The Caribbean Public Health Agency is the Caribbean region’s collective response to strengthening health systems and addressing public health challenges which threaten development.

To obtain additional information, please contact:
Caribbean Public Health Agency (CARPHA)
16-18 Jamaica Boulevard Federation Park
Port of Spain,
Trinidad and Tobago
Tel: 868-299-0895 Fax: 868-622-2792
Email: postmaster@carpha.org
Website: http://carpha.org/

Suggested citation.


ISBN 978-976-8114-48-8

© Caribbean Public Health Agency 2019
Module 1: Evidence-Based Treatment Protocols for Diabetes

Module 2: Guiding Lifestyle Changes

Module 3: Guidance For Persons With Diabetes (PwD) & Caregivers

Module 4: Access To Essential Medication

Module 5: Systems for Monitoring

CARPHA Guidelines For Management of Diabetes In Primary Care In The Caribbean
Contents

7 List of Tables
9 List of Algorithms
10 List of Boxes
11 List of Appendices
12 List of Abbreviations
15 Preface
17 Acknowledgements
19 CARPHA Diabetes Guidelines: The Modular Approach Expanded
22 The Client-Centred Approach
24 Methodology of Guideline Development

27 Introduction
29 Risk Factors for Type 2 Diabetes Mellitus
32 The Metabolic Syndrome – and the Wider Context of Risk Reduction
34 Targets for Blood Pressure and Other Metabolic States in Diabetes Mellitus and Associated Conditions

37 Overview of the Clinical Encounter
38 The History
39 The Clinical Examination
40 Investigations and Management
42 Follow-up Visits
44 Annual Visits

45 The Multidisciplinary Team Approach
Section 1: Screening, Diagnosis & Treatment of Diabetes

Screening for Type 2 Diabetes Mellitus
   Rationale

Recommended Diabetes Screening Tests
Role of Other Tests in Diabetes Screening.

Diagnosis of Diabetes
Criteria for Diagnosing Diabetes
Criteria for Diagnosing Impaired Glucose Tolerance and Diabetes

Treatment of Type 2 Diabetes Mellitus
Implementation of Pharmacotherapy
   Monotherapy
   Dual Therapy
   Triple Therapy
   Combination Injectable Therapy
   Treatment of Diabetes with Insulin
   Possible Insulin Regimes in T2DM

Section 2: Treatment of Diabetes in Special Populations

Treatment of Diabetes in Pregnancy
   Treatment of Pre-Existing Diabetes in Pregnancy
   Pre-conception Counselling
   Antenatal Care of Pre-existing Diabetes

Treatment of Diabetes in Children
   Presentation of Diabetes in Children and Adolescents
<table>
<thead>
<tr>
<th>Page</th>
<th>Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>84</td>
<td>Diagnosis and Initial Management</td>
</tr>
<tr>
<td>87</td>
<td>Treatment of Diabetes in Children with Subcutaneous Insulin</td>
</tr>
<tr>
<td>87</td>
<td>Type 2 Diabetes in Youth</td>
</tr>
<tr>
<td>88</td>
<td>Treatment of Overweight and Obese Persons with Diabetes</td>
</tr>
<tr>
<td>91</td>
<td>Treatment of Diabetes in the Elderly</td>
</tr>
<tr>
<td>93</td>
<td>Primary Care Providers’ Guide to Hospital Referral</td>
</tr>
<tr>
<td>94</td>
<td><strong>Section 3: Treatment of Complications of Diabetes</strong></td>
</tr>
<tr>
<td>95</td>
<td>Treatment of Diabetic ketoacidosis (DKA) and Hyperglycaemic Hyperosmolar Syndrome (HHS)</td>
</tr>
<tr>
<td>97</td>
<td>Microvascular Complications</td>
</tr>
<tr>
<td>98</td>
<td>Recommendations for Retinopathy in Diabetes</td>
</tr>
<tr>
<td>100</td>
<td>Recommendations for Nephropathy in Diabetes</td>
</tr>
<tr>
<td>103</td>
<td>Recommendations for Neuropathy in Diabetes</td>
</tr>
<tr>
<td>105</td>
<td>Management of Associated Conditions</td>
</tr>
<tr>
<td>106</td>
<td>Hypertension Management in Diabetes</td>
</tr>
<tr>
<td>107</td>
<td>Management Hypertension</td>
</tr>
<tr>
<td>113</td>
<td>Lipid Management in Adults with Diabetes</td>
</tr>
<tr>
<td>115</td>
<td>Other Therapeutic Interventions</td>
</tr>
<tr>
<td>116</td>
<td>Sexual Health Problems Associated with Diabetes: Erectile Dysfunction</td>
</tr>
<tr>
<td>117</td>
<td>Recommendations for Preventing Diabetic Foot Complications</td>
</tr>
<tr>
<td>124</td>
<td>Reference List</td>
</tr>
<tr>
<td>132</td>
<td>Appendices</td>
</tr>
</tbody>
</table>
List of Tables

21  **Table A:** Modules of the Guidelines for the Management of Diabetes in Primary Care

31  **Table 1:** Ethnicity Specific cut-offs for Type 2 Diabetes Mellitus risk equivalent to BMI ≥30kg/m² or WC ≥100cm (40in) in European populations

33  **Table 2:** Criteria for Identification of Metabolic Syndrome as Defined by Various BMI: Body mass index.

36  **Table 3:** Targets for Blood Pressure and Other Metabolic States in Diabetes Mellitus and Associated Conditions

**Table 4:** Guiding Principles for Client-Centred Delivery of Care for Type 2 Diabetes

38  **Table 4a**

39  **Table 4b**

41  **Table 4c**

42  **Table 4d**

44  **Table 4e**

55  **Table 5:** Criteria for Diagnosing Impaired Glucose Tolerance and Diabetes

58  **Table 6:** Oral Glucose Lowering Drugs

61  **Table 7:** Risks and Benefits of Common Glucose Lowering Agents
Table 8: Pharmacokinetic properties of Insulin Products

Table 9: Target Blood Glucose Levels in Persons with Diabetes

Table 10: Criteria for Diagnosing Diabetes and Gestational Diabetes

Table 11: Risk-based screening for Type 2 Diabetes or prediabetes in asymptomatic children and adolescents in a clinical setting

Table 12: Definition of Abnormalities in Renal Albumin Excretion

Table 13: Medicines Used in the Treatment of Hypertension
List of Algorithms

51  Algorithm 1: Screening of Diabetes

63  Algorithm 2: Treatment of Type 2 Diabetes

71  Algorithm 3: Treatment of Diabetes with Insulin

75  Algorithm 4: Treatment Diabetes in Pregnancy

86  Algorithm 5: Treatment of Minors with Elevated Blood Glucose

89  Algorithm 6: Treatment or Overweight and Obese Persons with Diabetes

108 Algorithm 7: Hypertension Treatment Protocols Using ARB/ACEI as First Line Management
List of Boxes

Box 1.1  Recommendations Screening for Type 2 Diabetes Mellitus
Box 1.2  Recommendations Screening Test
Box 1.3  Recommendations Diagnosing Diabetes
Box 1.4  Recommendations Monotherapy
Box 1.5  Recommendations Dual Therapy
Box 1.6  Recommendations Triple Therapy
Box 1.7  Recommendations Insulin
Box 1.8  Recommendations Pre-existing Diabetes in Pregnancy Part I
Box 1.9  Recommendations Pre-existing Diabetes in Pregnancy Part II
Box 1.10 Recommendations Pre-existing Diabetes and Other Comorbidities in Pregnancy
Box 1.11 Recommendations Presentation of Diabetes in Children
Box 1.12 Recommendations Diagnosis Diabetes in Children
Box 1.13 Recommendations Diabetes in the Elderly
Box 1.14  Recommendations Retinopathy
Box 1.15  Diabetic Kidney Disease
Box 1.16  Recommendations Nephropathy
Box 1.17  Recommendations Peripheral Neuropathy
Box 1.18  Recommendations Hypertension
Box 1.19  Recommendations Dyslipidaemia
Box 1.20  Recommendations Antithrombotics
Box 1.21  Doctor’s Role in Avoiding Diabetic Foot

List of Appendices

I. Diabetes Distress Screening Scale (DDS17)
II. The Patient Health Questionnaire-2 (PHQ-2)
III. FINDRISC Diabetes Risk Assessment Form
IV. Two Bag Technique for Treatment of Diabetic Ketoacidosis (DKA)
V. Hospital Care Diabetic Ketoacidosis (DKA) and Hyperosmolar Hyperglycemic Syndrome (HHS)
VI. Comprehensive Diabetic Foot Evaluation Form
VII. Referral Form to Hospital/Tertiary Care
# List of Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE</td>
<td>Angiotensin Converting Enzyme</td>
</tr>
<tr>
<td>ACEI</td>
<td>ACE inhibitors</td>
</tr>
<tr>
<td>ADA</td>
<td>American Diabetes Association</td>
</tr>
<tr>
<td>AER</td>
<td>Albumin Excretion Rate</td>
</tr>
<tr>
<td>ARB</td>
<td>Angiotensin Receptor Blockers</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>CARPHA</td>
<td>Caribbean Public Health Agency</td>
</tr>
<tr>
<td>CVD</td>
<td>Cardiovascular Disease</td>
</tr>
<tr>
<td>DCCT</td>
<td>Diabetes Control and Complications</td>
</tr>
<tr>
<td>DKA</td>
<td>Diabetic Ketoacidosis</td>
</tr>
<tr>
<td>DKD</td>
<td>Diabetic Kidney Disease</td>
</tr>
<tr>
<td>DM</td>
<td>Diabetes Mellitus</td>
</tr>
<tr>
<td>DPN</td>
<td>Distal Symmetric Polyneuropathy</td>
</tr>
<tr>
<td>DPP-4</td>
<td>Dipeptidyl Peptidase 4 Inhibitor</td>
</tr>
<tr>
<td>EMB</td>
<td>Evidence Based Medicine</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>EML</td>
<td>Essential Medical List</td>
</tr>
<tr>
<td>ESRD</td>
<td>End Stage Renal Disease</td>
</tr>
<tr>
<td>FBS</td>
<td>Fasting Blood Sugar</td>
</tr>
<tr>
<td>FINDRISC</td>
<td>Finnish Diabetes Risk Score</td>
</tr>
<tr>
<td>FPG</td>
<td>Fasting Plasma Glucose</td>
</tr>
<tr>
<td>GDM</td>
<td>Gestational Diabetes</td>
</tr>
<tr>
<td>GLP-1</td>
<td>Glucagon like Peptide 1 Receptor Agonist</td>
</tr>
<tr>
<td>HBA1c</td>
<td>Glycosylated Haemoglobin</td>
</tr>
<tr>
<td>HHS</td>
<td>Hyperglycaemic Hyperosmolar Syndrome</td>
</tr>
<tr>
<td>IDF</td>
<td>International Diabetes Federation</td>
</tr>
<tr>
<td>IGT</td>
<td>Impaired Glucose Tolerance</td>
</tr>
<tr>
<td>IFG</td>
<td>Impaired Fasting Glucose</td>
</tr>
<tr>
<td>Meds</td>
<td>Medications/Medicines</td>
</tr>
<tr>
<td>NCD</td>
<td>Non-Communicable Disease</td>
</tr>
<tr>
<td>NGSP</td>
<td>National Glycohaemoglobin Standardization Program</td>
</tr>
<tr>
<td>OECS</td>
<td>Organisation of Eastern Caribbean States</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>OGGT</td>
<td>Oral Glucose Tolerance Test</td>
</tr>
<tr>
<td>PAHO</td>
<td>Pan American Health Organization</td>
</tr>
<tr>
<td>PCP</td>
<td>Primary Care Physician</td>
</tr>
<tr>
<td>OECS PPS</td>
<td>OECS Pharmaceutical Procurement Service</td>
</tr>
<tr>
<td>PWD</td>
<td>Persons With Diabetes</td>
</tr>
<tr>
<td>RPG</td>
<td>Random Plasma Glucose</td>
</tr>
<tr>
<td>T1DM</td>
<td>Type 1 Diabetes Mellitus</td>
</tr>
<tr>
<td>T2DM</td>
<td>Type 2 Diabetes Mellitus</td>
</tr>
<tr>
<td>TZDs</td>
<td>Thiazolidinediones</td>
</tr>
<tr>
<td>UHC</td>
<td>Universal Health Coverage</td>
</tr>
<tr>
<td>WDF</td>
<td>World Diabetes Foundation</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>WINDREF</td>
<td>Windward Islands Research and Education Foundation</td>
</tr>
</tbody>
</table>
Preface

The CARPHA Guidelines on the Management of Diabetes in Primary Care in the Caribbean provide a strategic approach to improving diabetes health outcomes, by providing simple directives on key aspects of care for persons with diabetes (PWD).

In 2018, the OECS Health Unit, as part of the Strategic Pillar ‘Healthy Environments and Health Empowerment,’ and consistent with the emphasis placed on Non-communicable Diseases (NCDs) in the region, collaborated with CARPHA and WINDREF and secured funding from the World Diabetes Foundation for the implementation of the “OECS Diabetes, Prevention and Care Project.” A key component of the project, required to support its implementation, was the updating of clinical practice guidelines for the management of diabetes. The collaborators viewed this project as opportune, as it allowed for the review and update of the CARPHA Management of Diabetes in Primary Care in the Caribbean.

Previous versions of these guidelines were produced in 1995, 1998 and 2006. However, with rapid advancements in research, resulting in new international guidelines and treatment protocols, there was a need for an updated document to be produced. Consistent with its remit to provide an accurate, timely and relevant evidence-base for public health decision-making, the Caribbean Public Health Agency teamed up with the Organisation of Eastern Caribbean States to expedite the production of the revised guidelines, aligning them with current World Health Organization (WHO) strategies on Non-communicable Disease (NCD) treatment and management, including the WHO HEARTS and WHO Package of Essential Package of Non-communicable Disease Interventions (WHO PEN).
High quality, evidence informed clinical practice guidelines bridge the gap between policy, best practice, local contexts and client choice. They have been upheld as an essential part of quality medical practice and have been defined as ‘a convenient way of packaging evidence and presenting recommendations to health care decision makers,’ improving effectiveness and quality of care, by standardising clinical practices, and reducing costly and preventable mistakes and adverse events.

This newest version of the CARPHA guidelines has been extensively modified from its previous format and uses a modular approach which includes five modules.

- Module 1: EVIDENCE-BASED TREATMENT PROTOCOLS
- Module 2: GUIDING LIFESTYLE CHANGES
- Module 3: GUIDANCE FOR PERSONS WITH DIABETES (PWD) AND CAREGIVERS
- Module 4: ACCESS TO ESSENTIAL MEDICINES
- Module 5: SYSTEMS FOR MONITORING

These modules are intended for use by clinicians, caregivers, policymakers and programme managers. Each one focuses on complementary aspects of care of diabetes in the health system, and targets different cadres of workers and care providers for management of diabetes. Target users may vary, based on context, existing health systems and national priorities in CARPHA Member States, and recommendations made in each of the modules may require adaptation for implementation at country level. Ultimately, the revised guidelines seek to support the efforts of Ministries of Health, to strengthen and standardise the management of diabetes in primary care and improve outcomes in care of diabetes, regionally.
Acknowledgements

The Caribbean Public Health Agency and the Organisation of Eastern Caribbean States acknowledge, with appreciation, the World Diabetes Foundation (WDF) and the several regional individuals and agencies whose contributions were indispensable to the successful completion of these revised guidelines:

Dr. Avery Hinds and Dr. Lisa Monrose, the Consultants who were instrumental in the development of this revised document.

The members of the CARPHA Expert Working Groups:

**WORKING GROUP 1:**

- Prof. Surujpal Teelucksingh - UWI, St. Augustine
- Dr. Michael Boyne - UWI, Mona
- Dr. Marshall Tulloch-Reid – UWI, Mona
- Dr. Sonia Roache-Barker - Caribbean College of Family Practitioners (CCFP)
- Prof. Nigel Unwin - UWI, Cave Hill
- Dr. Claude Khan – Ministry of Health Trinidad and Tobago

**WORKING GROUPS 2 AND 3:**

- Ms. June Holdip - Registered Dietitian
- Ms. Alecia Surujlal - Registered Dietitian, Diabetes Educator
- Ms. Jochelle Mohammed - Registered Dietitian
• Ms. Vanesa Martina - Public Health Nutritionist
• Ms. Denesia Venus - Registered Dietitian and Public Health Nutritionist

The technical persons who assisted in the provision of materials, development of various modules, editing and revision including:

• CARPHA Technical Officers - Dr. Kimberly Ashby-Mitchell, Dr. Virginia Asin-Oostburg, Dr. Cheryl Jones, Dr. Glennis Andall-Brereton, and Ms. Christine Bocage
• OECS Health Unit Staff - Ms. Lydia Atkins, Dr. Carlene Radix, and Ms. Eliza James
• OECS Pharmaceutical Procurement Service Unit - Mr. Francis Burnett and Mr. Abraham Weekes
• WINDREF - Professor Calum MacPherson and Dr. Satesh Bidaisee
• Ministry of Health Saint Lucia - Dr. Christy Nathaniel and Ms Ira Isaac
• Dr. Rohan Maharaj - University of the West Indies
• Ms. Anica Sanoir – Caribbean Certified Diabetes Educator
• Health Professionals, who participated in the peer review consultations
• Mr. Sherlan Gittens, responsible for the graphics and layout of the guidelines
CARPHA Diabetes Guidelines: The Modular Approach Expanded

The revised CARPHA Diabetes Guidelines take a modular approach to providing guidance on the Management of Diabetes in Primary Care in the Caribbean.

Module 1: EVIDENCE-BASED TREATMENT PROTOCOLS
Targets primary care physicians, nurse-practitioners and any other health care provider who is directly involved in the medical management of diabetes. This module aims to give updated algorithms on care, incorporating the most recent recommendations in the care of diabetes.

Module 2: GUIDING LIFESTYLE CHANGES
Intended for all persons on the health team, who provide care and lifestyle counselling to persons living with diabetes (PWD). It is specifically geared toward physicians, dietitians, nutritionists, nurses, community aides and home-help. This module covers all aspects of lifestyle that directly impact target outcomes. Therefore, diet, physical activity, weight management and mental health are addressed in this module.

Module 3: GUIDANCE FOR PERSONS WITH DIABETES (PWD) AND CAREGIVERS
Aims to inform to persons living with diabetes (PWD) and all persons involved in their care, with or without a medical or health care background. This module should be particularly useful to community nurses, home-help, community aides, and other community caregivers,
especially those involved in caring for PWD in their homes and can serve as a directory of topics relevant to caregivers. It addresses topics such as foot care, self-monitoring of blood glucose, identification and management of low blood glucose (hypoglycaemia) and high blood glucose (hyperglycaemia).

**Module 4: ACCESS TO ESSENTIAL MEDICATION**
Targets physicians, nurses, pharmacists and personnel involved in ensuring the efficiency of health system procurement mechanisms. It provides information on the various classes of medicine available for care of diabetes, issues related to their availability, as well as the risks, benefits and cautions that should be considered in their use.

**Module 5: SYSTEMS FOR MONITORING**
Targets all health care providers but is of particular relevance to Primary Care Managers and those involved in health systems evaluations. It focuses on monitoring and reporting information on the prevention and management of T2DM, and the implementation of the guidelines using standardised indicators and data collection tools.

