: 2/3 of total daily dose (30 units) – 10 Regular; 20 NPH
- PM: 1/3 of total daily dose (15 units) – 5 Regular; 10 NPH

BLOOD GLUCOSE MONITORING

Self-Monitoring of Blood Glucose (Adapted from PAHO, 2006):

Blood glucose self-monitoring is essential in the life of a patient with diabetes. This test informs the patient immediately what the blood glucose levels are like. In Type 2 Diabetic Patients, testing is needed at least 1 to 2 times/day. Testing should be done while the patient is fasting and before meals. Some blood glucose level readings should be done 2 hours after a meal to assess the control of postprandial hyperglycemia. The main functions of self-monitoring of blood glucose are:

- To provide persons with diabetes with information about their response to therapy. This information can be used to make adjustments to diet, medication, and physical activity.
- To foster the partnership between the patient and the health care team as results obtained by the patient may be used to modify treatment regimens.
- To detect hypoglycemia especially in those who may be ill or unaware of relevant symptoms.
- To allow persons with diabetes to be aware of the status of their blood glucose control without being solely dependent on health care professionals.
- To empower persons with diabetes

In the patient on insulin, testing is required more frequently. Blood glucose testing may be required up to 8 times/day initially, while the patient's doses are being modified. Pre-breakfast, 2-hour post breakfast, pre-lunch, 2 hours post lunch, pre-dinner, 2 hour post dinner, bedtime and 2-3 am. In the stabilized patient, pre-meals and bedtime blood glucose reading is ideal. If patient has symptoms of hypoglycemia, then blood glucose should be tested.

Major limitations of self-monitoring of blood glucose include(CHRC & PAHO, 2006):

- The cost of testing strips
- Difficulties experienced by some persons in pricking themselves (needle phobia)

HbA1c Testing:

This test is used in combination with self-monitoring of blood glucose to assess long-term control. Testing should be done as a minimum once every 6 months (CHRC & PAHO, 2006).

Urine Testing:

Urine testing for glucose is not recommended for evaluating control. In settings where this may be the only available option for monitoring glycemic control, persistent glycosuria highlights the need for the patient to seek further medical attention. Urine testing for ketones is important during sick days especially for Type 1 Diabetics.

HYPOGLYCEMIA

The term "hypoglycemia" is used to describe blood sugar levels below 4 mmol/L. Hypoglycemia may occur when there is a greater amount of insulin in the blood stream than necessary, when food intake is decreased, or during periods of increased activity. Ideally, a blood glucose test should be performed before treatment. Possible causes of hypoglycemia include:

- More exercise than normal
- Too little food
- Missed or late meals
- Too much insulin/tablets
- Alcohol consumption
- Menses
- Hot weather

Signs and symptoms of hypoglycemia:

- Sweating
- Shaking
- Dizziness
- Tiredness
- Hunger
- Blurred vision
- Headaches
- Glazed eyes
- Mood changes
- Tingling lips / finger tips

Some suggested forms of glucose for treating hypoglycemia include:

- 1tsp sugar
- 1/2cup gelatin
- 2tsp honey
- 1/2cup orange juice
- 1/2cup regular soft/aerated drink
- 4 hard candies/sweets

Table 25. The Three Stages of Hypoglycemia

Stage	Description and Treatment Information
Mild Hypoglycemia	**Description:** Characterized by shaking, sweating, hunger, weakness, and anxiousness.
	Treatment: Self treatment of 10 – 15 grams of pure glucose, wait 10 minutes and follow with a protein such as 8 oz. of milk or cheese and crackers or bread. If untreated, it progresses to moderate hypoglycemia.
Moderate Hypoglycemia	**Description:** Characterized by confusion, slurred speech, glassy eyes, poor coordination and lack of concentration.
	Treatment: Assistance may be required. Take 20 to 30 gram dose of pure glucose, wait 10 minutes and follow with a protein such as 8 oz. of milk or cheese and crackers or bread. If untreated, it progresses to severe hypoglycemia.
Severe Hypoglycemia	**Description:** Characterized by unresponsiveness, combativeness, agitation, convulsions and unconsciousness.
	Treatment: This is an acute medical emergency. Seek medical assistance. Severe hypoglycemia can be life threatening if not treated promptly and thoroughly. Emergency measures are required, including injection of glucagon or intravenous dextrose, followed by oral glucose or sweetened drinks.
	Note: Hospital admission is indicated for severe or prolonged

	hypoglycemia, co-existing renal disease or illness associated with use of long acting oral glucose lowering agents. The usual dose of insulin/diabetic medication may need to be modified, once the hypo episode has been treated.

Source: Managing Diabetes in Primary Care in the Caribbean (CHRC & PAHO, 2006).

MANAGEMENT OF ASSOCIATED CONDITIONS

Because of the interrelationship between diabetes and co-morbidities, there is a need for related conditions to also be controlled to prevent or delay complications and improve quality of life.

Hypertension Management in Adults with Diabetes

There is a higher prevalence of hypertension among persons with diabetes compared with non-diabetics. In the Caribbean diabetes is present in about one-third of hypertensive patients (CHRC & PAHO, 2006). This co-existence is often a result of:

- High prevalence of both conditions in the region
- The relationship between insulin resistance and hypertension
- The higher prevalence of chronic renal disease among diabetic patients

Hypertension increases the risk of stroke, ischemic heart disease, retinopathy and neuropathy in persons with diabetes. The target blood pressure should be <130/80mmHg. However, attaining systolic pressure of <120mmHg is desirable. Such targets may be difficult to achieve in the elderly and more modest goals may have to be set.

Non-Drug Treatment

Weight management must be recommended for all persons with diabetes(CHRC & PAHO, 2006). Caloric restriction and any degree of weight loss are beneficial for the overweight or obese patient. The intake of potassium and calcium must be adequate and sodium intake limited. Increased consumption of fruits and vegetables is to be encouraged as well as the use of low fat dairy products. A balanced diet will provide all the essential nutrients and vitamins without the need for supplementation.

- Smoking cessation is critical for reducing the risk of vascular complications of hypertension and diabetes.
- Alcohol intake should be limited as it compromises the control of both diabetes and hypertension.
- Physical activity should be continued unless specifically contraindicated.

Drug Treatment

Most persons with hypertension and diabetes will need 2 or more drugs for control, in addition to lifestyle changes(CHRC & PAHO, 2006).

- Low-dose Thiazides e.g. Bendrofluazide or Hydrochlorthiazide can be used safely in the majority of diabetics. Thiazides, used in low doses, rarely affect glucose, lipids or electrolyte balance and should be the antihypertensives of first choice.
- Diuretics, ACE inhibitors, Angiotensin Receptor Blockers (ARBs) and Calcium Channel Blockers (CCBs) have all been shown to reduce the risk of cardiovascular events.
- ACE inhibitors have been shown to improve cardiovascular outcomes in high-risk patients with or without hypertension and there is compelling evidence for earlier use in persons with diabetes.
- ACE inhibitors or ARBs are the drugs of choice for renal protection in diabetics with proteinuria. In persons who are allergic to ACE/ARBs, the use of the calcium channel blocker Diltiazem has provided similar benefits.
- Beta-blockers have a place in the management of persons with diabetes but should be used with caution in persons with peripheral vascular disease. Water soluble forms e.g. Atenolol are preferable.

Lipid Management in Adults with Diabetes

Type 2 Diabetes mellitus is associated with increased prevalence of lipid abnormalities (viz. increased low density lipoproteins (↑LDL-C), decreased high density lipoproteins (↓HDL-C) and increased triglycerides (↑TG), which contribute to macrovascular disease (heart attacks and strokes). Lowering LDL cholesterol and triglycerides and raising HDL cholesterol have been shown to reduce macrovascular disease events as well as mortality.

Diet and exercise remain the cornerstone of treatment of dyslipidemia. Pharmacological therapy is often required to achieve targets and should be implemented in conjunction with lifestyle changes. Routine screening of all diabetes patients for dyslipidemia is to be encouraged through annual testing.