Table I, below, summarises the scope and highlights the target users of each module.
Table A: Modules of The Guidelines For The Management Of Diabetes In Primary Care In The Caribbean

<table>
<thead>
<tr>
<th>Modules of the Management of Diabetes in Primary Care Guidelines</th>
<th>What does it cover?</th>
<th>Who are the target users?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module 1 Evidence Based Treatment Protocols</td>
<td>Documentation of protocols aimed at standardizing the clinical approach to the management of T2DM in primary care.</td>
<td>Physicians</td>
</tr>
<tr>
<td>Module 2 Guiding Lifestyle Changes</td>
<td>Information on lifestyle interventions that target the four modifiable risk factors for diabetes.</td>
<td>Physicians</td>
</tr>
<tr>
<td>Module 3 Guidance for PWD and Caregivers</td>
<td>Information for Persons With Diabetes (PWD) and lay caregivers related to the care of diabetes.</td>
<td>Physicians</td>
</tr>
<tr>
<td>Module 4 Access to Essential Medications</td>
<td>Information on medicines and technologies available for diabetes management and their supply-chain management at the primary care facility level.</td>
<td>Physicians</td>
</tr>
<tr>
<td>Module 5 Systems for Monitoring</td>
<td>Monitoring and reporting information, standardized indicators and data collection tools for use in the prevention and management of T2DM.</td>
<td>Physicians</td>
</tr>
</tbody>
</table>
The Client-Centred Approach to Chronic Care

Diabetes is a chronic illness which extends across an individual’s lifespan. The goal of all clinicians and persons on the health team should therefore be to deliver optimal and evidence-based care and support. The Chronic Care Model, endorsed by the Pan American Health Organization/World Health Organization (PAHO/WHO), emphasises the importance of the team approach to the care of all Non-communicable Diseases (NCDs) and further underscores the integral role of high-level policy support in optimising the delivery of care to persons with chronic illnesses. This framework informs the approaches recommended in these guidelines and is both endorsed and encouraged by CARPHA and the OECS as a mechanism for improving the standard of health care delivered to people of the region.

The Chronic Care Model identifies patient-centeredness, effectiveness, efficiency, equity and timeliness as essential elements of efficient health service delivery for people with this chronic illness. From as early as the 1980’s, the approach to the care of “clients” has undergone a paradigm shift from the doctor-centred model, to one which gives more focus, autonomy and involvement to the recipient of health care services, initially called “patient-centred care.” Moria Stewart et al (2003), highlighted that persons receiving care preferred this model and reported improved satisfaction, outcomes, and health care utilisation with this approach. As archetypes, relating to health care delivery continued to evolve, and the shared role of health care providers and recipients in decision-making became more widely accepted, and the terminology describing health care participants was updated. “Patients” are now called “clients,” a term recognising the
more empowered role they play in their own health care. Rather than passively presenting to be “fixed” by a doctor, they are recognised as an integral part of the health care team for their treatment. These guidelines will therefore utilise the terms “persons with diabetes” (PWD) and “clients” in reference to the recipients of health care services for diabetes.

At each visit, health care providers need to remember that clients are individuals, with the circumstances of their lives constantly changing. The natural progression of the disease process also means that recommended management will almost certainly need to be adjusted periodically. Early involvement of the wider team of health professionals in the prevention and management of the complications of diabetes is a critical risk mitigation strategy, the success of which hinges upon the cooperation of educated, motivated clients and integrated, coordinated providers of health care. At each point of care, it behoves the care-provider, to seek an integrated understanding of the client’s world and to solicit feedback alongside the provision of their recommendations for improving management. Each member of the health team must recognise that managing the non-clinical (emotional, social, economic, psychological) needs and life issues of the client plays an important role in ensuring successful outcomes and must understand the relevance of tailoring their care to suit their individual clients.

Integrating the individual client-centred approach into the broader framework of the Chronic Care Model will, necessarily, take varying forms in different Member States and will require the adaptation of both systems and individuals to new ways of executing health care functions; but the benefits to be derived at both the individual and the systemic level from improving the quality of health care delivery have been shown, in many other jurisdictions greatly, to outweigh the costs.
Methodology of Guideline Development

The guidelines adopted the most recent recommendations from organisations including the International Diabetes Federation (IDF), American Diabetes Association (ADA), World Health Organization (WHO), the UK NICE Guidelines and other relevant sources. Instrumental documents included, but were not limited to the: IDF 2017 Recommendations For Managing Type 2 Diabetes In Primary Care; ADA Standards of Medical Care in Diabetes (2018 & 2019 iterations); WHO Guidelines on 2nd and 3rd Line Medicines and Types of Insulin for Control of Blood Glucose Levels in Non-pregnant Adults with Diabetes and the WHO HEARTS technical package for Cardiovascular Disease management in primary health care.

The updating of the guidelines utilised an iterative process for review and adhered to the Institute of Medicine’s (IOM) standards for developing trustworthy clinical practice guidelines. The IOM recommends that a Guidelines Development Group should be multidisciplinary and balanced, including methodological experts, clinicians, and populations expected to be affected, and should adopt strategies that increase effective participation. This was facilitated through the multidisciplinary CARPHA Expert Committee, who reviewed the draft iterations of the guidelines; and the broad stakeholder consultation, held in Saint Lucia, which allowed key end-users to provide feedback on the utility of the guidelines. Both internal and external review committees were developed to ensure that the final iteration of the guidelines was satisfactory. Additionally, WINDREF coordinated and facilitated a regional ‘Training of Trainers’ workshop in Grenada, which also provided and opportunity for attendees, health care professionals
involved in the management of diabetes, to give feedback on an early draft of the guidelines, accommodating broad-based reviewer input.

A consultant, based at the OECS Health Unit, was secured to update the guidelines and the CARPHA expert working group, who had drafted the first iteration of the guidelines was engaged for peer review to ensure that the most current and rigorous scientific evidence was included. The consultant, through a desk review, used the latest published version of the current guidelines for the management of Type 2 Diabetes around the world, limiting the selection to guidelines that were available in English.
MODULE 1
Evidence-Based Treatment Protocols for Diabetes
Introduction

The American Diabetic Association (ADA) defines Diabetes Mellitus (DM) as a group of metabolic diseases, characterised by hyperglycaemia, resulting from defects in insulin production and/or action. It is a complex, chronic illness that requires continuous medical care coupled with multifactorial risk-reduction strategies that go beyond glycaemic control. Significant evidence exists which purports that ongoing client self-management, education and support are critical to preventing acute complications and reducing the risk of long-term complications. There are four clinical classes of diabetes:

- **Type 1 Diabetes Mellitus (T1DM)** – due to autoimmune β-cell destruction and absolute insulin deficiency
- **Type 2 Diabetes Mellitus (T2DM)** – due to progressive β-cell dysfunction or insulin resistance
- **Gestational Diabetes (GDM)** – defined as glucose intolerance with onset or first recognition during pregnancy, usually in the 2nd and 3rd Trimester of pregnancy
- **Secondary Diabetes** – due to other causes such as genetic defects in β-cell function or in insulin action, (e.g. Monogenic Diabetic Syndrome), diseases of the exocrine pancreas (e.g. cystic fibrosis), and drug-induced or chemical-induced causes (e.g. treatment of human immunodeficiency virus/acquired immune deficiency syndrome [HIV/AIDS]).

Type 2 Diabetes (T2DM) is the most prevalent type of diabetes found worldwide. It is associated with modifiable, lifestyle-related risk factors interacting with non-modifiable and genetic risk factors. Globally 422 million adults live with diabetes and 1.6 million deaths resulted from this disease in 2015 (WHO 2018). Over the past decade, the prevalence of diabetes in several CARPHA Member States (CMS), was
estimated, using the WHO STEPS Risk Factor Survey methodology, and was found to be between ~7% and 20% of the population in various countries of the region. Age-standardised mortality rates for diabetes, in Caribbean countries, during the period 2000 to 2016, were among the forty (40) highest in the world – with OECS nations holding two (2) of the top twenty (20) spots (WHO GHE 2018); and during the same period, diabetes remained among the top three (3) causes of mortality in the English and Dutch-speaking Caribbean, accounting for between 8% and 12% of all deaths, annually, for CARPHA Member States (CMS). Additionally, diabetes is a key contributor to the development of ischaemic heart disease, the leading cause of death in the Region in 2016. (CARPHA 2017)

Diabetes, therefore, is a significant contributor to morbidity and mortality in the regional population. Given that its outcomes can be improved by early, evidence-based intervention on known risk factors, it is the duty of health care providers to optimise the care delivered to persons living with diabetes in the region, so as to mitigate its impact at both the level of the individual and the population.
Risk Factors for Type 2 Diabetes Mellitus

A key tenet of public health practice is the prevention of adverse events, through risk factor identification and the implementation of risk-reduction and avoidance strategies at both the individual and the population level. The published body of medical literature is replete with studies which identify risk factors for Type 2 Diabetes Mellitus (T2DM). The main ones are captured below. As clinicians and caregivers, our role is to prevent the complications of diabetes by identifying elevated risk of developing DM in those who have not yet developed disease, and by identifying disease in the persons who have not yet developed symptoms and complications, working alongside each client to mitigate risks through concerted lifestyle and behaviour-change approaches.

Figure 1: Risk Factors for Type 2 Diabetes Mellitus
Non-modifiable Factors
- Age 40 years and older (IDF 2017)
- First-degree relative with diabetes
- Ethnicity (especially among persons of Asian and African descent)
- History of previous Gestational Diabetes Mellitus (GDM) women who delivered a baby weighing 4 kg (9lbs)
- History of Impaired Glucose Tolerance (IGT), Impaired Fasting Glucose (IFG)/HbA1c ≥ 5.7%

Modifiable Factors
- Overweight or obesity as measured by:
  » Body Mass Index- BMI (Wt(kg)/height²(m²))
  » Waist Circumference
- Physical inactivity

Of these, age, ethnicity and past medical and family history, are used to stratify risk and to guide screening and follow-up; while obesity and physical inactivity are amenable to lifestyle interventions, which will be discussed in greater detail in Module 2 of these guidelines. It is important to note that risk-thresholds for obesity have been demonstrated to be ethnicity-specific (Ntuk et al 2014). Compared to persons of European descent, persons of African, Indian and Chinese descent demonstrate equivalent risks of diabetes at lower values of BMI and Waist Circumference. Consequently, the commonly used cut-off values for obesity (BMI ≥30kg/m² or WC ≥100cm (40in)) are not adequately sensitive for risk reduction in the Caribbean setting, where most of our populations belong to the aforementioned ethnic groups. Ethnicity-specific thresholds for BMI and Waist Circumference are, therefore, specified in Table 2 below.
<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>WC in Centimetres</th>
<th>WC in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>West-African</td>
<td>88</td>
<td>79</td>
</tr>
<tr>
<td>Indo-Asian</td>
<td>79</td>
<td>70</td>
</tr>
<tr>
<td>Sino-Asian</td>
<td>88</td>
<td>74</td>
</tr>
<tr>
<td>Western-European</td>
<td>102</td>
<td>88</td>
</tr>
</tbody>
</table>

**High Risk BMI Thresholds (kg/m²) by Ethnicity and Sex**

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>West-African</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>Indo-Asian</td>
<td>23</td>
<td>22</td>
</tr>
<tr>
<td>Sino-Asian</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>Western-European</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 1: Ethnicity Specific cut-offs for T2DM risk equivalent to BMI ≥30kg/m² or WC ≥100cm (40in) in European populations.
The Metabolic Syndrome – and the Wider Context of Risk Reduction

The Metabolic Syndrome is characterised by the occurrence of multiple co-morbidities including obesity (especially central obesity), dyslipidaemia (especially high levels of triglycerides and low levels of high-density lipoprotein cholesterol), hyperglycaemia and hypertension. Persons with the Metabolic Syndrome are at a significantly increased risk of developing both diabetes and Cardiovascular Disease (CVD). Extrapolating from various risk-factor surveys, it can be seen that the risk-factor profile of a large proportion of the Caribbean population meets many of the criteria for the metabolic syndrome, likely contributing to the high morbidity and mortality from diabetes and CVD, in the region. The shared risk factors for the Metabolic Syndrome and DM, provide an opportunity to reduce the occurrence of both DM and CVD, through concerted risk-factor screening and implementation of risk-reduction strategies.

The Metabolic Syndrome has been recognized since the 1990’s, with several institutions having proposed criteria for it over the decades. Table 3 captures the most commonly used criteria, including those of the National Cholesterol Education Programme (NCEP), which have gained the most traction.

Given the greater association between obesity and diabetes, and the prevalence of both these factors in Caribbean populations, the IDF criteria – modified by the use of ethnicity-specific cut offs for obesity (see above Table 3) – would be the most relevant for use in our settings.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Requirement</td>
<td>Diabetes, impaired fasting plasma glucose, glucose intolerance or insulin resistance plus two or more of the following:</td>
<td>Hyperinsulinemia (Fasting insulin values above quartile for the non-diabetic population) plus with two or more of the following:</td>
<td>Three or more of the following:</td>
<td>Central obesity (ethic specific values or BMI ≥ 30kg/m²) plus two or more of the following:</td>
</tr>
<tr>
<td>Central Obesity</td>
<td>BMI &gt; 30kg/m² or waist-to-hip ratio &gt;0.9 in male or &gt;0.85 in female</td>
<td>Waist circumference ≥ 94cm in male or ≥ 80cm in female</td>
<td>Waist circumference ≥ 120cm in male or ≥ 88cm in female</td>
<td></td>
</tr>
<tr>
<td>Blood Pressure</td>
<td>≥140/90mmHg</td>
<td>≥140/90mmHg or treatment for hypertension</td>
<td>≥135/85mmHg</td>
<td>≥135/85mmHg or treatment for hypertension</td>
</tr>
<tr>
<td>HDL-C</td>
<td>&lt; 0.9 mmol/L (35mg/dL) in male or &lt; 1.0 mmol/L (39mg/dL) in female</td>
<td>&lt;1.0 mmol/L (40mg/dL) or treatment for dyslipidemia</td>
<td>&lt; 1.0mmol/L (40mg/dL) in male or &lt; 1.3mmol/L (50mg/dL) in female</td>
<td>&lt; 1.0mmol/L (40mg/dL) in male or &lt;1.3 mmol/L (50mg/dL) in female or treatment for dyslipidemia</td>
</tr>
<tr>
<td>Fasting Plasma Glucose</td>
<td></td>
<td>≥ 6.1mmol/L (110mg/dL)</td>
<td>≥ 6.1mmol/L (110mg/dL)</td>
<td>≥ 5.6mmol/L (100mg/dL) or previously diagnosed Type 2 diabetes</td>
</tr>
<tr>
<td>Microalbuminuria</td>
<td>Urinary albumin excretion rate ≥ 50 µg/min or albumin: creatinine ratio ≥ 30mg/g</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
 Targets for Blood Pressure and Other Metabolic States in DM and Associated Conditions

NCD risk factor surveys for several Caribbean Countries have highlighted the prevalence of many of the derangements (biochemical, anthropometric and otherwise) that correlate with the metabolic syndrome. The mortality profiles of our member states bear out this fact with Cardiovascular Disease and diabetes, maintaining their places in the top 3 causes of mortality for nearly every CMS for the past 16 years. Lifestyle measures principally, changes in nutritional habits and physical activity, may reverse some of the glucose, lipid and blood pressure disorders of diabetes (Diabetes Voice May 2003) and by extension, the metabolic syndrome. Clinical intervention in the process of screening for, diagnosing and managing diabetes therefore, presents ample opportunity to improve control of all of the derangements that constitute the metabolic syndrome, thereby improving population morbidity and mortality from both DM and CVD. Targets for management of each of these components can be found the text and tables that follow.

**HbA1c targets:**

1. <6.5% in younger clients without CVD and with diabetes for a shorter duration, and in those without severe risk factors for hypoglycaemia.

2. <8.0% in older clients, in clients with known CVD, other comorbid diseases or advanced microvascular complication, hypoglycaemic unawareness and where there is no need to prevent long-term complication if expected lifespan will be short.
Cholesterol Targets:
3. LDL cholesterol <100mg/dL in clients without CVD
4. LDL cholesterol <70 mg/dL in clients with CVD
5. LDL cholesterol <40% baseline in clients with CVD regardless of baseline
6. LDL-C or Relative LDL-C reduction of approximately 40% if goals cannot be achieved because of high baseline
7. LDL-C or poor response to therapy
   a. Optimise Statin therapy to achieve target for LDL-C. The use of niacin or fibrates is actively discouraged.

Blood Pressure Targets
8. Less than or equal to 130/80mHg in persons with other high-risk conditions including Cardiovascular Disease, Stroke, Chronic Kidney Disease. Lower BP targets may be considered in younger clients without high risks of a cardiovascular event.

Weight-Loss Targets
9. Weight loss of at least 7% improves CVD risk factors, including lipid profile and HbA1c in persons with diabetes, with remission in T2DM.

Physical Activity Targets
10. Physical activity such as low-intensity aerobic exercise (i.e. walking), independent of dietary changes can reduce visceral fat.
Table 3: Targets for Blood Pressure and Other Metabolic States in DM and Associated Conditions

<table>
<thead>
<tr>
<th>Measure</th>
<th>Target/Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Pressure</td>
<td>&lt;130/80mm/Hg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Biochemistry</th>
<th>Target/Goal (mg/dL)</th>
<th>Target/Goal (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood glucose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preprandial</td>
<td>80-130mg/dl</td>
<td>4.4-7.2mmol/L</td>
</tr>
<tr>
<td>Postprandial</td>
<td>&lt;180mg/dl</td>
<td>10mmol/L</td>
</tr>
<tr>
<td>HBA1c</td>
<td>&lt;7.0%</td>
<td>&lt;7.0%</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>&lt;200mg/dL</td>
<td>&lt;5.2mmol/L</td>
</tr>
<tr>
<td>LDL</td>
<td>&lt;100 mg/dL (if no CVD)</td>
<td>&lt;2.5 mmol/L (if no CVD)</td>
</tr>
<tr>
<td></td>
<td>&lt;70mg/dL (if CVD present)</td>
<td>&lt;1.8mmol/L (if CVD present)</td>
</tr>
<tr>
<td>HDL</td>
<td>Men: &gt;40 mg/dL</td>
<td>Men: &gt;1.0 mmol/L</td>
</tr>
<tr>
<td></td>
<td>Women: &gt;50 mg/L</td>
<td>Women: &gt;1.3 mmol/L</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>&lt;150mg/dL</td>
<td>&lt;1.7mmol/L</td>
</tr>
</tbody>
</table>
Overview of the Clinical Encounter

The approach to all clients presenting for clinical care is structured around the main pillars of the clinical encounter: history-taking; clinical examination; and appropriate investigation. The following figure highlights the alignment of these components to the principles of client-centred care; and the natural flow of the encounter from the initial history to the commencement of shared management.

**History Taking**
- Explore both the disease and illness
- Understand the whole person
- Explore FIFE (Feelings, Ideas, Function, Expectations)
- Find common ground

**Clinical Exam & Investigations**
- Explore for other comorbidities/issues
- Look for any possible complications
- Screen for Depression and other mental health issues

**Management**
- Shared decision-making
- Be realistic
The History

The starting point of all clinical encounters (with a conscious client, in no distress) is the elicitation of a complete and relevant history. While current symptoms and past medical history are par for the course in any consultation, the following table highlights the key points that should not be overlooked when interviewing the newly presenting person with diabetes (PWD). An open-ended, informal discussion

Table 4a: Guiding Principles for Client-Centred Delivery of Care for Type 2 Diabetes

<table>
<thead>
<tr>
<th>Delivery of Care Components</th>
<th>Highlights of a Client-Centred Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Initial Visit</strong></td>
<td><strong>History</strong></td>
</tr>
<tr>
<td>Presenting complaint</td>
<td>Ask about client’s concerns and how</td>
</tr>
<tr>
<td>Ask about client’s concerns</td>
<td>the diabetes is affecting their daily</td>
</tr>
<tr>
<td>Past medical history</td>
<td>activities</td>
</tr>
</tbody>
</table>
| Identify other medical conditions | Explore: 
| Risk factor assessment      | *Feelings*: How do they feel knowing    |
| Smoking                     | they have diabetes? Overall what is     |
| Alcohol intake              | their mood like?                         |
| Exercise patterns           | *Ideas*: What do they think about how   |
| Diet                        | to manage their health and obtain target |
| Family history of DM, HTN, vascular disease | blood sugars? |
| Identify factors that may affect management of diabetes | *Function*: How does having diabetes affect their everyday activities? |
| Ask about any traditional, herbal or over the counter medicines being taken | *Expectations*: What do they hope to achieve from the consultation and the health partnership with you? |
| Note mental health issues that need to be managed to allow for proper management of DM | Structured approaches and standardised tools for assessing clients’ psychosocial status relating particularly to depression and diabetes distress are outlined in Appendix II of Module 1. |
| Psychosocial assessment     | |
around general mental state can be a helpful starting point for the psychosocial assessment, and standardised tools for supplementing the identification of depression and/or distress related to diabetes, can be found in appendix of Module 1.

The Clinical Examination

The physical exam presents the opportunity to identify signs of

Table 4b: Guiding Principles for Client-Centred Delivery of Care for Type 2 Diabetes

<table>
<thead>
<tr>
<th>Delivery of Care Components</th>
<th>Highlights of a Client-Centred Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>A thorough clinical examination should be done paying special attention to:</td>
<td>• A partnership should be developed with the client where they are informed of findings and make decisions with their primary care provider about short and long-term goals.</td>
</tr>
<tr>
<td>• General appearance, evidence of atrophy, ulcers etc.</td>
<td>• Goals should be set for:</td>
</tr>
<tr>
<td>• Height, weight (calculate BMI Wt (kg)/Ht (m²)</td>
<td>• HBA1c levels</td>
</tr>
<tr>
<td>• Waist circumference</td>
<td>• Blood pressure</td>
</tr>
<tr>
<td>• Blood Pressure</td>
<td>• Weight</td>
</tr>
<tr>
<td>• Skin for evidence of infections, ischemia, ulcers and state of insulin sites</td>
<td>Module 3 can be utilized here to inform clients on how to monitor and care for themselves between visits</td>
</tr>
<tr>
<td>• Mouth for gingivitis, periodontitis</td>
<td></td>
</tr>
<tr>
<td>• Heart for cardiomegaly and murmurs</td>
<td></td>
</tr>
<tr>
<td>• Eyes for visual acuity and evidence of diabetic retinopathy (clients should be referred to ophthalmologist annually for full eye exam)</td>
<td></td>
</tr>
<tr>
<td>• Abdomen for hepatomegaly</td>
<td></td>
</tr>
<tr>
<td>• Feet for evidence of peripheral artery disease and neuropathy</td>
<td></td>
</tr>
<tr>
<td>• Peripheral pulses-dorsalis pedis and posterior tibialis</td>
<td></td>
</tr>
<tr>
<td>• Neurological system for evidence of cranial and peripheral neuropathy</td>
<td></td>
</tr>
</tbody>
</table>
end-organ damage. Findings may be corroborated by the routine investigations that accompany the examination and constitute a part of the regular follow-up. In at least one audit of the previous iteration of these guidelines (Pinto-Periera et al 2009), it was noted that certain components of the physical examination tended to be omitted or overlooked. Most commonly among the omitted were measurement of waist-circumference and the performance of fundoscopy. We therefore take the opportunity to emphasize the importance of the former in risk stratification and the latter in the mitigation of blindness as a preventable outcome.

Investigations and Management

Management of Persons with Diabetes (PWD) involves the careful follow-up of blood-pressures, glucose and lipid levels, as risk reduction strategies for mitigating target-organ damage. Investigations at the initial visit therefore, include baseline measures of these biochemical parameters, as well as investigations of target-organ well-being. Urinalysis, fundoscopy (and fundal photography), and cardiac investigations, all form part of the initial assessment and periodic repetitions of these investigations are recommended in table below. In Type 1 Diabetes Mellitus (T1DM), it is also advisable to add thyroid function monitoring to the battery of investigations.

Timely referral to the relevant specialists (Nephrologists, Neurologists, Ophthalmologists, Cardiologists, Endocrinologists) is strongly recommended if abnormalities are identified in the investigations of target-organ function. Lifestyle management counselling, including guidance on self-monitoring of blood glucose (SMBG), is of paramount importance in maintaining control of diabetes and is an essential complement to pharmacologic management of blood glucose.
• In office, a urinalysis should be done (checking for glycosuria and ketones >3+)

• Blood Investigations
  • Fasting Plasma Glucose
  • HBA1c
  • Fasting or non-fasting Lipid Profile
  • Serum Creatinine
  • Haemoglobin
  • Check thyroid function at initial diagnosis of T1DM and consider re-checking every 1-2 years (ADA Standards of Medical Care (2015, 2018))

• Urine Investigations
  • Ketones
  • Protein/microalbuminuria

• Other Investigations
  • ECG
  • Echo cardiogram
  • Doppler
  • Fundal photography

• Advise client about lifestyle management
• Prescribe pharmacologic treatment
• Refer to relevant specialists
• Educate on glucose monitoring
### Follow-up Visits

Table 4d: Guiding Principles for Client-Centred Delivery of Care for Type 2 Diabetes

<table>
<thead>
<tr>
<th>Delivery of Care</th>
<th>Delivery of Care Components</th>
<th>Highlights of a Client-Centred Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At Every Visit</td>
<td>Set realistic goals for the next visit</td>
</tr>
<tr>
<td></td>
<td>• Measure weight and height</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Determine BMI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Measure BP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Review self-monitoring of blood glucose results</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Elicit information on adherence to treatment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ask about symptoms including hypoglycaemia (especially in persons taking insulin)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enquire about adherence to smoking, alcohol, diet and physical activity advice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enquire about mental health</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Enquire about sexual health</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• The frequency and severity of hypoglycaemic events should also be ascertained on first assessment of all clients with known diabetes and on all follow-up visits.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Repeat HBA1c every 3 months</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Counsel client on lifestyle management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Prescribe pharmacologic treatment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Refer to relevant specialist</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Educate on glucose monitoring</td>
<td></td>
</tr>
</tbody>
</table>
The follow-up and annual visits present the clinician with the opportunity to monitor progress toward glycaemic, lipid and weight-control targets; review target-organ function and gauge the client’s adjustment to their new lifestyle and disease-management responsibilities. The following two tables highlight the examinations and investigations that should form a routine part of these visits.
Annual Visits

Table 4e: Guiding Principles for Client-Centred Delivery of Care for Type 2 Diabetes

<table>
<thead>
<tr>
<th>Delivery of Care Components</th>
<th>Highlights of a Client-Centred Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Annual Review:</strong></td>
<td></td>
</tr>
<tr>
<td>• Measure weight and height</td>
<td></td>
</tr>
<tr>
<td>• Determine BMI</td>
<td></td>
</tr>
<tr>
<td>• Measure BP</td>
<td></td>
</tr>
<tr>
<td>• Measure waist circumference</td>
<td></td>
</tr>
<tr>
<td>• Review self-monitoring of blood glucose results</td>
<td></td>
</tr>
<tr>
<td>• Elicit information on adherence to treatment</td>
<td></td>
</tr>
<tr>
<td>• Ask about symptoms including hypoglycaemia (especially in persons taking insulin)</td>
<td></td>
</tr>
<tr>
<td>• Enquire about adherence to smoking, alcohol, nutrition and physical activity advice</td>
<td></td>
</tr>
<tr>
<td>• Review diet and physical activity levels (especially if overweight or plasma glucose is unacceptable)</td>
<td></td>
</tr>
<tr>
<td>• Enquire about mental health (especially depression)</td>
<td></td>
</tr>
<tr>
<td>• Enquire about sexual health</td>
<td></td>
</tr>
<tr>
<td><strong>Feet:</strong></td>
<td></td>
</tr>
<tr>
<td>• Ascertain if peripheral neuropathy or PVD are present</td>
<td></td>
</tr>
<tr>
<td>• Classify feet as being high or low risk for DM foot problems</td>
<td></td>
</tr>
<tr>
<td><strong>Eyes:</strong></td>
<td></td>
</tr>
<tr>
<td>• Annual check for diabetic retinopathy</td>
<td></td>
</tr>
<tr>
<td><strong>Mouth:</strong></td>
<td></td>
</tr>
<tr>
<td>• Check for gum disease and tooth decay</td>
<td></td>
</tr>
<tr>
<td><strong>Investigations:</strong></td>
<td></td>
</tr>
<tr>
<td>• Microalbuminuria</td>
<td></td>
</tr>
<tr>
<td>• HbA1c</td>
<td></td>
</tr>
<tr>
<td>• Dyslipidaemia</td>
<td></td>
</tr>
<tr>
<td>• Thyroid Disease (in T1DM) - Biennially</td>
<td></td>
</tr>
<tr>
<td><strong>Therapeutic Treatment Plan:</strong></td>
<td></td>
</tr>
<tr>
<td>• Counsel client on lifestyle management</td>
<td></td>
</tr>
<tr>
<td>• Prescribe pharmacologic treatment</td>
<td></td>
</tr>
<tr>
<td>• Refer to relevant specialist</td>
<td></td>
</tr>
<tr>
<td>• Educate on Glucose monitoring</td>
<td></td>
</tr>
</tbody>
</table>
The Multidisciplinary Team Approach

The Chronic Care Model (CCM), endorsed by PAHO/WHO, aligns with broader PAHO approaches for strengthening health systems, which are based on integrated service networks for health care delivery at the primary care level. Among its areas of focus, the CCM underscores the

Figure 2: Two-tiered model for multidisciplinary team care of PWD
importance of a client-centred approach to engaging a multidisciplinary team of health care professionals in the management of clients’ needs - a key consideration in the optimization of health care delivery at the primary care level. Successful management of PWD is the domain of a variety of professionals. The graphic below models the tiers of care accessed by the client during the course of their interactions with the health system.

The client is the central figure in this model. The primary care physician and the certified diabetes educator or diabetes nurse both engage with each other and with the client to identify risks, set goals, and guide the client to accessing the relevant levels of care. The inner tier represents the primary and secondary preventive levels of intervention, where risk-reduction in diet, physical activity, foot-care and mental health are combined with pharmacotherapy to achieve the goals and targets of individualised client management, with the aim of preventing or slowing the development of target organ damage. The outer tier represents the tertiary prevention circle – the network of clinical specialists to whom the client will be referred, in some cases for baseline assessment, and in all cases for intervention in the event that complications supervene.

The figure below outlines general referral criteria for the specialist services referenced above.
Figure 3: General referral criteria for the specialist services
Section 1: Screening, Diagnosis and Treatment of Diabetes
Screening for Type 2 Diabetes Mellitus

Rationale
Screening involves the testing of individuals who are at risk of having a given disease but have not yet developed signs and symptoms. The aim of screening is to improve early detection of disease in the population and reduce adverse outcomes by implementing treatment before disease complications occur. Screening is best applied in scenarios where the disease of interest has serious impact, is prevalent, is amenable to early detection and intervention and is identifiable by relatively inexpensive and non-invasive methods. Diabetes Mellitus meets all of these criteria. Implementation of effective and ethical screening programmes requires that health systems should have the ability to provide an appropriate screening test to the vast majority of the population at risk and, moreover, have the capacity to provide appropriate care to all the cases which are identified by the programme. Given the prevalence of both DM and its risk factors, the entire population of most Caribbean states would need to be targeted, warranting a population-based screening approach.

Population-based screening can be justified on the following grounds:

- There is an elevated and increasing prevalence of diabetes in Caribbean populations.
- Diabetes is an important public health problem in the Caribbean,
as evidenced by the comparatively high mortality rates from DM in the region.

• Caribbean populations have a high prevalence of obesity and are generally comprised of ethnic groups known to have higher-risks of developing diabetes.

• There is a long, latent asymptomatic period in which the diabetes can be detected, and treatment implemented, in order to minimise potential complications.

• At the time of symptom-driven diagnosis, significant numbers of individuals already have evidence of the microvascular complications of diabetes and may also have macro vascular disease, constituting a missed opportunity for secondary prevention.

• There is evidence that early treatment improves long-term outcomes.

Population-based screening is resource intensive however, and priority should be given to persons with higher risk profiles. IDF guidelines recommend that screening should not include blood tests in persons <40 years who show no risk factors for diabetes (IDF 2017), reminding us that screening should reduce the number of people needing a lab test. Instead, it recommends a screening questionnaire e.g. **FINDRISC (Appendix I)**, be applied as a means of risk-stratification. This screening tool can be administered to asymptomatic individuals, with a high risk-score prompting either a Fasting Plasma Glucose (FPG), a glycosylated haemoglobin (HbA1c) assay, or both, to be carried out. A proposed algorithm for risk stratification using this tool is outlined below.
Algorithm 1: Screening for Diabetes

1. Age ≥40 years?
   - NO
   - DM Symptoms?
     - NO
     - FINDRISC Scoring?
       - Low Risk Score (≤12)
         - Advise on general risk avoidance, repeat Screen in 3 years
       - High Risk Score (>12)
         - Advise on specific risk reduction. Repeat screen in 6 to 12 months
     - YES
   - YES
   - DM Symptoms?
     - NO
     - High Risk Score (>12)
       - Advise on specific risk reduction. Repeat screen in 6 to 12 months
     - YES
     - FINDRISC Scoring?
       - Low Risk Score (≤12)
         - Advise on general risk avoidance, repeat Screen in 3 years
       - High Risk Score (>12)
         - Manage for IGT or DM according to result

2. DM Symptoms?
   - NO
     - Diagnostic Testing: FPG or HbA1c
   - YES

3. FINDRISC Scoring?
   - YES
   - High Risk Score (>12)
   - NO
   - Low Risk Score (≤12)

4. NORMAL RESULT?
   - FPG < 100mg/dL (<7mmol/L) or HbA1c < 5.7%
     - YES
     - Advise on general risk reduction, repeat Screen in 1 year
     - NO
     - Manage for IGT or DM according to result
   - NO
     - Advise on specific risk reduction. Repeat screen in 6 months
Recommended Diabetes Screening Tests
The fasting plasma glucose (FPG) is the recommended screening test, as it is quick, reliable, inexpensive and easy to administer. Since 2010, the ADA and the World Health Organization (WHO) have included a glycosylated haemoglobin (HbA1c) level of ≥6.5% as a screening test for diabetes. When used, the HbA1c test should be performed, using a method that is certified by the National Glycohaemoglobin Standardisation Programme (NGSP) and standardised or traceable to the Diabetes Control and Complications Trial (DCCT) reference assay. When using the HbA1c, the results should be interpreted with caution in clients who have anaemias, haemoglobinopathies, recent blood transfusions or blood loss, renal failure or liver failure. HbA1c levels may also vary with clients’ race or ethnicity and can be slightly higher (up to 0.4%) in persons of African or Asian descent.

Persons at high risk as per FINDRISC score should have their FINDRISC repeated annually and screening with plasma FPG appropriate. Persons 40 years or older should be screened with plasma FPG, at least at three yearly intervals.

Box 1.2: Additional considerations for SCREENING TESTS
- Use BOTH FPG & HbA1c (where available) in Caribbean settings
  - FPG is inexpensive, sensitive, and widely available
  - HbA1c is highly specific and enhances detection of Impaired Glucose Tolerance (IGT) in persons with normal FPG
  - NB: HbA1c results may be inaccurate in clients with anaemia, thalassemia or other haemoglobinopathies, liver failure, recent blood transfusions or blood loss, particularly when non NGSP standardised assays are used
- Do not use Urine glucose testing as a screening test for DM; however abnormal urine glucose detected in routine urinalysis must be formally investigated, via FPG and HbA1c
Role of Other Tests in Diabetes Screening

Testing of glucose in the urine is not recommended for screening. An abnormal result, obtained during routine urinalysis for other reasons, however, must be confirmed by measurement of plasma glucose (uses venous blood).

Blood glucose testing by glucometers (which uses capillary blood) may play a role in initial screening but an abnormal result must be confirmed by measurement of plasma glucose (using venous blood).

The 75g Oral Glucose Tolerance Test (OGTT) is more sensitive than plasma FBG but is not recommended for universal screening, as it is more expensive and less practical.

Diagnosis of Diabetes

The formal screening algorithm for T2DM refers clients to have laboratory-based biochemical testing to confirm the diagnosis of diabetes. The HbA1c, plasma FPG or 2-hour OGTT are the recommended tests for this purpose, using the recommended criteria (IDF, WHO, ADA).

- **DO NOT** use finger-stick glucose measurements for the definitive diagnosis of diabetes. It may be used for initial primary care evaluations and for self-monitoring purposes.

- Any abnormalities in finger-stick tests **MUST** be confirmed with an **APPROPRIATE** diagnostic test.
Criteria for Diagnosing Diabetes

Persons presenting for the first time with symptoms of hyperglycaemia, and a Random Plasma Glucose (RPG) of 11.1mmol/L (≥200mg/dL) meet the diagnostic criteria for diabetes (Table 5).

Alternatively, an HbA1c of ≥6.5% and/or a FPG of 7mmols/L (>126mg/dL) are also diagnostic of diabetes. It is recommended that clients should have a second test done to confirm their diagnosis. The same test can be repeated or a different appropriate test can be performed.

If the HbA1c and plasma glucose results do not correlate, then the test that is above normal should be repeated.

Bear in mind that some conditions can give rise to misleading readings with the HbA1c test. E.g. Afro-Caribbean people who have heterozygous (HbAS) sickle cell trait, or full blown (HbSS) sickle cell disease or who have glucose 6-phosphate dehydrogenase (G6PD) deficiency, have red blood cells (RBCs) with shortened lifespans and will have spuriously lower mean HbA1c values at comparable levels of mean blood glucose. Another test such as the OGTT should be performed in these cases.
**Criteria for Diagnosing Impaired Glucose Tolerance and Diabetes**

If the FPG ranges from 5.6-6.9 mmol/L (100–125 mg/dL), or the blood glucose level two hours after a 75g glucose load is between 140-199, results are borderline, indicating impaired glucose tolerance, then the client should be closely monitored, advised on dietary and physical activity modification and have the FPG and HbA1c repeated in 3-6 months. (Recommendations adapted from ADA 2018 guidelines).