Treatment

- LDL-cholesterol: Aim for LDL-cholesterol <70 mg/dL (<1.8 mmol/L). Statins are the drug of choice.
- HDL-cholesterol: Aim for >40 mg/dL (>1.0 mmol/L).
- Nicotinic acid (Niacin) is the most effective drug for raising HDL-C but has limited usage in clinical practice, as a result of an unpleasant flushing reaction. When used, doses should be restricted (e.g. 500–1000 mg per day) to reduce the likelihood of hyperglycemia.

Food Intake during Illness

Illness, particularly nausea, vomiting and diarrhea requires special adjustment in food intake. If regular food is not tolerated, carbohydrates containing liquid or soft foods should be consumed in small but frequent amounts to prevent starvation ketosis. Fluid should be increased to prevent dehydration. If vomiting, diarrhea or fever persists, small amounts of salty foods and liquids should be consumed to replace lost electrolytes.

2.5 ROLE OF HEALTH CARE PROFESSIONALS IN DIAGNOSING, TREATING AND MANAGING DIABETES

The process of screening, diagnosing, treating, and managing on an ongoing basis represents a substantial workload for all members of the health care team, across both Primary and Secondary Care in Dominica. Effective and efficient provision of care for persons with diabetes requires clear identification of the roles and responsibilities of all health care professionals. This section aims to summarize these roles and responsibilities with the ultimate goal of working collaboratively to improve care across various professions to improve diabetes management in Dominica.

Table 26. Role of Health Care Professionals in Managing Diabetes

Health Care Professional	Roles and Responsibilities
A) District Nurse	1. To test blood glucose with glucometers of at risk patients attending general clinics. 2. Provides follow-up care and maintenance therapy. 3. Refers clients/ patients to appropriate levels. 4. Provides community education, group and individual counseling. 5. Routine checks of abdominal girth, Body Mass Index (BMI), blood pressure and foot examination at every visit. 6. Provide nutrition education for individual and family. 7. Ensure follow up of defaulters. 8. Follow-up shut-ins at least every three months. 9. All gestational diabetics should be followed-up at least monthly and then within the first six weeks post-partum.
B) Family Nurse Practitioner	1. Assesses Referred Patients: • Physical examination • Investigation • Stabilization • Education and counseling 2. Basic eye screening. 3. Provides follow-up care and maintenance therapy. 4. Refers client/patient to appropriate level. 5. Provides community education, group, and individual counseling. 6. Follows up on shut-ins every six months.
C) Community Health Nurse	1. To supervise the management of all patients. 2. Assist with the coordination of patient education programs. 3. To provide supervision and support in the use of the management protocol.

	4. To make appropriate referrals.
C) Community Health Aid (CHA)	1. Conduct home visits of clinic defaulters. 2. Routine checks of weight, blood pressure, and foot examination at every visit. 3. Provides individual, family, and group counseling. 4. Provides community education with preventative focus. 5. Provides follow-up on shut-ins at least every three months.
D) District Medical Officer	1. See all patients (both new and follow-up) with FBS more than 110 mg/dl and a2hrpp blood sugar of 140-200mg/dl respectively and/or Ketonuria2. Assess new patients. 3. Provides follow-up care and maintenance therapy. 4. Refer to MOPD/Ophthalmology clinic must be seen annually. Specialist (PMH) seen as required. 5. Provides individual, family, and group counseling and community education. 6. Yearly analysis of lipid profile, renal function, liver function, and HbA1C. 7. Funduscopy at least twice yearly.
E) Medical Out-Patient Department (MOPD) / Pediatric Out-Patient Department (POPD) / High Risk Clinic PMH	1. All newly diagnosed diabetics < 25 years. 2. Patients not adequately controlled on maximum doses of oral hypoglycemic agents. 3. Type 1 Diabetics managed in the district should be seen once a year. 4. Patients with complications will be seen for assessment (Ischemic heart disease, Neurological complications, Nephropathy). 5. Pregnant diabetics refer to high-risk obstetrics clinics. 6. Provides support to the diabetic clinics in PHC, through consultation and identification of continuing educational needs. 7. Ensures all patients eligible for discharge to the district diabetic clinics are referred outward (e.g. diabetics stabilized on oral hypoglycemic agents, and well stabilized uncomplicated Type 1 Diabetics). 8. Provides individual and group counseling/education. 9. Training of Health Educators and Community Health Workers.in Counseling, Health Education, and Nutrition for Diabetics. 10. Refers to district health center for follow-up care.
F) PMH Admissions	1. All patients with RBS/2hrpp>500mg or ketonuria. 2. All patients with diabetic ketoacidosis. 3. All patients for conversion to insulin (from MOPD).
G) Podiatrist	1. Foot screening should be performed on every newly diagnosed patient and at least annually thereafter. 2. Once the level of risk for foot injury or ulceration has been

	determined appropriate management schemes including footwear recommendations, and specialist care. 3. To provide intensive one to one education for the patient in all aspects of foot health, and update all other health professionals and caretakers on foot health advice. 4. To provide an expert clinician in the management and debridement (removal of infected or dead tissue or any foreign material) of foot ulcers to prevent further infection and allow for healing.
H) Ophthalmologist / Diabetic Fundus Photography	1. Screening as per schedule for diabetic retinopathy by the ophthalmic technician at the diabetic fundus photography clinics held at each of the district Type 1 Health Centers or by the ophthalmologist at the eye clinics at Princess Margaret Hospital or the District Eye Clinics. 2. Follow-up eye examinations will be scheduled based on the severity of diabetic retinopathy and glycemic control by ophthalmologist. Patients lost to follow-up should be rescheduled for eye examination as soon as possible. 3. Emergency follow-up eye examination as per established symptoms and signs for eye emergencies especially new onset of floaters and sudden decrease of visual acuity. 4. Treatment for sight threatening diabetic retinopathy promptly by established guidelines. 5. Documentation in patient's health-book presence of diabetic retinopathy, severity and follow-up appointment.
I) Dietician / Nutritionist	1. Food and lifestyles choices are fundamental to diabetic care. An integrated nutritional assessment once a year that would be documented. The assessment would include: • Anthropometric measurements (weight, height and waist circumference) • Screening for blood lipid profile • Screening for nutritional abnormality(undernourished, eating wrong foods etc.) • Screening for other illnesses such as hypertension, renal disease, anemia • See Appendix J for Nutritional Assessment Form 2. Diet plan for diabetic patients should be based on economic situation, cultural beliefs, and lifestyle practices.
J) Health Educator/Promoter	1. Responsible for providing diabetic education that addresses the medical and emotional needs of the individual patient and family members. Education will enable diabetic individuals and family members to participate more effectively in their treatment and in prevention of complications. 2. Diabetes education is a continuous process. It should begin

	with the essential elements of self-care and include instructions to diabetic individuals and their family members on following the prescribed medical regimen. Over time diabetes education should define and address the ongoing needs of diabetic patients and family members. 3. Health educator should emphasize the **role of self-management.** The purpose of patient education within the empowerment philosophy is to help patients make decisions about their care and obtain clarity about their goals, values, and motivations. Patients need to learn about diabetes and how to safely care for it on a daily basis. They also need information about various treatment options, the benefits and costs of each of these strategies, how to make changes in their behaviors, and how to solve problems. In addition, patients need to understand their role as a decision-maker and how to assume responsibility for their care. 4. Provide health education materials to clients, relatives and the community on the disease, its prevention and management. 5. Refer to relevant health care provider as necessary.
K) Pharmacist	1. Counsel patients on correct drug therapy. 2. Encourages compliance to management regimes, that is lifestyle modifications and drug therapy. 3. Dispenses drugs and medical supplies. 4. Refers patients to appropriate level.

2.6 PREVENTION AND REDUCTION OF COMPLICATIONS

The microvascular complications of diabetes mellitus (i.e. nephropathy, neuropathy and retinopathy) are all directly related to the duration and degree of glycemic control.