<table>
<thead>
<tr>
<th>Test</th>
<th>Normal</th>
<th>Impaired Glucose Tolerance</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FPG</strong></td>
<td>5.6mmols/L</td>
<td>5.6-6.9mmols/L</td>
<td>≥7mmols/L</td>
</tr>
<tr>
<td>Fasting is defined as at least 8 hours of no caloric intake.</td>
<td>&lt;100mg/dL</td>
<td>100-125mg/dl</td>
<td>≥126mg/dL</td>
</tr>
<tr>
<td><strong>HBA1c</strong></td>
<td>&lt;5.7%</td>
<td>5.7-6.4%</td>
<td>&gt;6.5%</td>
</tr>
<tr>
<td>This test should be performed in a laboratory using a method that is NGSP certified and standardised to the DCCT assay.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OGTT</strong></td>
<td>&lt;139mg/dL</td>
<td>140-199mg/dL</td>
<td>&gt;11.1mmols/L</td>
</tr>
<tr>
<td>(2 hr post 75g glucose) This test should be performed according to WHO recommendations, using a glucose load containing the equivalent of 75g anhydrous glucose dissolved in water.</td>
<td></td>
<td>&gt;200mg/dL</td>
<td></td>
</tr>
</tbody>
</table>
Once diabetes is confirmed (FPG > 7 mmol/L or >126mg/dL) or HbA1c > 6.5%), or Impaired Glucose Tolerance (IGT) (FPG 5.6-6.9mmol/L or 100-125mg/dL) is identified, the client will require detailed education both on the disease, and on the need to implement lifestyle changes that assist in the control and management of their blood glucose. Weight management, diet and physical activity constitute the first line of management for Diabetes Mellitus and careful monitoring of these parameters must be maintained throughout the client’s life-course. Clients benefit from access to a focal point for diabetes’ education and supported self-management. Certified Diabetes Educators play a critical role in assisting clients to navigate the processes of the management of diabetes. In addition to improving glycaemic control, concerted efforts to attain and maintain dietary and physical activity goals also slow progression from IGT to overt diabetes, reducing progression to overt DM by as much as 58% in the 3 years following initial diagnosis (Knowler et al., 2002). Detailed guidance on the lifestyle components of T2DM management are found in Module 2 of these guidelines.
**Therapeutic options for the oral treatment of T2DM include:**

- Biguanides and Thiazolidinediones - which increase insulin sensitivity;
- Sulfonylureas and Meglitinides - which increase insulin release;
- Alpha-glucosidase inhibitors which modify intestinal absorption of carbohydrates;
- Dipeptidyl-peptidase 4 Inhibitors (DPP-4 inhibitors) – which augment insulin release
- Glucagon-like, Peptide-1 receptor agonists (GLP-1 receptor agonist) – which enhance glucose- stimulated insulin, biosynthesis and secretion, suppress post-prandial glucagon release, decrease appetite and food intake and delay gastric emptying;
- Sympatholytic D2-Dopamine Agonists: Cycloset (Bromocriptine mesylate) – which inhibit excessive sympathetic tone within the central nervous system resulting in a reduction in post meal plasma glucose;
- Sodium, Glucose Cotransporter-2 Inhibitors (SLGT-2) – which reduce plasma glucose concentration by inducing glycosuria; and
- Synthetic Insulins- which replace endogenous insulin deficiency

The following table summarises the formulations, mechanisms of action, and cost-vs-efficacy considerations for the commonly available oral glucose-lowering drugs in the region.
<table>
<thead>
<tr>
<th>Class of Drug</th>
<th>Drug</th>
<th>MOA</th>
<th>Efficacy</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biguинide</td>
<td>Metformin 250/500/850mg</td>
<td>Hepatic glucose output Delays glucose absorption</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Sulphonylurea (2nd Generation)</td>
<td>Gliclazide 30mg MR tab 60mg SR tab Glyburide</td>
<td><strong>↑ Insulin release (Major complication is hypoglycemia esp in first generation)</strong></td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Meglitinides (glinides)</td>
<td>Repaglinide Nateglinide</td>
<td><strong>↑ Insulin Release</strong></td>
<td>High</td>
<td></td>
</tr>
<tr>
<td>Alpha Glucosidase inhibitors</td>
<td>Acarbose</td>
<td>↓ Intestinal absorption of carbohydrates</td>
<td>Moderate</td>
<td></td>
</tr>
<tr>
<td>TZDs Thiazolidinedions</td>
<td>Rosiglitazone Pioglitazone</td>
<td>↑ Insulin sensitivity</td>
<td>High</td>
<td>Moderate</td>
</tr>
<tr>
<td>DPP-4 inhibitors (dipeptidyl peptidase-4 inhibitors)</td>
<td>Sitagliptin Vildagliptin Saxagliptin Alogliphin</td>
<td>Enhances insulin secretion in response to meals ↓ Glucagon secretion (Glucose dependant)</td>
<td>Intermediate</td>
<td>High</td>
</tr>
<tr>
<td>GLP-1 Receptor Agonist</td>
<td>Exenatide Liraglutide Exenatide ER</td>
<td>Augments Insulin secretion after meal ingestion Suppresses glucagon release Reduces hepatic glucose production</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>SLGT-2 inhibitors Sodium-glucose Cotransporters Type 2 Inhibitors</td>
<td>Canagliflozin Dapagliflozin Empagliflozin Ipragliflozin</td>
<td>Reduce plasma glucose by inducing glycosuria (Thus major complication is UTI)</td>
<td>Intermediate</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 6: Oral Glucose Lowering drugs
Implementation of Pharmacotherapy

Lifestyle modifications in the absence of pharmacotherapy can be initiated in persons with an HbA1c less than 7%, with prompt re-evaluation of the HbA1c values within three (3) months. At the initial evaluation, clients must simultaneously be assessed for additional cardiovascular risk factors, including hypertension and hyperlipidaemia and appropriate medications prescribed to manage those components of CVD risk.

Initiation of drug therapy is indicated above the 7% threshold, with HbA1c values of <8.5% used as the upper limit for commencing with monotherapy. In initial HbA1c >8.5%, is an indication to begin treatment with dual therapy and an, HbA1c > 10% at diagnosis, is an indication that combination oral and injectable therapy should be initiated at the outset of treatment.

Metformin is the drug of choice for initiating oral therapy. In cases where Metformin is contraindicated, a Sulphonylurea, or SGLT2 inhibitor, or glinide or thiazolidinedione or a DPP-4 inhibitor may be used instead. Consideration must be given to client comorbidities, including Chronic Renal Disease and Coronary Heart Disease and choice of medications

<table>
<thead>
<tr>
<th>Class of Drug</th>
<th>Drug</th>
<th>MOA</th>
<th>Efficacy</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bile Acid sequestrants</td>
<td>Colesevelam</td>
<td>Acts by a hepatic mechanism in decreasing hepatic glucose output</td>
<td>Very High</td>
<td></td>
</tr>
<tr>
<td>Amylin mimetics</td>
<td>Pramlintide</td>
<td>Glucagon secretion slows gastric emptying</td>
<td>Very High</td>
<td></td>
</tr>
</tbody>
</table>
must be tailored to suit individual client profiles. Choice of agent should further be guided by client preferences, characteristics of the medicine, susceptibility to side-effects, potential for weight gain, propensity for hypoglycaemia and drug cost. Table 7 below, outlines key considerations in selecting additional or alternative medications.

Attainment of a client’s target HbA1c values, is the key indication that the team should maintain the current therapeutic and lifestyle interventions. At each stage of oral therapy, if the target HbA1c is not achieved, an assessment of compliance with and tolerance of the drug regimen must be carried out by the primary care physician in conjunction with the diabetes educator, diabetes nurse and client home-support team. Optimisation of both adherences to medication and lifestyle modification should be achieved before graduating to the next stage of pharmacotherapy (additional drug treatment). If target HbA1c values are not achieved with optimal monotherapy, at maximal dosages, then dual therapy must be initiated. Similarly, triple therapy without insulin must be initiated, if optimal dual therapy has not helped the client to achieve their HbA1c targets. If oral therapy does not achieve control, then proceed to combination oral and injectable therapy (NB. if client is known to have conditions shortening RBC lifespan, monitor control using SMBG values). This iterative process is summarised in Algorithm 2.

**Thresholds for Lipid Management** (see Table 4)

- Total Cholesterol: < 5.2 mmol/L or <200 mg/dL
- LDL (if no CVD present): < 2.5 mmol/L or <100 mg/dL
- LDL (CVD present): <1.8 mmol/L or <70 mg/dL
- HDL (Men): >1.0 mmol/L or >40 mg/dL
- HDL (Women): >1.3 mmol/L or >50 mg/dL
- Triglycerides: < 1.7 mmol/L or <150 mg/dL
<table>
<thead>
<tr>
<th>Medicine</th>
<th>Hypo</th>
<th>Weight</th>
<th>GI Side Effects</th>
<th>Major CV Events</th>
<th>Chronic Heart Failure</th>
<th>Other Side Effects</th>
<th>Chronic Kidney Disease STG3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metformin</td>
<td>Neutral</td>
<td>Slight loss</td>
<td>Moderate</td>
<td>Benefit</td>
<td>Neutral</td>
<td>Nil</td>
<td>Reduce dose in 3A</td>
</tr>
<tr>
<td>Sulphonylurea</td>
<td>Moderate</td>
<td>Gain</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Nil</td>
<td>Caution high risk hypo stage 3A, B</td>
</tr>
<tr>
<td>Pioglitazone</td>
<td>Neutral</td>
<td>Gain</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Risk</td>
<td>Edema and Bone loss</td>
<td>Neutral</td>
</tr>
<tr>
<td>Alpha-Glucosidase Inhibitors</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Moderate</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Nil</td>
<td>Neutral stage 3A, 3B</td>
</tr>
<tr>
<td>DPP4-Inhibitors</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Neutral but must reduce dose except linagliptin</td>
</tr>
<tr>
<td>GLP1 Receptor Agonists</td>
<td>Neutral</td>
<td>Loss</td>
<td>Moderate</td>
<td>Benefit (2RCT)</td>
<td>Neutral</td>
<td>Nil</td>
<td>Caution with exenatide ER stg3A, 3B</td>
</tr>
<tr>
<td>SLGT2 Inhibitors</td>
<td>Neutral</td>
<td>Loss</td>
<td>Neutral</td>
<td>Benefit</td>
<td>Neutral</td>
<td>Neutral</td>
<td>Contraindicated stage 3B</td>
</tr>
</tbody>
</table>

Table 7: Risks and Benefits of Common Glucose Lowering Agents
Monotherapy

Clients with an HbA1c between 7 and 8.5% are eligible to commence monotherapy with Metformin (unless contraindicated). Begin at a dose of 500mg daily and gradually titrate upwards to 2000mg as necessary, in divided doses. If clients cannot tolerate 500mg, the dose can be halved and titrated upward in increments of 250mg. If severe gastrointestinal (GI) side-effects occur, consider slow release Metformin and advise clients to take the medication with a meal. Assessment of compliance and tolerance of the medication should be done along with HbA1c at three-month intervals, to determine if client is achieving HbA1c target. Once targets are achieved, clients can maintain lifestyle changes and monotherapy. If the HBA1c goal is not achieved at maximal dosages of Metformin with optimal adherence to both medication and lifestyle interventions, progress to dual therapy (Algorithm 2).

Box 1.4: Recommendations for MONOTHERAPY

- At confirmation of diabetes
  » Advise ALL clients on lifestyle changes and provide self-management support for implementation
  » Measure HbA1c
- HbA1c <8.5%: Initiate MONOTHERAPY (i.e. Metformin only)
- START LOW AND GO SLOW (Make every effort to ensure tolerance)
- If Metformin is not tolerated, then replace with another drug class e.g.
  » Dipeptidyl Peptidase-4 inhibitor DPP4 inhibitor, OR SGLT-2 inhibitor, OR 2nd generation Sulphonylurea (NOT GLIBENCLAMIDE/GLYBURIDE)
- Repeat HbA1c in 3months. If HbA1c is at target, then continue existing management. If not at target, consider Dual therapy
Algorithm 2: Treatment of Type 2 Diabetes

**MONOTHERAPY**
- Metformin 500mg od → bd
- Increasing to max 2000 mg daily

**HbA1c at target after 3 months?**
- YES
  - Continue regimen and follow-up
  - Assess adherence and tolerance (A&T)
- NO
  - A&T already optimised? Max Dosage reached?
    - YES
      - Continue regimen and follow-up
    - NO
      - A&T already optimised? Max Dosage reached?

**DUAL THERAPY**
- Metformin + Additional oral agents
  - E.g. Sitagliptin (DPP4) or Gliclazide (sulphonylurea) or SGLT2 inhibitor (if available)
  - Consider drug effects & Client factors
    - E.g. weight management; CVD & renal comorbidities; ‘hypos’
    - Titrate both agents for optimal control

**TRIPLE THERAPY**
- Metformin + 2 Additional oral agents
  - E.g. Sitagliptin (DPP4) AND Gliclazide (sulphonylurea)
  - Consider drug effects & Client factors
    - E.g. weight management & tendency for ‘hypos’
    - Titrate agents for optimal control

**FPG OR HbA1c result?**
- FPG < 100 mg/dL (5.6 mmols/L) OR HbA1c < 5.7%
  - Continue follow up in accordance with Algorithm 1
- FPG > 126 mg/dL (7 mmols/L) OR HbA1c > 6.5%
- Degree of hyperglycaemia?
  - HbA1c < 8.5%; RBG < 197 mg/dL (11.0 mmols/L)
  - YES
    - Continue regimen and follow-up
    - Assess adherence and tolerance (A&T)
    - OPTIMISE A&T issues in conjunction with Chronic Care Team
    - Adjust dose as needed
    - Reassess attainment of HbA1c Target in 3 months
  - NO
    - A&T already optimised? Max Dosage reached?
      - YES
        - Continue regimen and follow-up
      - NO
        - A&T already optimised? Max Dosage reached?

- FPG > 126 mg/dL (7 mmols/L) OR HbA1c > 6.5%
  - Degree of hyperglycaemia?
    - HbA1c > 10%; RBG > 300 mg/dL (16.7 mmols/L)
    - YES
      - Commence team supported lifestyle-modification program with the goals of at least a 7 percent weight loss and at least 150 minutes of physical activity per week
    - NO
      - Test FPG and HbA1c
        - FPG < 100 mg/dL (5.6 mmols/L) OR HbA1c < 5.7%
          - YES
            - Continue regimen and follow-up
            - Assess adherence and tolerance (A&T)
            - OPTIMISE A&T issues in conjunction with Chronic Care Team
            - Adjust dose as needed
            - Reassess attainment of HbA1c Target in 3 months
          - NO
            - A&T already optimised? Max Dosage reached?
              - YES
                - Continue regimen and follow-up
              - NO
                - A&T already optimised? Max Dosage reached?

- FPG 100-126 mg/dL (5.6 - 7 mmols/L) OR HbA1c 5.7 - 6.4%
  - Test FPG and HbA1c
    - FPG < 100 mg/dL (5.6 mmols/L) OR HbA1c < 5.7%
      - YES
        - Continue regimen and follow-up
        - Assess adherence and tolerance (A&T)
        - OPTIMISE A&T issues in conjunction with Chronic Care Team
        - Adjust dose as needed
        - Reassess attainment of HbA1c Target in 3 months
      - NO
        - A&T already optimised? Max Dosage reached?
          - YES
            - Continue regimen and follow-up
          - NO
            - A&T already optimised? Max Dosage reached?
Dual Therapy

Persons with an initial baseline HbA1c of >8.5% are candidates for initiation of dual therapy at the outset of treatment. This entails combination therapy with 2 oral medications, taking client comorbidities and risk factors into account. Dual therapy is also recommended if after approximately 3 months of optimal monotherapy, the client’s HbA1c target has not been achieved.

Dual therapy can be any combination of metformin and one of the following: Sulphonylurea (SU), thiazolidinedione, a DPP-IV inhibitor, a GLP-1 RA. Other medicines such as alpha-glucosidase inhibitors, Colesevelam, bromocriptine, SGLT-2, may be chosen after evaluation for the advantages and disadvantages of each medication including cost and availability.

Sulphonylureas are recommended for control of blood glucose in clients with Type 2 Diabetes (WHO 2018), but only those who do not achieve glycaemic control with metformin alone. This decision is mainly driven by the low cost of Sulphonylureas and their high efficacy in promoting insulin secretion. It strongly recommends that Glibenclamide should NOT be used in clients 60 years or older because of the high risk of hypoglycaemia.

**Box 1.5: Recommendations for DUAL THERAPY**

- Begin Dual therapy if HbA1c >8.5%
  - Metformin + DPP4 inhibitor
    - E.g. Metformin + Sitagliptin
  - Metformin + SU (except Glibenclamide/Glyburide)
    - E.g. Metformin + Diamicron
  - Metformin + Thiazolidinediones TZDs
    - E.g. Metformin+Avandia

Repeat HbA1c in 3 months if client is not achieving targets after titration to maximal doses of dual regimen, move to triple therapy
Hypoglycaemia is of particular concern in persons that live alone, are at risk of falling, have impaired awareness of hypoglycaemia, as well as persons who drive or operate machinery. Second generation Sulphonylurea, such as Gliclazide, are the preferred option.

HbA1c levels should be checked at 3-month intervals. If the client is achieving HbA1c goals, then continue lifestyle changes and dual therapy. If not achieving HbA1c goals, assess adherence to medicine and explore any issues surrounding non-adherence. If despite adherence HbA1c goals are not attained, at maximal doses of a two-drug regimen, then progress to triple therapy (Algorithm 2).

**Triple Therapy**

Metformin plus two additional agents should be initiated in clients with HbA1c greater than 8.5% who have not achieved HbA1c goals on an optimal regimen of dual therapy. Any of the available classes of medicine not already prescribed may be added. Sulphonylurea, thiazolidinedione, a DPP-IV inhibitor, a GLP-1 RA or insulin may be added. Others such as alpha-glucosidase inhibitors, Colesevelam, bromocriptine, SGLT-2, may be chosen after evaluation for the advantages and disadvantages of each medicine, including cost and availability. Additional agents should be selected with consideration, both for client factors and complementary mechanisms of action. HbA1c levels should be checked at 3-month intervals. If the client is achieving HbA1c goals, then continue lifestyle changes and dual therapy. If not achieving HbA1c goals, assess adherence to medicine and explore any issues surrounding non-adherence. If despite adherence, HbA1c goals are not attained at maximal doses of a three-drug regimen, then progress to triple therapy (Algorithm 2).
Combination Injectable Therapy
In clients with significant hyperglycaemic symptoms, HbA1c >10.0%, or plasma glucose >300mg/dL, insulin therapy alongside one or two oral agents should be started from the onset. This regime should especially be applied if ketonuria is present. In the absence of evidence of T1DM, once glucotoxicity has resolved, insulin may be tapered or discontinued.

Combination injectable therapy is also the treatment modality of choice in clients who do not achieve optimal glycaemic control on triple therapy after 3-6 months.

Treatment of Diabetes with Insulin
The indications for insulin treatment:
• All clients with T1DM
• Clients with T2DM, whose metabolic control has remained inadequate, as evidenced by a HbA1c of >7.0%, despite appropriate diet, weight-management, adequate physical activity, and maximal dosages of oral hypoglycaemic agents
• To cover acute illness, surgery or pregnancy
• Treatment of Diabetic Ketoacidosis (DKA) or Hyperglycaemic/ Hyperosmolar non-ketotic diabetic states

Box 1.6: Recommendations for TRIPLE THERAPY
• If Target HbA1c not achieved in 3 months of being on optimised dual therapy, switch to triple therapy
  » Metformin + 2 other agents
  » Chose agents with complementary mechanisms of action
• Repeat HbA1c in 3 months, if not controlled, switch to Combination injectable therapy
• Once client has achieved desired HbA1c the test can be repeated every 6 months
• Post–myocardial infarction. Clients with T2DM who are failing or have failed oral therapy, can be safely and effectively started on insulin in the outpatient setting. This must be accompanied by proper advice and training by the health care team.

Possible Insulin Regimes in T2DM
As part of combination therapy, insulin can be added to oral glucose lowering agents. Basal insulin is generally calculated at 0.1-0.2 U/kg/ day and increased by 2-4 units weekly until the desired fasting plasma glucose levels are obtained.

Box 1.7: Recommendations for INSULIN

• Persons with T2DM who are symptomatically hyperglycaemic can be given rescue insulin, and reviewed when blood glucose control has been achieved (NICE 2015)
• Clients with initial Diagnostic HbA1c >10% (FPG > 300mg/dl) may commence with a combination injectable therapy (oral metformin and insulin)
• Once glucotoxicity has resolved and client confirmed not to have T1DM, tapering or discontinuation of insulin may be attempted

The insulin can be combined with oral agents as follows:
• Morning: Oral agents e.g. Metformin or Sulphonylurea or Thiazolidinediones
• Bedtime: Glargine or NPH insulin: Start with 10 units and adjust to achieve set target fasting values.