NEPHROPATHY

Neuropathy is a major cause of end-stage renal disease (ESRD). Contributing factors include duration of diabetes (usually >10 years), poor glycemic control, poor blood pressure control, genetics/family history of hypertension or renal failure, and high protein intake. Albuminuria is the earliest manifestation of nephropathy. The main methods for screening include:

- Measurement of urinary albumin/creatinine ratio (ACR).
- 24 hour collection of urine for proteinuria.
- Timed collection of urine for microalbumin.

Screen for microalbuminuria **at diagnosis** and then annually in all persons with Type 2 diabetes mellitus. Once microalbuminuria or proteinuria has been confirmed:

- Include an ACE-inhibitor or ARB in the therapeutic regimen.
- Aim for tight blood pressure control with combination therapy if necessary so that BP ≤ 125/75 mmHg.
- Aim for tight glycemic control.
- Advise on a protein-restricted diet and refer to a nutritionist/dietitian for specialized management.
- Refer for specialist care.

RETINOPATHY

Diabetic retinopathy is an important cause of blindness. Risk factors for diabetic retinopathy are the duration of the disease (usually >5years), poor glycemic control, poor blood pressure control, elevated cholesterol and pregnancy. It is a biomarker for systemic microvascular disease; hence patients with retinopathy should be screened for nephropathy and peripheral neuropathy. Refer diabetics for retinopathy screening to the ophthalmologist or for fundus photography as per schedule.

To reduce the risk of diabetic retinopathy, aim for control of blood sugar, blood pressure and cholesterol.

NEUROPATHY

Diabetic neuropathy occurs mainly in persons with poor glycemic control. The symptoms include tingling, numbness, weakness, and burning sensations. Symptoms usually start at the periphery (fingers and toes) and move up the limbs. If the autonomic nervous system is affected, abnormalities of bladder and bowel function and penile erectile dysfunction (ED) may also occur.

CARE OF THE FOOT

Foot lesions are common in persons with diabetes (see Appendix F for detailed guidelines of care of the foot in persons with diabetes). Some factors that contribute to foot lesions include neuropathy, ischemia, injury/infection, and incorrect footwear. To reduce the risk of foot problems, it is recommended to:

- Aim for tight metabolic and blood pressure control.
- Encourage smoking cessation.
- Encourage routine daily self-examination of feet.
- Encourage use of correct foot wear. Where available, a chiropodist or podiatrist should be consulted when necessary.
- Examine peripheral pulses for peripheral vascular disease.
- Test feet routinely for peripheral neuropathy.
- Refer for specialty care as appropriate.

CARDIOVASCULAR DISEASE

Persons with diabetes are at significantly increased risk of developing cardiovascular disease, which is the major cause of mortality and chronic morbidity. Cardiovascular disease includes coronary heart disease, which can lead to angina and myocardial infarction, cerebrovascular disease leading to transient ischemic attacks and strokes, and peripheral vascular disease. In terms of risk stratification, persons with diabetes should be treated in an identical manner to persons without diabetes who have previously had a heart attack. In addition to glycemic and blood pressure control and correction of dyslipidemias, the following are strongly advised:

- *Smoking Cessation:* Successful smoking cessation is the most effective intervention for both primary and secondary prevention of cardiovascular disease.
- *Use of Anti-Platelet Agents:* Primary prevention with an anti-platelet agent should be considered in all patients over the age of 40 years, especially those with multiple risk factors. Aspirin use is beneficial for secondary prevention following myocardial

infarction, stroke, peripheral vascular disease, and angina or following surgery for any of these conditions.

ORAL COMPLICATIONS

Persons with diabetes are more likely to also have gum disease and are at higher risk for gingivitis (an early stage of gum disease) and periodontitis (chronic inflammation and infection of the gums). This is because these individuals are generally more susceptible to bacterial infection, and have a decreased ability to fighting bacteria that invade the gums. Research also suggests that the relationship between gum disease and diabetes is two – way. Not only are people with diabetes more susceptible to gum disease, but gum disease may have the potential to affect blood glucose control and contribute to the progression of diabetes.

If any of the following warning signs of gum disease are present, diabetic patients should see a dentist immediately:

- Gums that bleed easily
- Red, swollen or tender gums
- Gums that have pulled away from the teeth.
- Persistent bad breath or bad taste
- Permanent teeth that are loose or separating.

Diabetes can cause gingival hyperplasia and gingivitis. Other diabetes- related conditions affecting the mouth include burning sensations (known as burning mouth syndrome), abnormal wound healing, fungal infections and dental decay. Some individuals with diabetes may notice fruity (acetone) breath and others may report frequent xerostomia (dry mouth) or a change in saliva thickness. These symptoms are associated with excessive loss of fluids through frequent urination, altered response to infection, altered connective tissue metabolism, micro vascular changes, medications for dry mouth and possible increased glucose concentration in saliva.

To prevent gum disease and other diabetes-related oral health problems, it is important that patients practice good oral hygiene habits and have regular checkups every six months. To control thrush (a fungal infection), patients must maintain good diabetic control, avoid smoking and, if used, clean dentures daily. Good blood glucose control can also help relieve dry mouth caused by diabetes.

Oral Infections: An oral infection is a cluster of germs causing problems in one area of your mouth. Here are some warning signs.

- Swelling or pus around teeth or gums or any place in the mouth.

- Pain in the mouth or sinus area that does not go away.
- White or red patches on gums, tongue, cheeks or the roof of the mouth.
- Pain when chewing or sore teeth when eating something cold, hot or sweet.
- Dark spots or holes in the teeth.

Fungal Infections: Diabetic patients are more prone to oral fungal infections such as thrush. Thrush makes white (or sometimes red) patches in areas of your mouth. These can get sore or turn into ulcers. Thrush likes moist spots that may be chafed or sore for example under poorly fitting dentures.

Poor Oral Healing: Poorly controlled diabetics tend to heal more slowly. It is therefore important that diabetic patients keep their blood sugar levels within a healthy range, particularly when they have mouth sores or infections, or after oral surgery.

Dry Mouth: Some diabetic patients experience dry mouth due to the medications they take. Dry mouth may be particularly pronounced when blood sugar levels are high. Dry mouth can increase a diabetic's risk for cavities because there is less saliva to wash away germs. Dry mouth can also lead to salivary gland infections. If your patient has dry mouth, encourage them to drinking plenty of fluids. They can also try chewing sugar free gum or sugar free candy to help keep the saliva flowing.

Recommendations for Diabetic Oral Health:

- Maintain blood glucose levels within a normal range
- Take medications as prescribed
- Inform dental care provider of diabetic condition
- Visit the dentist twice per year for examination and oral prophylaxis (cleaning)
- Brush teeth at least twice a day with fluoridated toothpaste
- Floss daily
- Consume a well-balanced diet including fruits and vegetables

2.7 MANAGEMENT OF DIABETIC KETOACIDOSIS

Overview of Diabetic Ketoacidosis(adapted from Joint British Diabetes Societies Inpatient Care Group, March 2010).

Diabetic ketoacidosis (DKA) is a complex disordered metabolic state characterized by hyperglycemia, acidosis, and ketonemia. DKA is a medical emergency with significant morbidity and mortality. It should be diagnosed promptly and managed aggressively. A specialist team should always be involved in management as soon as possible and ideally within 24 hours. DKA usually occurs as a consequence of absolute or relative insulin deficiency that is accompanied by an increase in counter- regulatory hormones (ie, glucagon, cortisol, growth hormone, and epinephrine). This type of hormonal imbalance enhances hepatic gluconeogenesis and glycogenolysis resulting in severe hyperglycemia. Enhanced lipolysis increases serum free fatty acids that are then metabolized as an alternative energy source in the process of ketogenesis. This results in accumulation of large quantities of ketone bodies and subsequent metabolic acidosis and ketonuria.

DKA is always caused by insulin deficiency, either relative or absolute. Many previously undiagnosed patients have been seen in physicians' offices or emergency rooms where an adequate history and laboratory study could have made the diagnosis before they became critically ill. In the established patient, DKA results from:

- Failing to take insulin
- Acute stress, which can be trauma, febrile illness, or psychological turmoil, with elevated counter-regulatory hormones (glucagon, epinephrine, cortisol, growth hormone).
- Poor sick-day management, typically not giving insulin because the patient is not eating or failing to increase insulin for the illness, as dictated by blood glucose monitoring.

Clinical Presentation of DKA:

<u>Symptoms:</u>

- Thirst
- Polyuria, polydipsia
- Generalized weakness
- Malaise/lethargy
- Nausea/vomiting

General Signs:

- Ill appearance/Dehydration
- Labored respirations
- Dry mucous membranes
- Decreased skin turgor

Vital Signs:

- Tachycardia
- Hypotension
- Tachypnea
- Hypothermia
- Fever, if infection

Specific Signs:

- Ketotic breath (fruity, with acetone smell)
- Confusion
- Coma

Laboratory Investigations:

- Hyperglycemia
- Acidosis
- Urinary ketones
- Electrolyte disturbances (especially Hypokalemia)
- Hyperosmolality
- Hyperlipidemia

Assessment of Severity

The presence of one or more of the following may indicate severe DKA and warrants admission to hospital after stabilization:

- Glasgow coma scale (GCS) less than 12 Oxygen saturation below 92% on air (assuming normal baseline respiratory function)
- Systolic BP below 90 mmHg
- Pulse over 100 or below 60 bpm

If available:

- Blood ketones over 6 mmol/L

- Bicarbonate level below 5 mmol/L
- Venous/arterial pH below 7.1
- Hypokalemia (under 3.5 mmol/L)
- Anion gap above16 [Anion Gap = (Na+ + K+) – (Cl- + HCO3-)]

GENERAL MANAGEMENT ISSUES

Fluid Administration and Deficits

There is universal agreement that the most important initial therapeutic intervention in DKA is appropriate fluid replacement followed by insulin administration. The main aims for fluid replacement are:

- Restoration of circulatory volume
- Clearance of ketones
- Correction of electrolyte imbalance

The typical fluid and electrolyte deficits are shown below. For example, an adult weighing 70kg presenting with DKA may be up to 7 liters in deficit. This should be replaced as crystalloid (Normal saline). In patients with kidney failure or heart failure, as well as the elderly and adolescents, the rate and volume of fluid replacement may need to be modified. The aim of the first few liters of fluid is to correct any hypotension, replenish the intravascular deficit, and counteract the effects of the osmotic diuresis with correction of electrolyte disturbance.

Pediatric patients usually require an infusion of 10 -20 ml /kg of Normal saline over 1 to 2 hours. Judicious correction of dehydration should be undertaken to avoid the risk of cerebral edema in children. Fluid volume for the first 4 hours should not exceed 40 ml/kg.

Once the Blood sugar has dropped to 250mg/dl or less, Dextrose saline (Adult 0.9% or Pediatric 0.2%) should be used instead of Normal saline.

<u>Typical Deficits in DKA:</u>

- Water (ml/kg) 100
- Sodium (mmol/kg) 7-10
- Chloride (mmol/kg) 3-5
- Potassium (mmol/kg) 3-5

Insulin Therapy

An insulin infusion calculated as 0.1 units/ per kilogram/ hour is recommended. It is necessary to weigh or estimate the weight of the patient to calculate the insulin needs accurately. An easy method of preparing an insulin infusion is to add the same amount of units of insulin as the weight of the patient in kg, to 100 ml of Normal saline and infuse at a rate of 10 ml /hr. This will deliver 0.1units of Insulin/kg/hr.
An initial bolus of Insulin of 0.1units/kg may be administered but after fluid resuscitation is commenced. This initial bolus is not always given prior to the Insulin infusion and a clinical decision is made based on severity. Some recommend starting Insulin after an hour allowing for initiation of correction of hydration status and hypokalemia. Hypokalemia can be further exacerbated by Insulin administration.

Correction of Hypokalemia

Potassium should be corrected as long as the Potassium level is normal or low.
20 to 40 meq KCL /Litre should be added to maintenance IV Fluids. Once Insulin is administered the Potassium level drops further, as Potassium moves into the intracellular spaces. Because of this intracellular shift of K+ a patient with a normal K+ level should still have Potassium supplementation.

Insulin has the following effects:

- Suppression of ketogenesis
- Reduction of blood glucose
- Correction of electrolyte imbalance

Patient Considerations

Patients with diabetes who are admitted with DKA should be counseled about the precipitating cause and early warning symptoms of DKA. Failure to do so is a missed educational opportunity. Things to consider are:

- Identification of precipitating factor(s) e.g. infection or omission of insulin injections
- Prevention of recurrence e.g. provision of written sick day rules
- Insulin ineffective e.g. the patient's own insulin may be expired or denatured. This should be checked prior to reuse
- Provision of handheld glucometers and ketone meters and education on management of ketonaemia.

2.8 MANAGEMENT OF GESTATIONAL DIABETES MELLITUS

Gestational diabetes mellitus (i.e. FBS > 105 mg/dl or after abnormal Oral Glucose Tolerance Test) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy(CHRC & PAHO, 2006).Diabetes during pregnancy can result in several adverse outcomes. Strict metabolic control may reduce these risks to the level of those of non-diabetic expectant mothers. The following categories of patients are at increased risk (adapted from PAHO Guideline for the Management of Diabetes in the Caribbean, 2006):

- >25 years of age
- Overweight
- First degree family history of diabetes
- Previous history of abnormal glucose metabolism
- Glycosuria
- Previous poor obstetric history
- Ethnicity associated with high prevalence of diabetes mellitus
- A previous large baby weighing more than 4.0 kg (9lbs)
- Increased fetal weight in multiparous patients (two or more offspring in a single pregnancy)

Gestational diabetes poses a high-risk for both the woman and the child. Complications of GDM for the fetus/child include congenital malformations, increased birth weight, shoulder dystocia, and elevated risk for perinatal mortality. For the mother, complications of GDM include hypertension in pregnancy and placental insufficiency, increased insulin resistance, development of diabetes-related complications, and miscarriage.

Protocol for Testing for Gestational Diabetes Mellitus:

1) Screen with questions related to risk factors as above
2) High risk patients should be tested with the Oral Glucose Tolerance Test

Note: If the first test is normal, retest high-risk patients at 24-28 weeks gestation.

Diagnostic Criteria:

There are two main glucose tolerance tests used for diagnosing gestational diabetes. The test using 100g glucose is also widely used for detection of “at risk” infants and mothers (Oral Glucose Tolerance Test).

Postpartum Follow-up:
Although most women with gestational diabetes mellitus revert to normal glucose levels after pregnancy, they are at significant risk of developing GDM in subsequent pregnancies as well as Type 2 Diabetes later in life. Intense lifestyle modification should be encouraged with annual routine screening for diabetes starting at the 6-week post-partum visit.

Nutritional Management of Gestational Diabetes Mellitus

The aim of nutritional management in Gestational Diabetes Mellitus is to control blood sugar levels whilst allowing the woman to consume sufficient calories for her baby's health. Nutritional recommendations for women with Gestational Diabetes Mellitus include:

- Eliminate concentrated simple carbohydrates e.g. honey, jam, jelly, marmalade, molasses, sugar, soft drinks, syrup.
- Eat meals and snacks at consistent times each day.
- Adjust calorie intake to provide for appropriate weight gain during pregnancy.
- Increase the intake of complex carbohydrates – cereals e.g. oats, cornmeal, whole grain, local ground provision e.g. yam, plantain, dasheen and legumes e.g. dried peas and beans.
- Eliminate the use of alcohol.
- Minimize the use of caffeine.
- Modify breakfast as needed.