If HbA1c goals are not achieved after 3 months, physicians may
If HbA1c goals are not achieved after 3 months, physicians may adjust, using two approaches. (Algorithm 3). A rapid acting insulin may be given in bolus form or a premixed insulin may be utilised instead.

**Rapid Acting Insulin Bolus**
A bolus of insulin may be added to the client’s largest meal. The bolus may comprise of 4 units to start, or be calculated at 0.1 U/kg. Insulin may be increased by 2-4 units weekly, until client achieves glycaemic control, (as measured by self-monitored blood glucose readings). If target HbA1c is still not achieved a second bolus with meals may be added.

**Premixed Insulin**
Another route that may be used is premixed insulin. It may be administered using the rule of thirds:

2/3 of the daily dose in morning and 1/3 in evening

1/3 short-acting insulin of regular insulin and 2/3 intermediate insulin, of NPH insulin

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

**Regular NPH**
A.M: 2/3 of total daily dose (30 units) 10/20
P.M: 1/3 of total daily dose (15 units) 5/10
If HbA1c is still not reaching optimal targets, then a third dose may be added at lunch (Algorithm 2).
Multiple Dosing Regimen:
Short-acting insulin analogue is given with/before/after each main meal together with long-acting analogue insulin at bedtime or in the morning with the breakfast. This regimen is useful in clients with poor control of less intensive insulin therapy or those who desire flexibility due to their lifestyles. High levels of motivation, frequent testing and adjustment of dosages, are necessary for good control of this regimen. Consider early collaboration with Endocrinologist/diabetes specialist on chronic care team.

Note:
- Regular insulin should be injected subcutaneously 15-30 minutes before a meal. This allows for the onset of action to coincide with food absorption and post-prandial hyperglycaemia.
- Rapid-acting insulin analogue can be given at the start of the meal, during the meal and immediately after the meal.
- Glargine insulin is given once daily, preferably on mornings, either alone or in combination with short-acting insulin or oral agents.
- Detemir insulin can be given once daily or twice daily.

Mixing of Insulins:
- If NPH insulin is mixed with regular insulin in a syringe, it should be injected immediately, or the action of the regular insulin becomes impaired.
- Glargine and Detemir should not be mixed in the syringe with other insulins or injected at the same site as other insulins.
- If it is necessary to mix short-acting insulin of regular insulin and intermediate-acting insulin of NPH insulin, then, the regular insulin should be drawn up first before the NPH insulin.
<table>
<thead>
<tr>
<th>Insulin Type</th>
<th>Onset</th>
<th>Peak</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid-acting or analogue (Lispro, aspart, glulisine)</td>
<td>5-15min</td>
<td>45-90min</td>
<td>2-4h</td>
</tr>
<tr>
<td>Short-acting (regular)</td>
<td>0.5-1h</td>
<td>2-4h</td>
<td>4-8h</td>
</tr>
<tr>
<td>NPH insulin</td>
<td>1-3h</td>
<td>4-10h</td>
<td>10-18h</td>
</tr>
<tr>
<td>Detemir</td>
<td>1-2h</td>
<td>None</td>
<td>12-24h</td>
</tr>
<tr>
<td>Glargine</td>
<td>2-3h</td>
<td>None</td>
<td>20-24+h</td>
</tr>
<tr>
<td>Premixed Insuline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70% NPH / 30% regular</td>
<td>0.5-1h</td>
<td>2-10h</td>
<td>10-18h</td>
</tr>
<tr>
<td>50% NPH/50% regular</td>
<td>0.5-1h</td>
<td>2-10h</td>
<td>10-18h</td>
</tr>
<tr>
<td>75% NPL /25% lispro</td>
<td>10-20min</td>
<td>1-6h</td>
<td>10-18h</td>
</tr>
<tr>
<td>50% NPL/50% lispro</td>
<td>10-20min</td>
<td>1-6h</td>
<td>10-18h</td>
</tr>
<tr>
<td>70% NPA/30% aspart</td>
<td>10-20min</td>
<td>1-6h</td>
<td>10-18h</td>
</tr>
</tbody>
</table>

Table 8: Pharmacokinetic properties of insulin Products
Algorithm 3: Treatment of Diabetes with Insulin

**Commence Basal Insulin**
With Metformin +/- another non-insulin drug

Start: 10U or 0.1 – 0.2 U/kg/day of long-acting insulin once daily on mornings
Adjust 2-4 units once-twice weekly until Target FBG achieved

*NB If client has hypoglycemic episode and you cannot determine cause decrease dose by 4 units*

If not attaining desired HbA1c target

**Combination Injectable Therapy**

- **Add 1 Rapid acting bolus with largest meal**
  Start with 4 units or 0.1U/kg
  Adjust 1-2 units increase once to twice weekly until SMBG target achieved

- **Add 2 Rapid acting insulin injections before meals**
  Start: 4 units OR 0.1U/kg
  Adjust: 1-2 unit increase once to twice weekly until SMBG target achieved

- **Switch to pre-mixed insulin twice daily**
  Start: Divide basal insulin dose 2/3am 1/3pm
  Adjust 1-2 units increase once to twice weekly

- **Switch to pre-mixed analog insulin 3x daily**
  (breakfast/lunch/supper)
  Start: Add an additional injection before lunch.
  Adjust: 1-2 units once to twice weekly till SMBG target achieved

Modified from ADA 2018 Standards of Medical Care In diabetes 2018
### HbA1c goals in specific diabetic populations

<table>
<thead>
<tr>
<th>Population</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons living with Type 2 Diabetes controlled on diet and lifestyle only</td>
<td>&lt;6.5%</td>
</tr>
<tr>
<td>Persons living with Type 2 Diabetes controlled on lifestyle and one drug not associated with hypoglycaemia (e.g. 1st Gen sulphonylureas)</td>
<td>&lt;6.5%</td>
</tr>
<tr>
<td>Persons living with Type 2 Diabetes on lifestyle and one drug associated with hypoglycaemia</td>
<td>7.0%</td>
</tr>
<tr>
<td>Persons &gt;60 years, living with Type 2 Diabetes who are more prone to hypoglycaemic episodes and who are unlikely to have major risk reduction</td>
<td>&lt;8%</td>
</tr>
<tr>
<td>Persons &gt;60 years, living with Type 2 Diabetes who have other comorbidities. Targets should be individualised on the basis of existing comorbidities</td>
<td>&lt;8%</td>
</tr>
</tbody>
</table>

Adapted from the National Institute for Health and Care Excellence (NICE) 2015 Guidelines

---

Table 9: Target Blood Glucose Levels in Persons with Diabetes
Section 2: TREATMENT OF DIABETES IN SPECIAL POPULATIONS
Treatment of Diabetes in Pregnancy

Universal Screening for diabetes in pregnancy is gaining momentum worldwide. Unfortunately, there has not been agreement by expert committees for a standardised test or for criteria for an abnormal result. In the Caribbean region, the prevalence of obesity among women ranges from 30% to 60%, in the countries for which data is available. Given the diabetogenic nature of the gravid state and the higher risk already posed by the ethnic composition of the region’s population, it is not only prudent but imperative, that we recommend universal screening for pregnant women in the Caribbean, even as we recognise that there will be local resource constraints. Until universal screening becomes policy, the client should be assessed for risks of diabetes, at their booking for antenatal visits. If at high risk, they should be screened immediately using the FPG or HbA1c test. Overt DM would be diagnosed if the FPG 7mmol/L (≥126mg/dL) GDM would be diagnosed at FPG values of 5.1-6.9mmol/L (92-125mg/dL).

Table 10: Criteria for Diagnosing Diabetes & Gestational Diabetes NA, not applicable. Testing should use plasma glucose analysed at a laboratory, not capillary blood glucose, analysed with a blood glucose monitor.
Algorithm 4: Treatment of Diabetes in Pregnancy

1. **High Risk of Diabetes at booking?**
   - **YES**
     - **Screening immediately at booking, using the following thresholds:**
       - FPG ≥ 126 mg/dL (7 mmol/L) – Overt DM
       - Or HbA1c ≥ 6.5% - Overt DM
       - FPG ≥ 92-125 mg/dL (5.1-6.9 mmol/L) – GDM
     - **Normal Screening Test Results?**
       - **YES**
         - **Screen at 24-28 weeks POG using one-step or two-step protocol**
         - **One-step: 75g OGTT**
           - GDM confirmed if:
             - FBS ≥ 92 mg/dL (5.1 mmol/L)
             - 1hr ≥ 180 mg/dL (10 mmol/L)
             - 2hr ≥ 153 mg/dL (8.5 mmol/L)
         - **Two-step: 50g non fasting test**
           - If 1HPRP ≥ 140 mg/dL then
             - 100g OGTT 3hrs
         - **Normal Screening Test Results?**
           - **YES**
             - **Continue Routine Care**
           - **NO**
             - **DM Confirmed: Initiate Lifestyle Changes and SMBG**
               - **Self-Monitoring of Blood Glucose (SMBG) Targets**
                 - Maintain:
                   - FBS ≥ 95 mg/dL (5.3 mmol/L)
                   - 1hrPP ≥ 140 mg/dL (7.8 mmol/L)
                   - 2hrPP ≥ 120 mg/dL (6.7 mmol/L)
               - **Lifestyle Modifications**
                 - Maintain:
                   - Link client to Diabetes educator and Registered Dietician/Nutritionist
                   - Limit Carbohydrates to 33-40% of total calories
         - **NO**
           - **Initiate Insulin Therapy**
             - See Algorithm 3
     - **NO**
       - **Screen at 14 weeks POG using the Following thresholds:**
         - FPG ≥ 126 mg/dL (7 mmol/L) – Overt DM
         - Or HbA1c ≥ 6.5% - Overt DM
         - FPG ≥ 92-125 mg/dL (5.1-6.9 mmol/L) – GDM
       - **Normal Screening Test Results?**
         - **YES**
           - **Treat as confirmed DM**
         - **NO**
           - **Continue Healthy Lifestyle Regimen**

2. **High Risk of Diabetes at booking?**
   - **NO**
     - **Screen at 24-28 weeks POG using the Following thresholds:**
       - FPG ≥ 126 mg/dL (7 mmol/L) – Overt DM
       - Or HbA1c ≥ 6.5% - Overt DM
       - FPG ≥ 92-125 mg/dL (5.1-6.9 mmol/L) – GDM
     - **Normal Screening Test Results?**
       - **YES**
         - **Treat as confirmed DM**
       - **NO**
         - **Initiate Lifestyle Changes and SMBG**
           - **SMBG Targets attained?**
             - **NO**
               - **Continue Insulin Therapy**
                 - See Algorithm 3
             - **YES**
               - **Continue Healthy Lifestyle Regimen**
An HbA1c ≥6.5% would also indicate that the client has diabetes in pregnancy. The 2hr OGTT can also be used for screening (Table 5).

In the Caribbean setting, there is a mix of ethnicities, with large proportions of Afro-Caribbean and Indo-Caribbean descendants. There is a strong family history of diabetes in many families and increasing obesity in the population, in general. This demographic and risk factor profile means that ALL Caribbean women should be screened routinely by at least 14 weeks’ gestation, using an FPG or HbA1c, with high-risk clients being screened immediately at their booking visit.

**Box 1.8: Recommendations for Pre-existing Diabetes in Pregnancy Part I**

- Offer routine preconception counselling to all women of reproductive age with a diagnosis of diabetes.
- Discuss family planning and offer appropriate contraception, if the client is not actively planning on becoming pregnant.
- Counsel clients on the maternal and foetal risk involved during pregnancy.
- Aim for tight glycaemic control, in women with pre-existing DM, using an HbA1c <6.5% as the blood glucose target, before and during pregnancy to reduce the risk of congenital anomalies.
- Counsel clients on the increased risk and or progression of diabetic retinopathy during pregnancy.
- Ensure that clients have a thorough eye exam with an ophthalmologist or optometrist before becoming pregnant, in the first trimester and then in each subsequent trimester and one postpartum.
- Address other comorbidities, as needed; and review meds, in clients with reproductive ambitions, to identify and substitute those with a higher risk of teratogenicity.

**SOURCE:** ADA 2018
If negative, screening should be repeated at 24-28 weeks using the one-step or two-step method (Algorithm 4). In the one-step method (75g OGTT test), an FPG is done then the client given 75g of glucose and a 1-hour then 2-hour blood glucose carried out. The two-step method comprises a 50g non-fasting screen, followed by a 100g OGTT test. These guidelines recommend that ALL high-risk women be screened using the one-step method (75g OGTT) at 24-28 weeks if not previously screened during their pregnancy. The criteria for diagnosing diabetes or GDM in early pregnancy are shown in Table 10. In persons with normal results, routine antenatal care should be continued. If the client meets the criteria for GDM, they should be managed initially with diet, with an early referral to the nutritionist on the health team being the preferred approach. Persons with GDM should also commence self-monitoring of blood glucose. If properly controlled, their FBG should remain <5.3mmol/L (<95mg/dL), 1-hour post-prandial readings should be 7.8mmol/L (<140mg/dL) and 2-hour post-prandial readings should be 6.7mmol/L (<120mg/dL). Clients with GDM can continue management with diet if plasma glucose is well-controlled. If it is not controlled, they should be started on Metformin or insulin, (see Algorithm 3).

**Treatment of Pre-Existing Diabetes in Pregnancy**

Diabetes among pregnant clients, is becoming increasingly more commonly diagnosed, with GDM being the major contributor to this trend. However, the prevalence of pre-existing diabetes in pregnancy is also increasing worldwide (ADA 2018). Pre-existing diabetes in pregnancy is associated with greater maternal and foetal risks, including:

- Spontaneous abortion
- Foetal anomalies
• Poor metabolic control
• Pre-eclampsia
• Foetal demise
• Macrosomia, and
• Neonatal Hypoglycaemia to list a few

Thus, all women of reproductive age with a history of diabetes should have preconception counselling to discuss the risks involved and the precautions and measures that need to be taken.

Pre-conception Counselling

Women who are known to have diabetes should be counselled about becoming pregnant from the point of diagnosis of diabetes. Preconception counselling should be a routine part of care. Women should be educated on the risks of unplanned pregnancy and family planning options. If the woman is not yet ready to have a family, then effective contraception should be prescribed. If the woman is desirous of becoming pregnant, she should be counselled on the need for strict blood glucose control before and during the pregnancy, ideally HbA1c <6.5%. Women who are already diabetic should be informed that they are at increased risk of developing diabetic retinopathy. Those with diabetic retinopathy should be informed of the potential exacerbation of this condition. A thorough eye exam with retinal check should be done before the pregnancy or in the first trimester and subsequently in every trimester. A follow-up should be done at 1 year post-partum.
Preconception counselling should also include discussions and the relevant tests for:

- Rubella
- Syphilis
- Hepatitis B
- HIV testing
- PAP smear and cervical cultures as necessary
- Blood typing
- Prescription for antenatal Vitamins (minimum of 400ug Folic acid should be prescribed)
- HbA1c to determine present blood glucose control
- Thyroid Simulating Hormone (TSH)
- Creatinine
- Urinary albumin to creatinine ratio
- Review present meds for potential teratogenicity and switch to appropriate one for pregnancy
- Review other comorbidities and address medicines for control. Refer to specialist if deemed necessary

**Antenatal Care of Pre-existing Diabetes**

Maintaining tight plasma glucose control is paramount in the care of pre-existing diabetes, during pregnancy. Lifestyle habits, especially diet, need to be strictly adhered to. A nutrition plan can be arranged by a nutritionist. It should provide adequate calories for foetal growth and development and maternal health, without compromising the mother’s glycaemic control. In addition to nutrition therapy, persons should engage in some physical activity.
Box 1.9: Recommendations for Pre-existing Diabetes in Pregnancy Part II

Lifestyle factors including nutrition therapy and physical activity are key to management of pregnancy in persons with pre-existing diabetes

- Refer all pregnant women to the nutritionist or dietician for a tailored nutritional plan
- Advise clients to engage in 150 minutes of moderate-intensity aerobic physical activity during pregnancy and the post-partum period.

Self-monitoring of blood glucose is key to care:

- Target FBG is 5.3 mmol/L (95 mg/dL) and target 2hr PP is 6.7 mmol/L (120 mg/dL)
- HbA1c target <6.5%

Insulin is the drug of choice for therapeutic care, but metformin and glyburide can be used to maintain glycaemic control.

**SOURCE:** ADA 2018

CDC 2nd Edition Physical Exercise guidelines recommends that pregnant women and women during the post-partum period should engage in 150 minutes of moderate-intensity aerobic activity, spread over a week period. They should consult with their health care provider who can advise on how they can best adjust their physical activity during this time.

Self-monitoring of blood glucose is also a key component of care. A fasting and post-prandial blood glucose is the recommended standard of care. In some women pre-prandial care may also be required. Women should aim for a FBG of 5.3 mmol/L (<95 mg/dL) and a two-hour post-prandial of 6.7 mmol/L (<120 mg/dL).
In early pregnancy, pregnant women who do not have diabetes, tend to have a baseline FPG which is lower than the non-pregnant state. This is due to insulin-independent glucose uptake by the foetus and placenta, and increased tissue sensitivity to insulin at this stage. In later pregnancy a measure of insulin resistance emerges, as a result of diabetogenic placental and other reproductive hormones, leading to slightly elevated blood glucose which is transported across the placenta to fuel the growth of the foetus. In GDM, pancreatic beta-cell dysfunction occurs, compounding the effects of insulin insensitivity on blood glucose levels. (Plows et al 2018). Due to increased red blood cell turn over, HbA1c is generally lower in normal pregnancy than non-pregnant women. Thus, for women with pre-existing diabetes, in pregnancy, the target HbA1c should be between 6.0-6.5%. Nevertheless, it may be relaxed to 7% to prevent hypoglycaemia, in clients so prone.

Glycaemic control is generally achieved through a combination of oral medicine, insulin and nutritional therapy. Insulin is the preferred medication as it does not cross the placenta to any measurable extent. However, metformin and glyburide may be safely used. If metformin was introduced to females who have Polycystic Ovary Syndrome solely to induce ovulation, there is no need to continue, once pregnancy has been achieved.
If pre-existing hypertension is a comorbidity in women who were already on hypertensive medicines, then a blood pressure of 120-160 mm/Hg systolic on 80 - 105 mm/Hg diastolic would be the target goal during pregnancy (ADA 2018). Potentially teratogenic medications e.g. ACE inhibitors ARBs and statins should be avoided.

In women with T1DM or T2DM, low dose Aspirin (ASA) 60-150mg should be prescribed from the end of the first trimester, until the baby is born. This will lower the risk of pre-eclampsia (ADA 2018).

**Treatment of Diabetes in Children**

The prevalence of diabetes in children in the Caribbean, while low, may be increasing. Additionally, over the last 2 decades there has been an emergence of T2DM in the paediatric and adolescent population. With increasing numbers of children and adolescents becoming overweight and obese, we can expect this trend to continue. Little data has been published on the outcomes, such as survival or diabetes’ complications in persons with paediatric-onset diabetes residing in the Caribbean.

**Box 1.11: Recommendations for IDENTIFICATION OF Diabetes IN CHILDREN**

The following are indications to investigate for DM in children:

- Hyperglycaemia (RBS >11.1 mmol/L)
- Polyuria
- Polydipsia
- Excessive tiredness
- Weight loss
- Diabetic ketoacidosis (DKA)
- ALL new cases of DM in children are presumed to be T1DM
- REFER FOR IMMEDIATE HOSPITAL CARE
Traditionally, management of children has been challenging because of the absence of paediatric endocrinologists and other critical members of the health care team. There is need for more persons trained in paediatric and adolescent diabetes’ management, in many Caribbean islands. The inclusion of this section in these guidelines aims to equip our community physicians with the tools to diagnose and manage paediatric and adolescent diabetes and to sensitise regional clinicians on the nuances associated with the management of diabetes in this population.