2.9 EFFECTIVE SELF CARE THROUGH EDUCATION

Helping people with diabetes to acquire the knowledge and skills to manage their own condition is central to their leading a full and healthy life. The following goals are a guide for the entire health care team, which should work together to achieve them(CHRC & PAHO, 2006).Always remember that the main member of the team is the PERSON LIVING WITH DIABETES and that he/she should be totally involved in goal and priority setting (Adapted from PAHO Guideline for the Management of Diabetes in the Caribbean, 2006):

1) Describing the disease process and treatment options

- Identify diabetes as a disorder in which the body is unable to utilize food properly
- Describe the actions of insulin and what happens in the body when insulin is not available or does not work properly
- Explain how the prescribed meal and exercise plan and blood glucose monitoring are essential for management of the disease
- List the risk factors for diabetes
- State how the diagnosis of diabetes is established
- State the importance and benefits of good diabetes control
- Describe the effects of oral hypoglycemic agents

2) Incorporating appropriate nutritional management

- State that nutrition therapy and meal planning are essential components in the control of blood glucose
- List the goals:
    - Identifying appropriate body weight (explain BMI)
    - Importance of reaching and maintaining appropriate body weight
    - Controlling blood glucose and lipids
    - Practicing good nutrition
- Discuss types of nutrients that affect blood glucose and lipid levels
- List the types and amounts of foods to include in meals as indicated in the meal plan
- State the relationship of food and meals to blood glucose levels, medication and activity
- Discuss meal-planning strategies to meet the goals
- Demonstrate the correct portion sizes for the meal plan
- Identify times for snacks
- Demonstrate how to evaluate food products using food labels
- Discuss use of non-caloric sweeteners
- Explain importance of reducing total fat as well as saturated and hydrogenated fats
- State the relationship of salt and hypertension

- Discuss ways to reduce salt
- State the effect of alcohol on blood glucose

3) Incorporating physical activity into lifestyle

- State that exercise is recommended for diabetes management and good health in general
- State that exercise can help lower blood glucose levels
- Describe role of physical activity on a regular basis to achieve or maintain appropriate body weight
- State the need to consult with the health care team before beginning an exercise program
- List types of physical activity that the patient agrees to use
- Describe the proper shoes and clothing to use
- State why and how to avoid dehydration
- State that hypoglycemia can result from exercise if certain medications are used
- State relationship of exercise to oral agent activity
- List factors that may increase the risk of exercise-induced hypoglycemia (i.e. Alcohol and ß-blockers)

4) Using medications for therapeutic effectiveness

- State that in addition to diet and exercise some individuals may need either oral agents or insulin
- State that the oral medication dosage is individualized
- State the action of oral medication on blood glucose level
- State the name of oral medication, its dosage and when it is to be taken
- List the possible side effects of oral medication
- State the possible interactions of diabetes medications with other medications taken

5) Monitoring

- Describe rationale for monitoring blood glucose
- Demonstrate how to perform tests with appropriate materials
- Demonstrate how to record results
- Demonstrate proper disposal of lancets and other materials
- State when and how to contact health care provider if results are consistently higher or lower than guidelines given

6) Preventing, detecting and treating chronic complications

- Identify chronic complications associated with diabetes

- State that near-normal blood glucose may prevent or delay chronic complications
- State that smoking increases risk of complications
- State the need for an eye examination on a regular basis
- State that diabetes can affect the eyes without any symptoms being initially apparent
- State the need for daily foot inspection and for wearing well fitting shoes
- Demonstrate how to bathe feet and trim toenails safely
- Identify factors that may cause injury to the feet
- State the need to report early symptoms of potentially serious problems
- State the need for daily dental and mouth care
- Identify the organ systems particularly at risk from diabetes
- State that regular blood pressure monitoring is necessary
- Need to control high blood pressure
- State that monitoring of cholesterol and triglycerides is necessary

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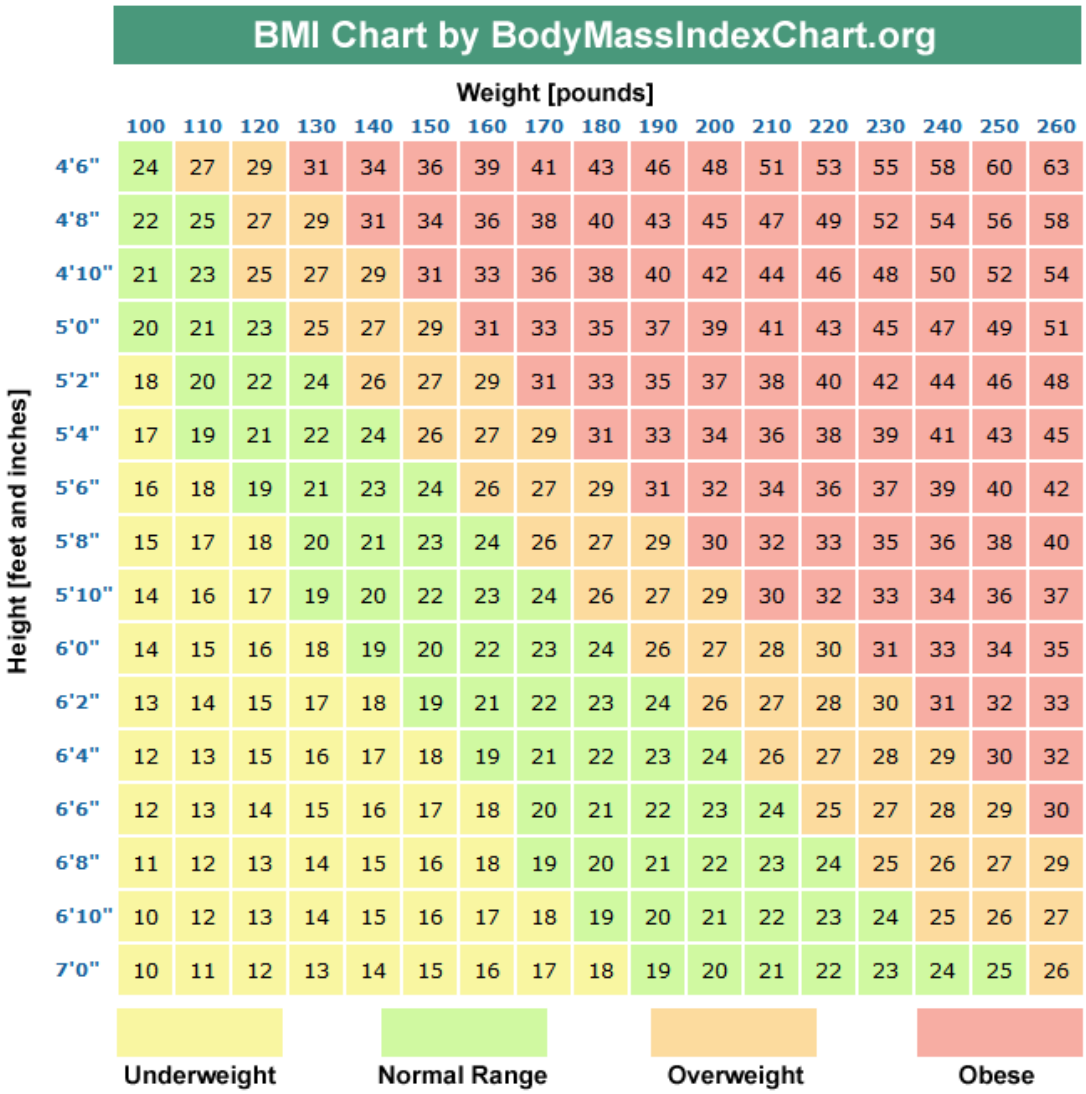
Appendix A - Body Mass Index Chart

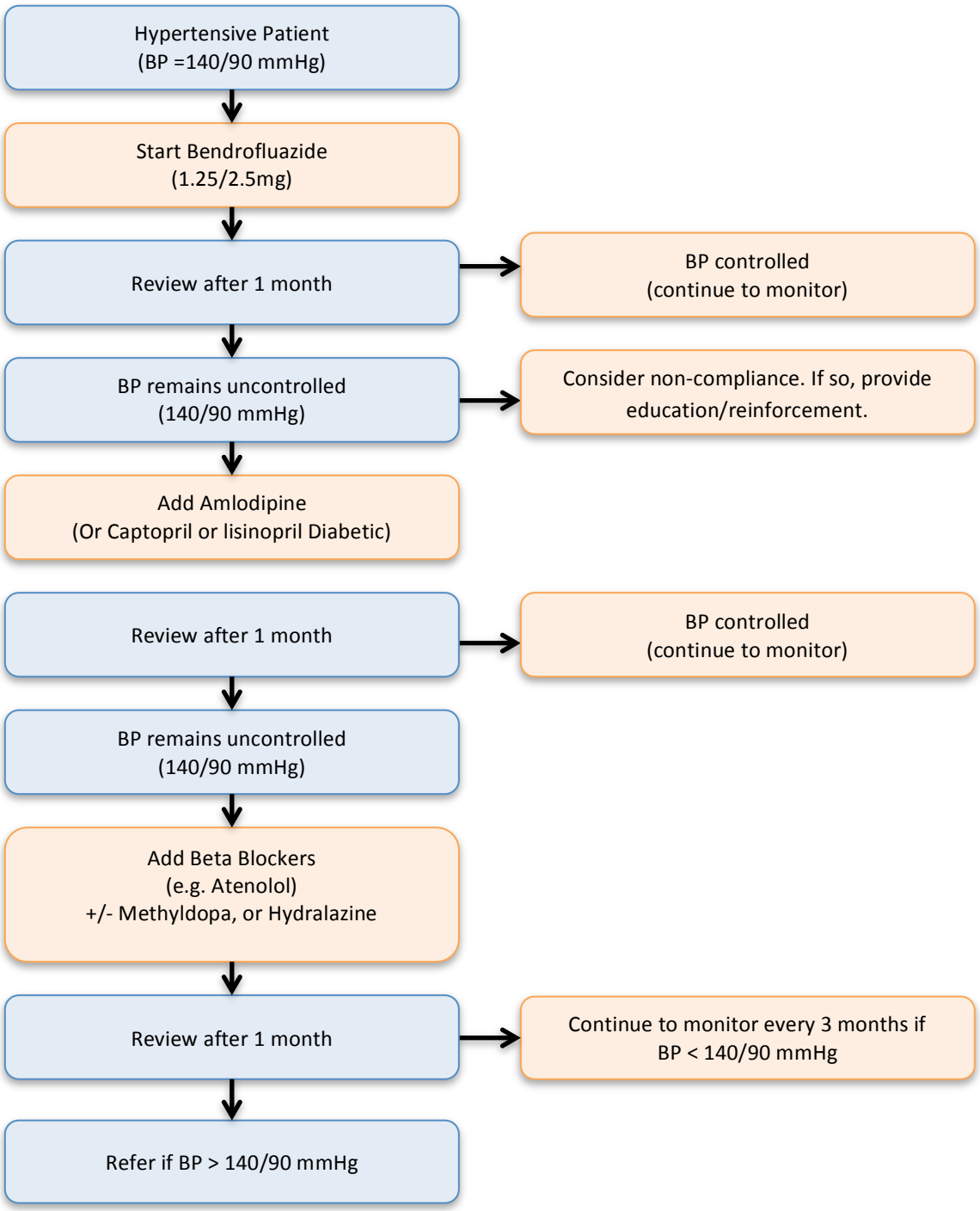
For a quick determination of BMI (kg/m^2), use a straight-edge to help locate the point on the chart where height (in or cm) and weight (lbs or kg) intersect. Read the number on the dashed line closest to this point. For example, an individual who weighs 69 kg and is 173 cm tall has a BMI of approximately 23. Then use the BMI classification table to determine the nutritional status of the patient.

Body Mass Index (BMI) Classification:

Normal	18.5 – 24.9 kg/m^2
Overweight	25 – 29.9 kg/m^2
Obese	30 – 39.9 kg/m^2
Morbidly Obese	40+ kg/m^2



Appendix B – Flowchart for Hypertensive Drug Therapy



Appendix C – Values for Diagnosis of Diabetes Mellitus and Other Categories of Hyperglycemia

Diagnosis	**Whole Blood (glucose concentration (mmol/L [mg/dL)**	
	Venous	Capillary
Diabetes Mellitus	Fasting: ≥ 6.1 (≥ 110) 2-h post glucose load or both: ≥ 10.0 (≥ 180)	Fasting: ≥ 6.1 (≥ 110) 2-h post glucose load or both: ≥ 11.1 (≥ 200)
Impaired glucose tolerance (IGT)	Fasting: < 6.1 (< 110) And 2h post glucose load: ≥ 6.7 (≥ 120) and< 10.0 (< 180)	Fasting: < 6.1 (< 110) And 2h post glucose load: ≥ 7.8 (≥ 140)and< 11.1 (< 200)
Impaired fasting glycemia (IFG)	Fasting: ≥ 5.6 (≥ 100) and< 6.1 (< 110) 2 h post glucose load: < 6.7 (< 120)	Fasting: ≥ 5.6 (≥ 100) and< 6.1 (< 110) 2h post glucose load: < 7.8 (< 140)

Diagnosis	**Plasma (glucose concentration (mmol/L [mg/dL)**	
	Venous	Capillary
Diabetes Mellitus	Fasting: ≥ < 7.0 (≥ 126) 2-h post glucose load or both: ≥ 11.1 (≥ 200)	Fasting: ≥ 7.0 (≥ 126) 2-h post glucose load or both ≥ 12.2 (≥ 220)
Impaired glucose tolerance (IGT)	Fasting: <7.0 (<126) And 2h post glucose load: ≥ 7.8 (≥ 140) and< 11.1 (< 200)	Fasting: < 7.0 (< 126) And 2h post glucose load: ≥ 8.9 (≥ 160)and< 12.2 (< 220)
Impaired fasting glycemia (IFG)	Fasting: ≥ 6.1 (≥ 110) and< 7.0 (< 126) 2 h post glucose load: < 7.8 (< 140)	Fasting: ≥ 6.1 (≥ 110) and< 7.0 (< 126) 2h post glucose load: < 8.9 (< 160)

Source: World Health Organization, 1998.

Appendix D – Guide to Physical Activity Levels

The following table provides a few examples of physical activities and their levels. Physical activity levels will be determined by the degree of exertion. Before commencing a physical activity program, persons with diabetes should be assessed by a medical doctor.

Guide to Physical Activity Levels

Level of Activity	Examples
Light	Office work, cleaning house, playing golf, walking
Moderate	Walking briskly, gardening, cycling, tennis, dancing, swimming, light weight training, climbing stairs
Strenuous	Jogging, competitive swimming and tennis, aerobic workout, vigorous dancing
Very Strenuous	Running, intense aerobic workout, intense weight training, football

Elicit medical history including:

- Present status of disease including symptoms, treatment, complications
- Cardiac history
- Family history

Conduct physical examination including:

- Measurement of BMI, waist circumference
- Cardiac assessment
- Identification of complications of diabetes
- Foot examination

Contraindications to exercise:

- Uncontrolled hyperglycemia
- BP>200/100 mmHg
- Febrile illness
- Unstable angina
- Acute heart failure

Appendix E – Diabetic Flow Sheet

Princess Margaret Hospital

DIABETIC FLOW SHEET

Name: _____ Diagnosis: _____

Sex: _____ Date of Birth: _____ _____

CHECK EVERY VISIT		
DATE		
WEIGHT		
BP		
URINE/GLUC/ALB		
BLOOD – FBS		
– 2HPP		
SMOKE/ALCOHOL		
MEDICATIONS: 1.		
2.		
3.		