**Presentation of Diabetes in Children and Adolescents**

All children or adolescents with undiagnosed diabetes will present with hyperglycaemia RBG >11 mmol/L. Children with T1DM typically present with polyuria, polydipsia, excessive tiredness and weight loss whilst up to a half present in DKA (ADA 2018).

Risk-based screening for prediabetes and/or Type 2 Diabetes should be considered in children and adolescents after the onset of puberty or ≥10 years of age, whichever occurs earlier, who are over-weight (BMI ≥85th %) or obese (BMI ≥95th %) and who have one or more additional risk factors for diabetes (see Table 11).

If tests are normal, repeat testing at a minimum of 3-year intervals, or more frequently if BMI is increasing.

Fasting plasma glucose, 2-h plasma glucose during a 75-g oral glucose tolerance test, and HbA1C can be used to test for prediabetes or diabetes in children and adolescents.

All new cases of paediatric and adolescent diabetes should be presumed to have T1DM, until proven otherwise. They should be referred immediately to the paediatric unit of the nearest hospital and started on insulin at diagnosis.
Referral to an endocrinologist/diabetes specialist, if available, is advised to assist with management. It may be difficult to determine the diabetes’ type at diagnosis, as the supporting tests for confirmation are not readily available in most settings, and are not specific or sensitive enough to confirm the diagnosis.

**Diagnosis and Initial Management**

Diagnosis is made using the same tests as for adults and the diagnostic criteria as recommended by ADA (Table 5).

In the Caribbean, Autoantibody testing is available privately in some CARPHA Member States. Given the current obesity epidemic, distinguishing between Type 1 and Type 2 Diabetes in children can be difficult. Overweight and obesity are common in children with Type 1 Diabetes, and diabetes-associated autoantibodies and ketosis may be present in paediatric patients with features of Type 2 Diabetes (including obesity and acanthosis nigricans).

Accurate diagnosis is critical, as treatment regimens, educational approaches, dietary advice, and outcomes differ markedly between patients with the two diagnoses.

Note that the HbA1c test should be used with caution in children due to the short pre-clinical phase of Type 1 Diabetes and the low prevalence of Type 2 Diabetes. The HbA1c may not have changed significantly with the sudden onset of the disease.

---

**Box 1.12: Recommendations for Diagnosis of Diabetes in Children**

- Diagnose using the same test as for an adult
  - FBS ≥7 mmol/L (126 mg/dL)
  - HbA1c >6.5%
- HbA1c may not change due to the acute onset of diabetes in most cases
Table 11: Risk-based screening for Type 2 Diabetes or prediabetes in asymptomatic children and adolescents in a clinical setting*

**Criteria**
- Overweight (BMI >85th percentile for age and sex, weight for height >85th percentile, or weight >120% of ideal for height)

**Plus, one or more additional risk factors based on the strength of their association with diabetes:**
- Maternal history of diabetes or GDM during the child’s gestation
- Family history of Type 2 Diabetes in first- or second-degree relative
- Signs of insulin resistance or conditions associated with insulin resistance (acanthosis nigricans, hypertension, dyslipidaemia, polycystic ovary syndrome, or small-for-gestational-age birth weight)

*Persons aged <18 years.

A child with symptoms of diabetes should be referred immediately to the hospital for assessment, confirmation of the diagnosis and immediate care.

A child without symptoms of diabetes and an elevated random glucose, should have a urine test for ketones, if available, and sent immediately to hospital, if these are present. In the absence of ketones, they should be referred to their physician for evaluation within 48 hours of the abnormal blood glucose result. They must be advised to go to hospital if symptoms of diabetes develop (Algorithm 5).
Algorithm 7: Treatment of Minors with Elevated Blood Glucose

**Symptoms of Diabetes?**

**Random Plasma Glucose value elevated?**

- **YES**
  - Conduct **risk-based** screening (≥10 yrs old; BMI≥85th percentile; other risk factors)
  - Refer immediately to hospital for assessment, confirmation and care of DM

- **NO**
  - Continue routine care. Repeat screening in 3 months.

**Test Urine for Ketones**

- **YES**
  - Review within 48 hours
    - Repeat FBG
    - Retest urine
  - Advise on need for careful monitoring for symptoms and immediate hospital visit, if symptoms arise before review.
  - If hyperglycaemia persists on review, refer to the hospital immediately.
  - After client is stabilised in a hospital setting and discharged, maintain insulin therapy in accordance with Algorithm 3

- **NO**
  - Refer immediately to hospital for assessment, confirmation and care of DM
Treatment of Diabetes in Children with Subcutaneous Insulin

Once ketoacidosis is absent or has resolved, treatment with subcutaneous insulin can be implemented for continued care (Algorithm 3).

Total Daily Starting Doses: 0.3-1.0 U/kg/day (higher doses for ill clients or older children; lower doses in younger children) see Algorithm 3.

- First Line Therapy: NPH and regular Insulin 2/3 1/3 Regimen
- Second Line Therapy: Basal bolus Insulin Regimen

Type 2 Diabetes in Youth
T2DM is becoming more common in youth. Primary care givers can entertain the possibility of T2DM in children /young people

- Who have a strong family history of T2DM
- Are obese at presentation
- Are of Black or Asian ethnicity
• Require <0.5 units/kg/bodyweight/day of insulin after partial remission
• Show insulin resistance

Undiagnosed diabetes is very rare in the adolescent population. It is often difficult to distinguish T2DM from T1DM and while several tests are available worldwide, they are often not readily available regionally. For this reason, we recommend that all children with diabetes be treated with insulin. Due to the high prevalence of microvascular and macro vascular complications at diagnosis in adolescents with T2DM, screening for these complications may commence earlier than in a client with T1DM.

Weight and lifestyle management is critical. Metformin is the preferred oral agent of choice but rapid deterioration in glucose control has been demonstrated in the TODAY trial when this agent was used as monotherapy with many clients requiring some form of insulin therapy.

Treatment of Overweight and Obese Persons with Diabetes

At each encounter with the health system the clients’ weight should be taken and the BMI calculated and documented. Persons of Asian or African descent, with diabetes who are overweight with a BMIs of 23–26.9 kg/m² should commence diet, physical activity and behavioural change seeking to lose 5% of their booking weight. Routine referrals to the team’s nutritionist should be made, in order to provide practical, individualised guidance to PWD on what constitutes an appropriate diet to help them maintain glycaemic control and reduce the risks associated with obesity. In prescribing to manage a client’s diabetes,
Algorithm 6: Treatment or Overweight and Obese Persons with Diabetes

At each encounter the BMI of the diabetic client should be calculated and documented

BMI wt (Kg)/Ht (m²)

BMI 23-26.9

Diet, Physical Activity, Behavioural Therapy

Goal achieve >5% wt loss

Initial intervention should be High intensity >16 sessions in 6 months to achieve 500 - 700Kcal/day energy deficit.

Diets should be individualised they may have the same calorie restriction but differ in protein carb and fat content.

Clients who achieve short-term weight loss goals should be prescribed long term (>1yr) weight loss maintenance programs.

Grade A evidence ADA 2018

BMI 27-29.9

Can also be given to highly motivated clients BMI>25

Pharmacotherapy

Weight loss medications can be effective adjuncts to diet and physical activity and behavioural counselling for some DM clients with Type 2 DM and BMI >27

If a client response to weight loss medications is <5% after 3 months or if there are safety or tolerance issues, discontinue meds and seek alternate meds or treatment options.

Grade A evidence ADA 2018

Approved Meds Tx Obesity

Short term (a few weeks):
Phentermine (Lomaria) 37.5mg daily or 8mg tds
Long term Tx (more than a few weeks)

Lipase inhibitor
Orlistat (Alli 60mg) (Xenical 120mg)
60 or 120mg tds within 1 hr of low fat meal

Selective Seratonin (5-HT) 5-HT2C receptor agonist
Lorcaserin (Belviq) 10mg bd. (Belvique XR) 20mg daily

Sympathomimetic anoretic/antileptic combinations Opiod antagonist/aminoketone antidepressant combination Glucagon like receptor agonist.

BMI ≥30

Metabolic Surgery

Metabolic Surgery can be considered an option for adults with Type 2 DM and a BMI 30-34.9kg/m²

Should be recommended as an option to treat Type 2 DM BMI >40 who are suitable surgical candidates. When blood glucose levels not controlled despite lifestyle and optical medical therapy. (Grade A evidence ADA 2018)

All persons for metabolic surgery should receive a complete mental health assessment. (Grade B evidence ADA 2018)
physicians should always consider the glucose lowering drugs that promote weight loss or have no impact on weight gain.

Persons with diabetes, who are moderately to severely overweight and have BMIs >27kg/m² should be offered behavioural therapy and pharmacotherapy (IDF 2018). Drugs approved for short-term weight management (i.e. a few weeks) include Phentermine (Lomaira). For long-term weight management (i.e. more than a few weeks) several drugs and drug combinations have been approved. Lipase inhibitors e.g. Orlistat and selective serotonin (5HT) receptor agonist e.g. Lorcaserin are approved. (Algorithm 5).

Bariatric surgery (used for the sole purpose of weight loss) may be considered for persons who are obese with a BMI >30kg/m², and is recommended as treatment for diabetes in persons with a BMI of >40kg/m² (ADA 2018). Surgeries of this nature should never be undertaken without a full psychiatric assessment and the client being fully informed on what the procedure entails, as well as long-term post procedure concerns and lifestyle changes they will need to make post procedure.

Metabolic surgery is costly and some of the long-term concerns include dumping syndrome, vitamin and mineral deficiencies and severe hypoglycaemia from insulin hypersecretion.

Box 1.13: Recommendations for Diabetes in the Elderly

- Healthy elderly people with T2DM should have the same glucose targets as young adults.
- Elderly persons should be screened for frailty and their HbA1c target adjusted accordingly.
- Glucose lowering medicine with a risk of causing hypoglycaemia should be avoided.
- Treatment of persons at the end of life should aim to avoid symptoms of high blood glucose.
Metabolic surgery is not available through the public health care service in CMS. However, clients can access it through private health care on the islands of Barbados and Trinidad. If we are to embrace Bariatric surgery as a means of treating diabetes, a regional approach for referrals may need to be established.

**Treatment of Diabetes in the Elderly**

Healthy elderly people with diabetes should have no significant, special allowances made for their care or special blood glucose targets. However, as the elderly become more “frail” special considerations are made. Frailty is defined as a combination of:

- significant fatigue
- recent weight loss
- decreased mobility
- increased risk of falls and
- increased risk of becoming institutionalised

Special targets should be set for the frail, elderly. A higher HbA1c of <8% (64 mmol/L) is the target for frail, elderly persons with diabetes.

Adults with diabetes >65yrs should additionally be screened for early detection of mild cognitive impairment and dementia.

Special care needs to be taken in prescribing for the frail, elderly. The risk vs benefit of glucose lowering medicine must be considered. The risk of hypoglycaemia or falls needs to be taken into consideration before prescribing. Doses may have to be reduced or medicines
discontinued altogether. Medicines which have a higher risk of hypoglycaemia, should be avoided.

Persons at the end of life, should be made comfortable and every effort should be made to avoid symptoms and signs of high blood glucose levels.

Figure 4: Indicators for immediate referral to Hospital
Primary Care Providers’ Guide to Hospital Referral

These guidelines, while covering a broad range of topics, are essentially geared toward guiding health care providers in the primary care setting. This segment seeks to emphasise the importance of early recognition of the need for hospital referrals. Triggers and thresholds for referral will vary with the capacities of the primary care facilities in different member states, but consensus within-country, among primary care providers on when to refer persons living with diabetes for advanced care, is essential. Timely referral is essential for optimising client outcomes.
Section 3: TREATMENT OF COMPLICATIONS OF DIABETES
Treatment of Diabetic Ketoacidosis (DKA) and Hyperglycaemic Hyperosmolar (HHS)

Diabetic Ketoacidosis (DKA) and Hyperglycaemic Hyperosmolar Syndrome (HHS) are two potentially fatal hyperglycaemic complications, that can occur in persons with diabetes. It is imperative that PCP recognises them, initiate sound management and give timely referrals to hospital, Figure 5.

DKA generally occurs when there is very little insulin, or absolute insulin deficiency which increases ketone body production and contributes to metabolic acidosis. Often DKA is precipitated by an event such as an infection (especially urinary tract and respiratory infections), myocardial infarction, stroke, pancreatitis or trauma.

HHS is a non-ketotic state with limited insulin being secreted by the pancreas for lipolysis but not for glucose regulation. Thus, HHS has a more insidious onset with more severe hyperglycaemia and mental status dysfunction than DKA.

At each visit to the primary care physician, an office dipstick urine analysis should be performed. If ketone bodies 3+ and above are found, then this should alert the physician that DKA needs to be ruled out. A random capillary blood glucose test should then follow to determine the present blood glucose status. If blood diascan value is >300mg/dL, there should be a high level of suspicion for DKA. In most outpatient settings, clients are asked to take their meds if they have not, before attending the clinic. They are also advised to drink at least a litre of water over the next 2 hours with serial glucometer readings being repeated hourly. This observation should not extend beyond 2 hours. A thorough history and clinical exam should be carried out to ascertain if the client had polyuria, unexplained weight loss, or mental changes prior to coming to the clinic. The clinical exam should ascertain if the client has a present source of infection.
**DKA**

Onset: generally precipitated by and incident (eg. stress, trauma, infection)

Distinguishing feature: relative insulinopaenia, Ketone bodies formed often associated metabolic acidosis.

Acute onset symptoms

**HHS**

Onset insidious

Distinguishing feature absolute insulinopaenia, no Ketone bodies

(Symptoms of extreme Hyperglycaemia in both DKA & HHS)
Polyuria, Polydipsia, unintended weight loss, vomiting, weakness, mental status changes

GP’s role:
Urinalysis - Ketonuria >3+
Diascan - BS elevated (>300mg/dl assume hyperglycemia)
Along with clinical exam high degree of suspicion

Investigations (If possible in your setting/do hospital admission)

Plasma glucose Calculate Anion GAP
Urea, Cr, electrolytes, CBC, Osmolarity
Blood culture, urine cultures, CXR, ECG

To hospital for further investigation & management

Start in Community

Fluids (Correct hypovolemia)

- Assess Volume Status then give 1L/hr .9% saline

Hospital Care

*refer to Appendix 2*
If the setting allows for laboratory investigations to be done in a timely fashion, the following investigations should be requested: Plasma glucose, Calculate Anion GAP, Urea, Cr, electrolytes, CBC, Osmolarity, blood culture, urine cultures, CXR and ECG. The client should be assessed using the A1C, Blood pressure, Cholesterol, and Drugs (ABCDs) and referred immediately to a tertiary setting for appropriate care (Figure 5).

Clients with HHS generally have much higher blood glucose levels and often have mental changes. Ketones will generally not be found in the urine but the client should nevertheless be referred immediately to hospital for appropriate treatment (Figure 5).

In some Caribbean settings, the IV two-bag technique is employed for stabilisation in the hospital in the first 24 hours of admission (Appendix II). Hospital care is further discussed in Appendix III.

**Microvascular Complications**

The microvascular complications of Diabetes Mellitus i.e. nephropathy, neuropathy and retinopathy, are directly related to the duration and degree of hyperglycaemia. Macro vascular complications include the manifestations of CV D, which is the leading cause of mortality in the region. In addition to these classical complications, there are others that are being increasingly recognised, although these will not be discussed in this summary:

1. Increased rates of cancer especially breast, colon, pancreas, uterus, liver and bladder
2. Decreased lung capacity
3. Deafness
4. Dementia
5. Depression
6. Non-alcoholic fatty liver disease, an increasingly common cause of cirrhosis
7. Osteoporosis
8. Obstructive sleep apnea
9. Periodontal disease
10. Glaucoma
11. Cataract
12. Fractures
13. Hypogonadism

**Recommendations for Retinopathy in Diabetes**

Diabetic retinopathy increases the risk of blindness by approximately 20-fold.

**Contributing Factors**
- Duration of the disease (usually >10 years)
- Poor glycaemic control
- Poor blood pressure control

**Screening**
Refer all persons with T2DM to an ophthalmologist as soon as possible, after initial diagnosis and then annually. Clients with T1DM should have an initial eye examination, 5 years after the onset of the disease.
Recommendations to Reduce Risk of Retinopathy

- Aim for tight glycaemic control (HbA1c <7% in most cases)
- Aim for tight blood pressure control (<130/80 in most cases)
- Both glycaemic and blood pressure control can also slow down the progression of retinopathy
- Refer for specialty care: for those with severe retinopathy
- Laser photocoagulation surgery and/or anti-VEGF therapy is effective in preventing visual loss in persons with proliferative diabetic retinopathy, clinically significant macular oedema, and in some cases severe non-proliferative diabetic retinopathy.

Box 1.14: Recommendations for Retinopathy

General Recommendations
- Optimise glycaemic control to prevent onset or slow progression of retinopathy
- Optimise blood pressure, serum lipid control to reduce onset and slow progression of diabetic retinopathy
- Screening
- Use non-mydriatic retinal photography to screen for retinopathy
- REFER TO OPHTHALMOLOGIST for baseline evaluation
- Screen retina every 1-2 years
- Refer ALL T1DM for a comprehensive eye exam by an ophthalmologist within 5 years of diagnosis
- T2DM should be referred at diagnosis.

IDF 2017/ADA 2018
Recommendations for Nephropathy in Diabetes

Diabetes increases the risk of end-stage renal disease (ESRD) approximately 25-fold and accounts for approximately 28% of cases of ESRD in the Caribbean.

“People with poorly controlled diabetes have a markedly increased risk for and incidence of, heart attacks, strokes, blindness, kidney failures, leg amputations and early death. Not only is their productive life span shortened, but the quality of life of people with diabetes and their families are severely impacted.”

(Declaration of the Americas on Diabetes August 1996)

Contributing Factors

• Duration of diabetes (usually >10 years)
• Poor glycaemic control
• Poor blood pressure control
• Genetic factors i.e. family history of hypertension or renal failure
• High protein intake Screening Albuminuria is the earliest manifestation of nephropathy.

Box 1.15: Recommendations for Diabetic Kidney Disease

• Diabetic Kidney Disease (DKD) is identified when the e.g. GFR <60mil/min/1.73m2
  » Screen for microalbuminuria at diagnosis and then annually in all persons with T2DM at a well-client visit.
  » Screen annually for microalbuminuria in all persons who have T1DM for longer than 5 years.
  » Repeat the test within 3-6 months for confirmation, if microalbuminuria is present at initial screen.
  » Measure serum creatinine and/or calculate estimated eGFR (e.g. FR) at least annually
Main Methods for Screening:

- Measurement of urinary albumin/creatinine ratio (ACR) in a spot urine specimen
- 24-hour collection of urine for proteinuria
- Timed collection of urine for micro albumin

NB: dipstick tests for albuminuria are cheaper, but they do not identify many clients with micro albuminuria i.e. they have a high false-negative rate.

Recommendations to Reduce the Risk of Nephropathy

- Screen for microalbuminuria at diagnosis and then annually in all persons with T2DM at a well-client visit.
- Screen annually for microalbuminuria in all persons who have T1DM for longer than 5 years

Box 1.16: Recommendations for Nephropathy

- Screen for albumin annually (microalbuminuria)
- Serum creatinine can be measured by spot urine albumin or by calculating e.g. GFR
- T1DM should be screened within 5 years of diagnosis
- All T2DM and all persons with diabetes, with HTN should be screened annually
- Persistent albuminuria should be treated with an ARB or ACE inhibitor
• If microalbuminuria is present, repeat the test within 3-6 months for confirmation. Acute illness, fever, exercise and dehydration can cause falsely elevated levels.