CHECK AT LEAST EVERY YEAR		
DATE		
FOOT INSPECTION		
FOOT PULSES		
FOOT SENSATION		
VISUAL ACUITY		
FUNDUSCOPY *		
URINE MICROALB		
BUN/CREAT.		
CHOL/TRIG.		
HBA1C/PBG		
OTHER		

* RETINA N=Normal; NPR=Non-Proliferative Retinopathy; PRO=Prol.Retinopathy; MO=Macular Oedema

Appendix F – Care of the Foot in Persons with Diabetes

Foot care is a critical aspect of effective management of the diabetic patient. Patients should be advised to (Adapted from PAHO, 2006):

- Perform daily examination of feet using mirrors to observe sole of feet or with the assistance of a relative
- Never walk barefooted indoors or outdoors
- Never cut corns, bunions nor use corn pads
- Avoid corn cures, paints or plasters
- Seek assistance with cutting of nails
- Wear comfortable, loose fitting shoes
- Avoid open sandals. Use sandals with good protection of the feet
- Keep feet clean and dry
- Cover any minor cuts
- Never use iodine on the foot
- Never prick blisters

Diabetics often cannot tell if a shoe is uncomfortable because feet may be insensitive due to neuropathy. Therefore, advise as follows:

- Ensure that they have enough time to purchase shoes.
- Purchase shoes in the afternoon
- Look at shoe and compare to shape of their feet. They should be similar
- There should be a deep toe box to allow the toes to function and correct width to accommodate the widest part of the foot. Shoe size should allow 1 inch of space between tips of toes and front of shoe.
- Shoe should have an effective fastening e.g. lace, strap or velcro.
- Leather uppers are preferable.
- The seamless styled shoe uppers are better; and a thick, soft and comfortable cushioning sole that aids with shock absorption and reduces the probability of being punctured through the shoe.
- Spend a few minutes walking in the shoes to ensure that they are comfortable

Consult doctor/podiatrist/chiropodist if there is:

- Color change in any part of the foot or leg
- Discharge coming from break in skin
- Any pain, throbbing, swelling or itching

Appendix G – Dietary Guidelines and Examples

Recommended Number of Food Servings per Day by Food Group

Food Group	Recommended Number of Servings Per Day
Staple Foods	Four (4) or more
Legumes	One (1) or more
Dark leafy, yellow and other non-starchy vegetables	Two (2) or more
Fruits	Two (2) or more
Foods from animals	Two (2) or more
Fats	Three (3) or more

Note: These amounts are considered adequate for practically all healthy persons and may be excessive in some cases. Therefore a complete analysis of the individual's diet is necessary.

STAPLE FOODS
Bread - 1 slice, ¼ mastiff, 1 roll/hotdog bun, 6 crackers, 1 Johnny cake
Rice, peas, macaroni, cornmeal, oatmeal – ½ cup
1 dumpling
Corn - 1 small corn on the cob, ½ cup canned corn
Cereal – 1 weetabix or ½ cup high fiber cornflakes
Provisions – 2 ½ inch long by ½ inch thick, one medium green banana or Irish potato

LEGUMES
Legumes (dried peas and beans; **not including baked beans) –** 1/3 cup
2-16 peanuts or 7 cashew nuts

VEGETABLES
Patients should be advised to consume as many raw vegetables as possible. Examples include: cabbage, christophene, cucumber, watercress, lettuce, spinach, pawpaw, tomato, eggplant, and celery. When cooking vegetables, use 1 cup as a serving. When using canned vegetables (i.e. carrot, pumpkin, string beans), ½ cup can be counted as a single serving.

FRUITS
Examples of a single serving of fruit includes:
Banana - 1 small or ½ large banana
Orange, tangerine, apple, star apple – 1 small
Soursop pulp – ½ cup
Watermelon – 1 slice (5 inch long)
Cherries – 20 pieces
Grapes – 14 pieces
Pineapple – 1 slice ½ inch thick
Prunes – 2 medium
Juice (unsweetened) - ½ cup

FOOD FROM ANIMALS
Chicken parts (i.e. wing, drumstick, thigh) – 1 small
Beef /goat meat - 2-3 oz
Fish - (2-3 oz) 1 flying fish, salt fish (all salt removed), tuna, mackerel,
Seafood - 3 medium shrimp
Eggs and dairy products: 1 egg, 2 tbsp cheese
Milk (½ cup skim, ¼ cup full cream, or 2 tbsp powdered)
NOTE: A single serving of animal meat is approximately the size of a deck of playing cards or a bar of soap.

FATS
1 teaspoon of any fat (i.e. olive oil, corn oil, sunflower oil, butter, margarine)
Avocado – 1 slice (4 inches across)
Peanut butter – 1 teaspoon

Amount of Fiber (grams) According to Foods of Various Serving Sizes

FOOD	SERVING SIZE	FIBER (GRAMS)
GRAINS, BEANS, AND NUTS		
Lentils	½ cup	7.8
Black Beans	½ cup	7.7
Kidney beans	½ cup	7.3
Wheat germ	½ cup	7.3
Peanuts	½ cup	5.8
Kellogg's Bran Flakes	1 cup	5.5
Garbanzo beans (chickpeas)	½ cup	5.3
Oatmeal, cooked	1 cup	4.0
Bran Muffin	1 medium	2.5
Bread, whole wheat	1 slice	1.5
VEGETABLES		
Potato, baked with skin	1 medium	4.8
Peas, cooked	½ cup	4.4
Sweet potato, baked with skin	1 medium	3.4
Brussels sprouts, cooked	½ cup	3.4
Spinach, cooked	½ cup	2.8
Broccoli, cooked	½ cup	2.3
Potato, baked without skin	1 medium	2.3
Carrot	1 medium	2.2
Corn, cooked	½ cup	2.0
Cauliflower, cooked	½ cup	1.7
FRUITS		
Pear	1 medium	4.0
Apple, with skin	1 medium	3.7
Orange	1 medium	3.1

Banana	1 medium	2.7
Nectarine	1 medium	2.2
Cantaloupe	½ medium	2.1
Prunes, dried	10 pieces	1.8
Peach	1 medium	1.7
Strawberries	½ cup	1.7

Appendix H – Conversion and Measurement Tables

Approximate Equivalents among Systems

Metric	Household/English
1 liter	1 quart / 32 ounces / 2 pints
500 milliliters	1 pint / 16 ounces / 2 cups
240 milliliters	1 cup / 8 ounces
30 milliliters	1 ounce
15 milliliters	1 tablespoon / 3 teaspoons
5 milliliters	1 teaspoon
1 milliliters	15 drops
0.0067 milliliters	1 drop

Metric System Measurements

Length	Temperature
1 meter = 100 centimeters 100 centimeters = 1000 millimeters 10 millimeters = 1 centimeter	C=(F-32) 5/9 F=(C)9/5 + 32
Weight	**Weight Conversion**
1 gram = 1000 milligrams 1 milligram = 1000 micrograms 1 kilogram = 1000 grams	1 kilogram = 2.2 pounds 1 pound = 16 ounces
Volume for Solids	**Volume for Fluids**
1000 cubic millimeters =1 cubic centimeter 1000 cubic centimeters = 1 cubic decimeter 1000 cubic decimeters = 1 cubic meter	1 liter = 1000 milliliters 10 centiliters = 1 deciliter 10 deciliters = 1 liter

Exact Conversion Rule for Conversion of Glucose from mg/dl to mmol/l

mg/dl	x0.0555	= mmol/l
mmol/l	x18.0182	=mg/dl

Conversions for mg/dL to mmol/L

mg/dl to mmol/l	mmol/l to mg/dl
40 ~ 2.2	2.0 ~ 36
45 ~ 2.5	2.5 ~ 45
50 ~ 2.8	3.0 ~ 54
55 ~ 3.1	3.5 ~ 63
60 ~ 3.3	4.0 ~ 72
65 ~ 3.6	4.5 ~ 81
70 ~ 3.9	5.0 ~ 90
75 ~ 4.2	5.5 ~ 99
80 ~ 4.4	6.0 ~ 108

85 ~ 4.7	6.5 ~ 117
90 ~ 5.0	7.0 ~ 126
95 ~ 5.3	7.5 ~ 135
100 ~ 5.6	8.0 ~ 144
110 ~ 6.2	8.5 ~ 153
120 ~ 6.7	9.0 ~ 162
130 ~ 7.2	9.5 ~ 171
140 ~ 7.8	10.0 ~ 180
150 ~ 8.3	10.5 ~ 189
160 ~ 8.9	11.0 ~ 198
170 ~ 9.4	11.5 ~ 207
180 ~ 10.0	12.0 ~ 216
190 ~ 10.6	12.5 ~ 225
200 ~ 11.1	13.0 ~ 234
220 ~ 12.2	13.5 ~ 243
240 ~ 13.3	14.0 ~ 252
260 ~ 14.4	14.5 ~ 261
280 ~ 15.5	15.0 ~ 270
300 ~ 16.7	16.0 ~ 288
320 ~ 17.8	17.0 ~ 306
340 ~ 18.9	18.0 ~ 324
360 ~ 20.0	19.0 ~ 342
380 ~ 21.1	20.0 ~ 360
400 ~ 22.2	21.0 ~ 378
420 ~ 23.3	22.0 ~ 396
440 ~ 24.4	23.0 ~ 414
460 ~ 25.5	24.0 ~ 432
Calculate mg/dl x 0.0555 = mmol/l	Calculate mmol/l x 18.018 = mg/dl

Appendix I – List of Hypertension and Diabetes Management Manual Review Workshop Participants

Workshop Date: Friday February 18th, 2011
Time: 8:30am – 4:00pm
Workshop Location: Ross University Classroom, Princess Margaret Hospital

Last Name	First Name	Title	Health District	Organization
Alexander	Magdalene P.	CHN	Grand Bay	PHC
Bekele	Nebiyu	DMO	Marigot	PHC
Birmingham	Marvlyn	President	Roseau	Diabetes Association
Blaize	Juliette	FNP	Grand Bay	PHC
Brumant	Charmaine	Laboratory - PMH	Roseau	MOH
Bruney	Vanya	Ward Sister, Female Medical Ward	PMH	PMH
Carsley	Sarah	Assistant National Epidemiologist	MOH	MOH
Christmas	Martin	Director, PHC (Ag.)	Roseau	MOH
Cuffy	Veronica	CHN	St. Joseph	PHC
Dechaussay	Adrien	DMO	Portsmouth	PHC
Elwin	Jennifer	Internist Medical Consultant	PMH	PMH
Emmanuel	Rosana	Director of Clinical and Community Affairs	Ross University	Ross University
Eusebe	Rebecca	FNP	Roseau	PHC
Fabien	Elizabeth	FNP	St. Joseph	PHC
Fenn	Kelly	Health Planning Intern	MOH	MOH
Francis	Nora	CHA	Grand Bay	PHC
Gibbons	Joycelyn		Marigot	PHC
Greenaway	Royette	Communications Officer	MOH	MOH
Grell	Gerald	Dean, Clinical and Community Affairs	Portsmouth	Ross University
Hypolite	Catherine	Departmental Sister, RFA Hospital	Portsmouth	MOH
Jeffery	Francine	DMO	St. Joseph	PHC
Jno. Baptiste	Carol	SCHN Region 2	Region 2	PHC
John	Idaline	CDO	MOH	MOH
Johnson	David	Chief Medical Officer	MOH	MOH
Joseph	Magdalene G.	Ward Sister Neonatal Unit	PMH	MOH
Julien	Charmaine	FNP	Roseau	PHC
Lambert	Elenore	Dietician	Portsmouth	Ross University
Lambert	Jasmine	Matron (Ag.)	PMH	MOH
LeBlanc	Rosemarie	Ward Sister, RFAH	Portsmouth	MOH
Lestrade-Wyke	Letitia	Matron	PMH	MOH
Lewis	Mary	Ward Sister, Male Medical Ward	PMH	PMH

Lewis	Florestine	SCHN Region 1	Region 1	
Louisy	Ramona	CHN	Roseau	PHC
Matthew	Louvenia	Ward Sister, Dialysis Unit	PMH	MOH
Meade-Thomas	Portia	DMO	Roseau	PHC
Mitchell	Michele	Capacity Developer	MOH	MOH
Mitchell	Peaches	Ward Sister, Maternity Unit	PMH	MOH
Peters	Cleona	DMO	Grand Bay	PHC
Ravaliere	Terrillia	CHN	Roseau	PHC
Roberts	Elunora		PMH	MOH
Royer	Helen	Coordinator, Health Promotion		MOH
Samuel	Allison	Health Educator	MOH	MOH
Shillingford-Ricketts	Hazel	Ophthalmologist	PMH	PMH
Sorhaindo	Caryl	Ward Sister, Dialysis Unit	PMH	PMH
St. Jean	Philip	DMO	Roseau	PHC
St. Jean	Philip	DMO	Roseau	PHC
Thomas	Errol	Chief Pharmacist	MOH	MOH
Titre	Marynese	Nutritionist	MOH	MOH
Toussaint	Adora M.L.	Registered Nurse	Portsmouth	Portsmouth Hospital
Trotter	Paula	Retired Nutrition Consultant	Roseau	n/a
Vigilant	Eva	CHN	LaPlaine	PHC
Vigilant	Vetline		Castle Bruce	PHC
Williams	Cassandra	DMO	LaPlaine	PHC

Appendix J – Nutritional Assessment Form

Nutritional Assessment Form

Date:	

Demographic Information	
Name:	
Age:	
Sex:	□Male □ Female
Phone Number:	
Address:	
Religion:	
Name of Family Doctor:	
Marital Status:	□ Single □ Married □ Divorced □ Common Law
Occupation:	
Level of Education:	
Type of Exercise:	

Patient Health Data	
Present Weight:	
Height:	
Body Mass Index (BMI):	
Waist Circumference:	
Hip Circumference:	
Waist-Hip Ratio (Males < 1; Females < 0.8):	
Blood Pressure:	
Blood Sugar	
Total Cholesterol	
HDL:	
LDL:	
Protienuria:	
Ketones:	
Allergies:	
Smoker?	

Treatment	
Diagnosis:	
Date of Diagnosis:	
Treatment Information:	

Family History:

- Do you have any history of Diabetes in your family?
- Do you or your family have any history of High Cholesterol, Heart Disease and Stroke?
- Do you have any history of any other illnesses or problems in your family?
- Do you have any support at home or community to help you manage your diabetes?

Diet Related History:

- How many people live in your household?
- Do you have facilities to store your foods to keep them fresh?
- Who does the cooking?
- Who does the shopping? Do you have access to a vegetable garden?
- Approximately how much money is spent on food?
- Do you have dental problems?
- Describe your typical breakfast.
- Describe your typical lunch.
- Describe your typical dinner.
- What are the typical meals that you eat out?
- Can you describe to me what a balanced diet is?
- Do you eat a balanced diet everyday? Y or N
    - ☐ If No, give reasons:
    - ☐ Finance
    - ☐ No Help
    - ☐ No Facilities
    - ☐ Time
    - ☐ Poor Health
    - ☐ Other

24 Hour Recall:

List meals eaten over the past 24 hours:

- Breakfast:
- Lunch:
- Snacks:

Food Frequency Diet History (per day/week/month)		
Animal Food	• Beef • Pig feet • Pig snout • Fish • Egg	• Milk • Yogurt • Cheese • Back-n-neck • Other meats
Vegetables	• Pumpkin • Carrots • Cabbage • Tomato	• Christophene • Light leafy greens • Dark leafy greens
Fruits	• Grapefruits • Oranges • Mango • Guava • Passionfruit	• Ripe banana • Paw Paw • Watermelon • Pineapple
Starch	• Provisions • Bread • Macaroni • Biscuits • Rice	• Oatmeal • Toloma • Custard • Crackers • Corn flakes
Fats	• Butter • Oil • Margarine	• Mayonnaise • Coconut • Fried foods
Legumes	• Red beans • Lentils • Nuts	• Peanuts • Soya chunks • Tofu
Miscellaneous	• Soft drinks • Cube • Canned food • Smoked foods • Ice cream	• Coffee • Cocoa • Tea • Alcohol • Cakes

	• Ketchup • Herb Tea	• Sweets • Vitamin supplements

Summary of Findings:

Plan of Action / Goals:

Signature of Health Professional:_____

Nutritional Assessment Form — Follow-up

- How have you changed your diet or exercise since your last visit?

- What problems did you encounter?

- Do you feel confident you can maintain the changes?

- What other changes do you still need to make to improve your health?

- How can I help with these changes?

- What one behavior could you change that would result in the most significant change in your health?

- What one or two behaviors would you be unlikely to change now?