• Measure serum creatinine and/or calculate estimated eGFR (e.g. FR) at least annually.

• Once microalbuminuria or proteinuria has been confirmed:
  » Refer to Nephrologist if sudden decrease in eGFR with sudden increased creatinine
  » Include an ACE-inhibitor or ARB (but not both together) in the therapeutic regimen. These medications should not routinely be used in normotensive clients with no microalbuminuria.
  » Aim for tight blood pressure control with combination therapy if necessary so that BP ≤125/75 mm Hg. Calcium channel blockers, diuretics, beta-blockers and alpha-blockers can be used in combination to attain goals.
  » Aim for tight glycaemic control. Metformin can be continued in the non-hospitalised client.
  » Consider referral of clients with nephropathy to Nutritionist for protein-restricted diet as appropriate.
  » Refer for specialist care for persons with advanced disease (e.g. GFR < 60 ml/ min, and nephrotic range proteinuria or if there is doubt about the aetiology of the nephropathy.

Some individuals can develop chronic kidney disease with declining e.g. GFR without detectable albuminuria. The stage of Chronic Kidney Disease (CKD) should be classified according to National Kidney Foundation Kidney Disease Outcomes Quality Initiative (NKF KDOQI) (Table 9B) and treated as above.

However, consider earlier referral to a nephrologist.
Recommendations for Neuropathy in Diabetes

Diabetic neuropathy may be focal (i.e. mononeuritis multiplex) or diffuse. Diffuse neuropathy is the most prevalent i.e. chronic sensorimotor peripheral neuropathy and autonomic neuropathy. In the initial phases of peripheral neuropathy, the small nerve fibres of the feet are generally affected and the client experiences pain, burning and tingling sensations. As the disease progresses and the large nerve fibres

**Box 1.17: Recommendations for Peripheral Neuropathy**

**Screening**
- Screen for neuropathy using the 5.07 monofilament (Appendix III)
- Inspect the feet of persons with diabetes at every visit
- Educate clients on the prevention of diabetic foot

<table>
<thead>
<tr>
<th>Category</th>
<th>Spot Urine for microalbumin (ug/mg creatinine)</th>
<th>24-hr collection of protein (mg/24hr)</th>
<th>Timed collection of microalbumin (ug/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;30</td>
<td>&lt;30</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Microalbuminuria</td>
<td>30-299</td>
<td>30-299</td>
<td>20-199</td>
</tr>
<tr>
<td>Clinical albuminuria</td>
<td>≥300</td>
<td>≥300</td>
<td>≥200</td>
</tr>
</tbody>
</table>

Source: American Diabetes Association, Standards of Medical Care, 2014
are affected, they may experience numbness and loss of protective senses (LOPS) which often leads to ulcers.

Non-diabetic neuropathies can occur in clients with diabetes and should be suspected in cases of severe or atypical neuropathies e.g. vitamin B12 deficiency, alcohol abuse, lead or heavy metal neuropathy, and neuropathy associated with medications, vasculitis, and renal failure.

**Contributing Factors**
- Poor glycaemic control
- Duration of diabetes >5 years

**Screening**
All clients should be screened for Distal Symmetric Polyneuropathy (DPN) at the time of diagnosis of T2DM and 5 years after the onset of T1DM.
International diabetes Federation 2017 recommends:
- Screening for neuropathy using 5.07 monofilament to identify if the foot is at risk
- Inspection of feet at every visit
- When at risk, clients should be educated on prevention of diabetic foot

**Recommendations to Reduce the Risk of Neuropathy**
- Maintaining HbA1c <7% may prevent the onset of neuropathy
- Improving glycaemic control may slow progression in established disease but does not reverse neuronal loss.
Pharmacological treatment for neuropathic pain includes pregabalin (class A indication) and/or duloxetine (class B indication).

Amitriptyline, venlafaxine, gabapentin, valproate, opioids (morphine sulphate, tramadol, and controlled-release opiates) may also be helpful (EBM references).

**Autonomic Neuropathy (AN)**

Autonomic Neuropathy (AN) should be suspected in clients with Diabetic Peripheral Neuropathy (DPN). Clinically, this includes resting tachycardia, postural hypotension (a fall in systolic BP of 20mm Hg or diastolic BP of at least 10 mm Hg after standing for 3-5 minutes without an appropriate heart rate response), constipation, diarrhoea, gastroparesis (early satiety and epigastric discomfort), erectile dysfunction, sudomotor dysfunction (dryness of skin or hyperhidrosis), bladder dysfunction and hypoglycaemic unawareness. Persons with AN require referral to the appropriate specialists. Treatments for erectile dysfunction can include phosphodiesterase type 5 inhibitors, but would require urology consultations if intracorporeal injection is being considered.

**Management of Associated Conditions**

Because of the compounding effect of diabetes with other comorbidities, there is a need for all comorbid conditions to be controlled, to prevent or delay complications and improve quality of life.
Hypertension Management in Diabetes
(Cross reference WHO 2018 HEARTS: Evidence-Based Protocols Module 2)

**Box 1.18: Recommendations for Hypertension**

Stage 1 HTN is defined as BP ≥130/80mmHg.
Stage 2 HTN is defined as BP ≥140/90mmHg

- Target Blood pressure for persons with HTN and DM is ≤130/80
- Advise Lifestyle changes to ALL clients
- Commence medical management if blood pressure is ≥140/90
- Protocol using ACE or ARB as first line treatment is preferable
- ACE and ARB both have renal protecting properties
- Diuretics although effective and cheap, may cause hypokalaemia and interfere with blood glucose measurements.
- CCB are the recommended medication for treatment of pregnant ladies with HTN
  - Protocol HTN management using ACE or ARB as first line medication:
    - start with ACE or ARB (If not controlled add)
    - CCB (if not controlled add)
    - Thiazide diuretic
- Check blood pressures monthly until optimal BP target is achieved
- Combination medicines increase adherence

Modified from WHO 2018 HEARTS Guidelines

Hypertension (HTN) is defined as a blood pressure of systolic values ≥140 mm Hg and a diastolic value ≥90 mm Hg. There is a higher
Hypertension (HTN) is defined as a blood pressure of systolic values ≥140 mm Hg and a diastolic value ≥90 mm Hg. There is a higher prevalence of hypertension among persons with diabetes compared to persons without it. In the Caribbean, diabetes is present in about one-third of hypertensive clients. This co-existence is often a result of:

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

Hypertension increases the risk of strokes, ischemic heart disease, complications of peripheral arterial disease, retinopathy and nephropathy in persons with diabetes.

The target blood pressure should be <140/90 mm Hg in the general population but in persons with diabetes and complications of diabetes, the target goal should be <130/80 mm Hg. Lower BPs may be attained in younger clients with CVD if excessive pill burden or side-effects from the medicine have been considered.

Lower targets may be difficult to achieve in the elderly and more modest goals may have to be set.

**Management Hypertension**

All persons with a blood pressure of ≥130/80 mm Hg should be advised on lifestyle changes which include:

- Weight management (weight loss is beneficial for the overweight or obese client)
- Limiting sodium intake
- Increasing consumption of fruits and vegetables
- Use of low-fat dairy products. A balanced diet will provide all the essential nutrients and vitamins without the need for supplementation
HTN protocol ARB/ACE first line

Hypertension Protocol
ARB inhibitor or ACE as first line treatment

Screen All Patients

Lifestyle changes recommended for ALL blood pressure >130/80

After one month

Prescribe starting dose of ARB or ACEi

If BP>130/80 Increase to full dose

After one month

If BP still >130/80 add starting dose CCB

If BP still >130/80 increase to full dose CCB

If BP still >130/80 add a Thiazide diuretic

If taking meds as prescribed and BP is still elevated, refer to cardiologist

At each stage if BP>130/80 check that the client is taking meds as prescribed. Blood pressure assessments should be made in conjunction with home blood pressure readings.”

Algorithm 7: HTN Treatment Protocol Using ARB/ACE Inhibitor as First Line
Cessation of smoking - critical for reducing the risk of vascular complications of hypertension and diabetes

Limiting alcohol intake to 1-2 drinks per day

Maintaining physical activity unless specifically contraindicated.

Table 13: Medicines Used in the Treatment of Hypertension

<table>
<thead>
<tr>
<th>Class</th>
<th>Examples</th>
<th>Starting Dose</th>
<th>Increased dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACE</td>
<td>Lisinopril</td>
<td>20mg</td>
<td>40mg</td>
</tr>
<tr>
<td></td>
<td>Ramipril</td>
<td>5mg</td>
<td>10mg</td>
</tr>
<tr>
<td></td>
<td>Perindopril</td>
<td>4-5mg</td>
<td>8-10mg</td>
</tr>
<tr>
<td>ARB</td>
<td>Iosartan</td>
<td>50mg</td>
<td>100mg</td>
</tr>
<tr>
<td></td>
<td>Telmisartan</td>
<td>40mg</td>
<td>80mg</td>
</tr>
<tr>
<td>Diuretic Thiazide like</td>
<td>Chlorthalidone</td>
<td>12.5mg</td>
<td>25mg</td>
</tr>
<tr>
<td></td>
<td>Indapamide</td>
<td>1.5mg</td>
<td>Stay at 1.5mg</td>
</tr>
<tr>
<td>CCB</td>
<td>Amlodipine</td>
<td>5mg</td>
<td>10mg</td>
</tr>
</tbody>
</table>
Persons with Diabetes who are diagnosed with hypertension and have a blood pressure of $\geq 130/80$ mm Hg, in addition to implementing the lifestyle changes above, should be started on antihypertensive medications and other cardiovascular risks should be identified and treated. Most persons with hypertension and diabetes will need 2 or more medicines for control, in addition to lifestyle changes.

There are five classes of hypertensive medications:

- ACE I (Angiotensin Converting Enzymes inhibitors)
- ARB (Angiotensin receptor blocker)
- Beta-blockers
- Calcium channel blockers
- Diuretics

WHO 2018 HEARTS Evidence-Based Treatment Protocols on HTN management, suggest several protocols for the treatment of hypertension. The initial drug may vary between diuretics or an ACE inhibitor. Diuretics are less expensive and probably effective in all races. However, there is a risk of hypokalaemia with use of diuretics and they may have unfavourable effects on lipid and glucose measurements.

ACE inhibitors and ARB both have reno-protective, as well as cardio-protective effect. Neither is better than the other and choice depends on client-tolerance. However, the combination of an ARB with an ACE inhibitor is not recommended, nor a direct renin inhibitor (DRI) e.g. Aliskiren with ACE or an ARB.

Pregnant women and women of reproductive age, not on effective contraception, should not be treated with ACE inhibitors, ARB’s or thiazide diuretics. Calcium channel blockers are the recommended medication for them.
If their blood pressures are not adequately controlled on Calcium Channel Blocker (CCB), they should be referred to a specialist.

**First Step**
Angiotensin Converting Enzyme Inhibitors (ACEi)

Angiotensin-Converting Enzyme (ACE) Inhibitors or Angiotensin Receptor Blockers (ARB) are the first-line therapy in persons with diabetes and with hypertension especially in those with albuminuria. The power of ACE inhibitors to lower BP is limited. It may be necessary to combine them with other agents.

**Second step**
Your next drug may be a Calcium Channel Blocker (CCB) especially a non-dihydropyridine CCB, e.g. Diltiazem. The combination of an ACE with a CCB is superior to the combination of an ACE with a thiazide diuretic, with less adverse cardiovascular outcome (ACCLOMPLISH TRIAL).

**Third Step**
Adding a diuretic to ACE or ARB
Thiazide and thiazide-like diuretics are effective in lowering BPs in clients with diabetes and hypertension.

Chlorthalidone is as effective as ACE in preventing CVD and stroke in persons with diabetes, but there is often a mild rise in plasma glucose. Volume depletion induced by the thiazide diuretic, which activates the renin-angiotensin-aldosterone system, is mitigated by the ACE inhibitor or ARB. The combination helps also to prevent hypokalaemia or hyperkalaemia.
If the target BP is not achieved, add a CCB, a thiazide or a beta blocker.

Although beta blockers may mask hypoglycaemic-related symptoms, beta blockers are as efficient as ACE inhibitors in lowering BPs and in preventing CVD in persons with diabetes (UKPDS). Use with caution in peripheral vascular disease. A beta blocker with β1-blocker specificity has less adverse effect on HbA1c and retards albuminuria better than a non-β1-specific beta blocker.
Fourth Step
If the target BP is not achieved with dual- or triple-agent combination, add a third or fourth agent such as a vasodilator (hydralazine) or other agents (loop diuretic in Congestive Heart Failure (CHF) or chronic renal failure). Blockers may be useful as tertiary add-on therapy but in the ALLHAT Trial, they were associated with new onset CHF.

Lipid Management in Adults with Diabetes
T2DM 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 macro vascular disease (heart attacks and strokes). Lowering LDL cholesterol and triglycerides and raising HDL cholesterol have been shown to reduce macro vascular disease events as well as mortality.

Concepts of Care
All T2DM clients should be screened for dyslipidaemia as part of their annual examination. Once diagnosed with dyslipidaemia, then treatment should commence using the following principles:

• All clients should be advised to diet and optimise physical activity levels.
• Statins are the drug of choice.

Many different statins and doses may be used to achieve the targets above but experience at achieving these targets above, precludes the use of simvastatin 10 mg, pravastatin 10 mg and 20 mg, lovastatin 20 mg and all doses of fluvastatin except for 80 mg (ACC/AHA Guidelines 2013).
Treatment

**LDL-cholesterol**

- Aim for LDL-cholesterol <1.8 mmol/L (<70 mg/dL) in those with CVD and <2.5 mmol/L (<100 mg/dL) in those without CVD.
- Secondary target is to aim for LDL-cholesterol (LDL-C) lowering to <40% of the baseline in clients with CVD regardless of baseline LDL-C.
- If goals cannot be achieved because of high baseline LDL-C or poor response to therapy, a relative LDL-C reduction of approximately 40% is appropriate.

**HDL-cholesterol**

- Aim for >1.0 mmol/L (>40 mg/dL) in men and >1.3 mmol/L (>50 mg/dL) in women. Drug therapy, other than statins, is not recommended. Optimise diet, physical activity, and attainment of weight management goals. Optimise statin therapy and LDL-C lowering to address elevating low HDL-cholesterol levels.

**Hypertriglyceridemia**

- Aim for <1.7 mmol/L (<150 mg/dL)
- Hypertriglyceridemia may respond to caloric and alcohol restriction. Adequate glycaemic control also contributes to reductions in triglyceride levels. Fibrate therapy is not recommended.

**Statin Therapy**

- Clients with diabetes over the age of 40 who have one additional cardiovascular risk factor (such as hypertension, smoking or microalbuminuria), may benefit from the addition of a statin, irrespective of initial LDL-cholesterol levels.
• All clients with diabetes and CVD (angina, myocardial infarction, transient ischemic attack, stroke, and claudication) should be on cholesterol-lowering medication.

• Note that liver function should be evaluated before commencement of statin therapy, but may not be repeated as frequently as before. Repeat as indicated by clinical evaluation of the client.

Other Therapeutic Interventions
The following therapies may be considered in the management of diabetes and associated conditions:

Anti-thrombotics (Aspirin)
1. Aspirin (75-81 mg daily) should be given to all persons with diabetes over the age of 50 years in men and in 60 years in women as primary prevention, who have at least one

Box 1.20: Recommendations for Anti-thrombotics

• Aspirin (75-81 mg daily) should be given to all persons with diabetes
• Over the age of 50 years in men and in 60 years in women as primary prevention, who have at least one other additional risk factor for CVD
• Aspirin or clopidogrel may be used in clients with symptomatic PAD or asymptomatic PAD with an ankle-brachial index of <0.09

Note: Aspirin is not recommended for persons under age 21 years because of increased risk of Reye’s Syndrome
other additional risk factor for CVD such as hypertension, hyperlipidaemia, smoking, albuminuria or a family history of CVD.

2. Aspirin or clopidogrel may be used in clients with symptomatic PAD or asymptomatic PAD with an ankle-brachial index of <0.9 who do not have a contra-indication to aspirin therapy and who have two or more risk factors for CVD. Note that higher doses will increase the possibility of gastric mucosal injury and gastrointestinal haemorrhage. Warfarin has no benefits in preventing CV ischemic event. Aspirin is not recommended for persons under the age of 21 years because of increased risk of Reye’s Syndrome.

3. Alternative therapies include the combination of aspirin with an H2 antagonist or proton pump inhibitors or the use of Clopidogrel.

Sexual Health Problems Associated with Diabetes: Erectile Dysfunction

If diabetes progresses without being controlled for long periods of time, it can affect the vascular and neurological function of the reproductive organs. In men with diabetes, erectile dysfunction is a common complication.

Primary care providers should ensure that they initiate conversations on sexual health in a non-judgmental manner. In males with diabetes, erectile dysfunction may be an embarrassing topic to discuss. Primary care providers manage erectile dysfunction by:

1. Educating clients about the problem and the contributing factors
2. Assessing the problem by a thorough history and clinical examination.
3. Determine contributing factors such as cardiovascular risks and medications (B-blockers) etc.

4. Offer treatment options:
   a. Strict blood glucose control
   b. Phosphodiesterase-5 inhibitors (e.g. Sildenafil (Viagra), Tadalafil (Cialis)) if not responding

5. Make adequate and timely referrals:
   a. Medical
   b. Psychological
   c. Surgical, if phosphodiesterase-5 inhibitors are not successful

Recommendations for Preventing Diabetic Foot Complications
Foot lesions are common in persons with diabetes and can lead to lower-extremity amputations. In fact, diabetes is the most common cause of non-traumatic amputations with rates as high as 936, per 100,000 populations. The prevention of diabetic foot complications requires comprehensive screening form primary care physicians, and all members of the health team, as well as continued client education.

Contributing Factors to Diabetic Foot Complications
• Peripheral neuropathy
• Peripheral artery disease
• Injury/Infection
• Incorrect footwear
Box 1.21: Recommendations for Doctors and Nurses’ Role in Avoiding Diabetic Foot Complications

Screening
A comprehensive foot examination should be done, at least annually, to identify risk factors predictive of ulcers and amputations. The foot examination should include:

- Inspection
- Assessment of foot pulse
- An ankle-brachial index (ABI) in any client with symptoms of claudication or who is at high risk for peripheral artery disease
- Testing for peripheral neuropathy
- Provide general foot self-care education to all clients (Module 3)

Recommendations to Reduce the Risk of Foot Problems
- Aim for tight metabolic and blood pressure control
- Encourage smoking cessation
- Encourage routine daily self-examination of feet
- Encourage use of correct footwear. Where available, a chiropodist or podiatrist should be consulted when necessary
- Aggressively treat any infected wounds with broad spectrum antibiotics including anaerobic coverage.
- Refer for specialty care accordingly, especially in cases with foot ulcers, high-risk feet (i.e. those with a history of prior ulcer or amputation), smokers, and those with peripheral artery disease.

- Tobacco use
- Impaired vision
- Presence of other microvascular complications
The presence of the SLIPPING SLIPPER SIGN – in which clients complain of their slippers frequently slipping off their feet is an indicator of neuropathy and potentially other diabetic foot complications.

**History-Taking in a Proper Foot Assessment**
The Primary care physician should enquire about:

- Numbness or tingling in the feet
- Burning sensation in legs or feet
- Pain in the legs on walking that limits mobility
- Leg/foot symptoms that resolve on sitting
- History of foot ulcers
- Swelling of the legs/feet
- Hot/cold sensations in the feet

Positive responses for any of the above should be an indication that the client may be at high risk for diabetic foot disease.

**Components of a Comprehensive Foot Exam**
A comprehensive foot exam (Appendix IV) should be done annually for all persons with diabetes to determine if the client has diabetic foot complications. A comprehensive foot exam comprises the following:

- Touch pressure sensation
- Test vibration loss
- Temperature sensation
- Pain sensation
- Ankle Reflex

- Vibration Perception Threshold is also recommended. However, it may need to be outsourced to a designated foot clinic which has the designated machine. In most Caribbean territories, with limited resources this is not practical in the primary health setting.
A simplified foot exam was developed by St. George’s University in Grenada as demonstrated by the Touch Toe Test. It focuses on inspecting the foot, assessing light touch and pressure sensation with a microfilament.

**Touch Pressure Sensation**
Using a 10g microfilament, assess the plantar surface of the 1st, 3rd, 5th metatarsal areas and the hallux. Avoid testing areas that are callused as you may get a false positive result.

Place the monofilament on each area perpendicularly, until it buckles. Allow 2 seconds for each test. The client should be instructed to say YES if they feel the sensation or NO if they do not.

If the client does not have sensation in one of the four areas tested, then that is determined as a positive test/confirmation of peripheral neuropathy (Appendix IV).

**Test for Vibration Loss**
Ask the client to close their eyes. Place their foot on a flat surface. Using a 128Hz tuning fork, tap on tuning fork. Place it on the client’s hand/sternum so client knows what the vibration feels like. Then place vibrating fork on the big toe (Distal Hallux) and ask client to answer yes/no if they are feeling the vibration. If no vibration/sensation is felt, check other bony parts in proximity, until sensation is felt.
Temperature Sensation
Temperature sensation is generally lost in conjunction with pain sensation. It can be assessed clinically with a “Tip Therm” or by using test tubes - one hot filled with warm water (35-45°C) and one filled with cold water (5-10°C).
Put the dorsum aspect of client’s foot, directly onto the skin. The client should then be asked if they feel the sensation. The sensation can then be documented as being normal, diminished or absent (Appendix IV).

Assess Pain Using ID Pain Scale
Persons with painful diabetic peripheral neuropathy often complain of burning, stinging sensations in their feet. A simple way of assessing this is by using the ID pain scale as shown below. A value of 2-5 is considered a positive test for neurological damage. 0-1 does not exclude neurological damage but 1-0 is considered a negative test.
Assess Ankle Reflex
The ankle and plantar reflex can be assessed using a patellar hammer. However, this test is not very specific for motor neuropathy, as it may be weak in the elderly. Motor neuropathy can more accurately be determined by flexion extension of the big toe or splaying of the lesser digits.
REFERENCE LIST


EX CLI journal 2018;17;72-88-ISSN. www.ncbi.nih.gov/pmc/article

HEARTS Technical package for Cardiovascular Disease management in Primary care; Module 1; Healthy lifestyle counselling

HEARTS Technical package for Cardiovascular Disease management in Primary Care; Module 2; Evidence based protocols

HEARTS Technical package for Cardiovascular Disease management in Primary Care; Module 3; Access to essential Medicines and technology

HEARTS Technical package for Cardiovascular Disease management in Primary Care; Module 4; Team based care


https://www.cdc.gov/tobacco smoking and diabetes

https://www.cdc.gov/vaccines/adults/rec-ve centres for Disease
control and prevention

https://www.diabetes.co.uk/diet-basics.htm Diet Guides


NICE pathway updated 10th Sep 2018 https://ww.who.int/news-room/factsheets/detail/healthy diet

IDF Clinical Practice recommendations on Diabetic Foot 2017 (a guide for health care professionals)

Incidence and trends of childhood Type 1 Diabetes worldwide 1990-1999.


https://www.ncbi.nlm.nih.gov/pcm/articles/PMC4363846

International Diabetes Federation Clinical Practice Recommendations for Managing Type 2 Diabetes in Primary Care- 2017


Kate Lorig, Halsted Holman et al Living a Healthy Life with Chronic Conditions 4th Ed Management of Diabetes in Youth WDF10-573. 2015.

Moria Stewart, Judith Belle Brown et al. Patient- Centred Medicine Transforming the Clinical Method. 2nd Edition


NICE guidelines26 Aug 2015. Diabetes Type 1 and Type 2 in children and young people; diagnosis and management. nice.org/guidance/ng18

NICE Managing a diabetic foot

NICE Reducing the risk of developing a diabetic foot problem. OECS/PPS medical Products list 2017-2019
NICE guideline 2 Dec 2015. Type 2 Diabetes in adult management. Nice. org.uk/guidance/ng28

NICE guidelines 26 Aug 2015. Diabetes Type 1 and Type 2 in children and young people; diagnosis and management. nice.org/guidance/ng18

NICE Managing a diabetic foot

NICE Reducing the risk of developing a diabetic foot problem. OECS/PPS medical Products list 2017-2019


Post grad med. http://pmj.bmj.com jan 28 2016. Does the slipper sign in the patient with Diabetes predict the presence of retinopathy and nephropathy

Psychosocial Care for People With Diabetes: A Position Statement of


Russell, Koenigsberg et al. Facilitating Treatment adherence with Lifestyle changes in diabetes.


Paediatrics 2013 Feb;131(2):e648 e664.


Tulloch-Reid MK, Boyne MS, Smikle MF, Choo-Kang EG, Parkes RH, Wright- Pascoe RA, et al. Clinical and laboratory features of


WHO 2018. Guidelines on second and third line medicines and type of insulin


World Diabetes day project Report by Windward islands research and education Foundation 28thNov 2012.

Appendices
Psychosocial Assessment
Current international guidelines and recommendations in the management of diabetes emphasise the importance of integrating psychosocial considerations into the client-centred model of care for diabetes, citing potential improvements in health outcomes and quality of life. (ADA 2016). While those guidelines reference the assessment of a wide range of mental health issues, including depression, distress, anxiety, eating disorders and cognitive impairment, the regional guidelines for primary care will focus on the first two: diabetes-related distress and depression. This appendix provides examples of tools that can be used to explore these two conditions in an objective and standardised manner in each client encounter.

DDS17
The Diabetes Distress Screening Scale (DDS17) is a 17-question tool, asking pertinent questions around the way that PWD feel about managing their diagnosis. The DDS17 questions are a good thematic guide to the general discussion of the psychosocial issues faced by PWD. The questions and scoring for the DDS17 are shown in the following section of this appendix.

PHQ2
The Patient Health Questionnaire-2 (PHQ2) is a two-question screening tool for flagging possible depressed mood and/or anhedonia. A positive score on this tool should prompt more in-depth enquiry into symptoms of altered mood, using either the longer (9-question) PHQ9, or another validated tool for the population from which your clients may be drawn. The questions and scoring for the PHQ2 are also shown below.

It is important to remember that chronic disease management has an inherent trajectory over which several circumstances in a PWD’s
life may change, altering their mental state. Periodic re-evaluations of PWD mental state are advisable, especially when there has been a change in disease state, treatment regimen or life circumstance. Inclusion of the perspectives of caregivers and family members, in these assessments, is strongly recommended.

Early and objective assessment of mental health issues should be linked to appropriate referral of affected PWD to specialist mental health providers, when deemed appropriate, especially in situations where the PWD’s symptoms are refractory to generic mental health interventions (e.g. adequate sleep, physical activity and natural light exposure), or where there is identified risk of self-harm.
Diabetes Distress Screening Scale (DDS17)

**DIRECTIONS:** Living with diabetes can sometimes be tough. There may be many problems and hassles concerning diabetes and they can vary greatly in severity. Problems may range from minor hassles to major life difficulties. Listed below are 17 potential problem areas that people with diabetes may experience. Consider the degree to which each of the 17 items may have distressed or bothered you DURING THE PAST MONTH and circle the appropriate number.

Please note that we are asking you to indicate the degree to which each item may be bothering you in your life, NOT whether the item is merely true for you. If you feel that a particular item is not a bother or a problem for you, you would circle "1". If it is very bothersome to you, you might circle "6".

<table>
<thead>
<tr>
<th></th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Feeling that diabetes is taking up too much of my mental and physical energy every day.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. Feeling that my doctor doesn't know enough about diabetes and diabetes care.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>3. Feeling angry, scared, and/or depressed when I think about living with diabetes.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. Feeling that my doctor doesn't give me clear enough directions on how to manage my diabetes.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. Feeling that I am not testing my blood sugars frequently enough.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. Feeling that I am often failing with my diabetes routine.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. Feeling that friends or family are not supportive enough of self-care efforts (e.g. planning activities that conflict with my schedule, encouraging me to eat the &quot;wrong&quot; foods).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. Feeling that diabetes controls my life.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
DDS17 SCORING SHEET

INSTRUCTIONS FOR SCORING:

The DDS17 yields a total diabetes distress scale score plus 4 sub scale scores, each addressing a different kind of distress. To score, simply sum the patient’s responses to the appropriate items and divide by the number of items in that scale. The letter in the far right margin corresponds to that item’s subscale as listed below. We consider a mean item score of 3 or higher (moderate distress) as a level of distress worthy of clinical attention. Place a check on the line to the far right if the mean item score is \( \geq 3 \) to highlight an above-range value.

We also suggest reviewing the patient’s responses across all items, regardless of mean item scores. It may be helpful to inquire further or to begin a conversation about any single item scored 3 or higher.

Total DDS Score:

a. Sum of 17 item scores.
   b. Divide by:
   c. Mean item score:

\[
\begin{align*}
\text{17} & \quad \geq 3 \\
\end{align*}
\]

A. Emotional Burden:

a. Sum of 5 items (1, 3, 8, 11, 14)
   b. Divide by:
   c. Mean item score:

\[
\begin{align*}
\text{5} & \quad \geq 3 \\
\end{align*}
\]

B. Physician-related Distress:

a. Sum of 4 items (2, 4, 9, 15)
   b. Divide by:
   c. Mean item score:

\[
\begin{align*}
\text{4} & \quad \geq 3 \\
\end{align*}
\]

C. Regimen-related Distress:

a. Sum of 5 items (5, 6, 10, 12, 16)
   b. Divide by:
   c. Mean item score:

\[
\begin{align*}
\text{5} & \quad \geq 3 \\
\end{align*}
\]

D. Interpersonal Distress:

a. Sum of 3 items (7, 13, 17)
   b. Divide by:
   c. Mean item score:

\[
\begin{align*}
\text{3} & \quad \geq 3 \\
\end{align*}
\]
Health Questionnaire-2 (PHQ-2)

The PHQ-2 enquires about the frequency of depressed mood and anhedonia over the past two weeks. The PHQ-2 includes the first two items of the PHQ-9.

The purpose of the PHQ-2 is to screen for depression in a “first-step” approach.

Patients who screen positive should be further evaluated with the PHQ-9 to determine whether they meet criteria for a depressive disorder.

*Over the last 2 weeks,* how often have you been bothered by the following problems?

0 - Not at all; 1 – Several Days; 2 – More than half the days; 3 Nearly every day

1. Little interest or pleasure in doing things
   - 0
   - +1
   - +2
   - +3

2. Feeling down, depressed or hopeless
   - 0
   - +1
   - +2
   - +3

**PHQ-2 score obtained by adding score for each question (total points)**

**Interpretation:**

A PHQ-2 score ranges from 0-6. The authors identified a score of 3 as the optimal cut-point when using the PHQ-2 to screen for depression.

If the score is 3 or greater, major depressive disorder is likely.

Patients who screen positive should be further evaluated with the **PHQ-9**, other diagnostic instruments, or direct interview to determine whether they meet criteria for a depressive disorder.
THE DIABETES DISTRESS SCREENING SCALE

DIRECTIONS: Living with diabetes can sometimes be tough. There may be many problems and hassles concerning diabetes and they can vary greatly in severity. Problems may range from minor hassles to major life difficulties. Listed below are 2 potential problem areas that people with diabetes may experience. Consider the degree to which each of the 2 items may have distressed or bothered you DURING THE PAST MONTH and circle the appropriate number.

Please note that we are asking you to indicate the degree to which each item may be bothering you in your life, NOT whether the item is merely true for you. If you feel that a particular item is not a bother or a problem for you, you would circle "1". If it is very bothersome to you, you might circle "6".

<table>
<thead>
<tr>
<th>Item</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Feeling overwhelmed by the demands of living with diabetes.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. Feeling that I am often failing with my diabetes routine.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>


**DDS**

**DIRECTIONS:** Living with diabetes can sometimes be tough. There may be many problems and hassles concerning diabetes and they can vary greatly in severity. Problems may range from minor hassles to major life difficulties. Listed below are 17 potential problem areas that people with diabetes may experience. Consider the degree to which each of the 17 items may have distressed or bothered you DURING THE PAST MONTH and circle the appropriate number.

Please note that we are asking you to indicate the degree to which each item may be bothering you in your life, NOT whether the item is merely true for you. If you feel that a particular item is not a bother or a problem for you, you would circle “1”. If it is very bothersome to you, you might circle “6”.

<table>
<thead>
<tr>
<th>1. Feeling that diabetes is taking up too much of my mental and physical energy every day.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Feeling that my doctor doesn't know enough about diabetes and diabetes care.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Feeling angry, scared, and/or depressed when I think about living with diabetes</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Feeling that my doctor doesn't give me clear enough directions on how to manage my diabetes.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Feeling that I am not testing my blood sugars frequently enough.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Feeling that I am often failing with my diabetes routine.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Feeling that friends or family are not supportive enough of self-care efforts (e.g. planning activities that conflict with my schedule, encouraging me to eat the &quot;wrong&quot; foods).</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>9. Feeling that my doctor doesn't take my concerns seriously enough.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>10. Not feeling confident in my day-to-day ability to manage diabetes.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>11. Feeling that I will end up with serious long-term complications, no matter what I do.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>12. Feeling that I am not sticking closely enough to a good meal plan.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>13. Feeling that friends or family don't appreciate how difficult living with diabetes can be.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>15. Feeling that I don't have a doctor who I can see regularly enough.</th>
<th>Not a Problem</th>
<th>A Slight Problem</th>
<th>A Moderate Problem</th>
<th>Somewhat Serious Problem</th>
<th>A Serious Problem</th>
<th>A Very Serious Problem</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>DDS</td>
<td>Not a Problem</td>
<td>A Slight Problem</td>
<td>A Moderate Problem</td>
<td>Somewhat Serious Problem</td>
<td>A Serious Problem</td>
<td>A Very Serious Problem</td>
</tr>
<tr>
<td>-----</td>
<td>---------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>--------------------------</td>
<td>------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>16.</td>
<td>Not feeling motivated to keep up my diabetes self-management.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>17.</td>
<td>Feeling that friends or family don't give me the emotional support that I would like.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
DDS17 SCORING SHEET

INSTRUCTIONS FOR SCORING:

The DDS 17 yields a total diabetes distress scale score plus 4 sub scale scores, each
addressing a different kind of distress. To score, simply sum the patient's responses to the
appropriate items and divide by the number of items in that scale. The letter in the far right margin
corresponds to that item's subscale as listed below. We consider a mean item score of 3 or
higher (moderate distress) as a level of distress worthy of clinical attention. Place a check
on the line to the far right if the mean item score is 3 to highlight an above-range value.

We also suggest reviewing the patient's responses across all items, regardless of mean item
scores. It may be helpful to inquire further or to begin a conversation about any single item scored 3
or higher.

Total DDS Score:

a. Sum of 17 item scores. 
   b. Divide by:  
   c. Mean item score: 

A. Emotional Burden:

a. Sum of 5 items (1, 3, 8, 11, 14) 
   b. Divide by:  
   c. Mean item score: 

B. Physician-related Distress:

a. Sum of 4 items (2, 4, 9, 15) 
   b. Divide by:  
   c. Mean item score: 

C. Regimen-related Distress:

a. Sum of 5 items (5, 6, 10, 12, 16) 
   b. Divide by:  
   c. Mean item score: 

D. Interpersonal Distress:

a. Sum of 3 items (7, 13, 17) 
   b. Divide by:  
   c. Mean item score: 

\[ \geq 3 \]
THE PATIENT HEALTH QUESTIONNAIRE-2 (PHQ-2)

The PHQ-2 inquires about the frequency of depressed mood and anhedonia over the past two weeks. The PHQ-2 includes the first two items of the PHQ-9.

The purpose of the PHQ-2 is to screen for depression in a "first step" approach.

Patients who screen positive should be further evaluated with the PHQ-9 to determine whether they meet criteria for a depressive disorder.

---

<table>
<thead>
<tr>
<th>Over the past 2 weeks, how often have you been bothered by any of the following problems?</th>
<th>Not At all</th>
<th>Several Days</th>
<th>More Than Half the Days</th>
<th>Nearly Every Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Little interest or pleasure in doing things</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2. Feeling down, depressed or hopeless</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

PHQ-2 score obtained by adding score for each question (total points).

Interpretation:

A PHQ-2 score can range from 0 to 6. The authors identified a score of 3 as the optimal cut-point when using the PHQ-2 to screen for depression. A score of 3 points or more on this version of the PHQ-2 has a sensitivity of 83 percent and a specificity of 92 percent for major depressive episode.

If the score is ≥3, major depressive disorder is likely.

Screening with the PHQ-2 is only a first step. Patients who screen positive should be further evaluated with the PHQ-9, other diagnostic instruments, or direct interview to determine whether they meet criteria for a depressive disorder.

### Score interpretation:

<table>
<thead>
<tr>
<th>PHQ-2 score</th>
<th>Probability of major depressive disorder (%)</th>
<th>Probability of any depressive disorder (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>15.4</td>
<td>36.9</td>
</tr>
<tr>
<td>2</td>
<td>21.1</td>
<td>48.3</td>
</tr>
<tr>
<td>3</td>
<td>38.4</td>
<td>75.0</td>
</tr>
<tr>
<td>4</td>
<td>45.5</td>
<td>81.2</td>
</tr>
<tr>
<td>5</td>
<td>56.4</td>
<td>84.6</td>
</tr>
<tr>
<td>6</td>
<td>78.6</td>
<td>92.9</td>
</tr>
</tbody>
</table>

---

Sources:
TYPE 2 DIABETES RISK ASSESSMENT FORM

Circle the right alternative and add up your points.

1. Age
0 p. Under 45 years
2 p. 45–54 years
3 p. 55–64 years
4 p. Over 64 years

2. Body-mass index
(See reverse of form)
0 p. Lower than 25 kg/m²
1 p. 25–30 kg/m²
3 p. Higher than 30 kg/m²

3. Waist circumference measured below the ribs
(usually at the level of the navel)
MEN       WOMEN
0 p. Less than 94 cm  Less than 80 cm
3 p. 94–102 cm  80–88 cm
4 p. More than 102 cm  More than 88 cm

4. Do you usually have daily at least 30 minutes
of physical activity at work and/or during leisure
time (including normal daily activity)?
0 p. Yes
2 p. No

5. How often do you eat vegetables, fruit or
berries?
0 p. Every day
1 p. Not every day

6. Have you ever taken medication for high
blood pressure on regular basis?
0 p. No
2 p. Yes

7. Have you ever been found to have high blood
glucose (eg in a health examination, during an
illness, during pregnancy)?
0 p. No
5 p. Yes

8. Have any of the members of your immediate
family or other relatives been diagnosed with
diabetes (type 1 or type 2)?
0 p. No
3 p. Yes: grandparent, aunt, uncle or first
cousin (but no own parent, brother, sister
or child)
5 p. Yes: parent, brother, sister or own child

Total Risk Score
The risk of developing
type 2 diabetes within 10 years is

Lower than 7    Low: estimated 1 in 100
will develop disease
7–11 Slightly elevated: estimated 1 in 25
will develop disease
12–14 Moderate: estimated 1 in 6
will develop disease
15–20 High: estimated 1 in 3
will develop disease
Higher than 20 Very high: estimated 1 in 2
will develop disease

Please turn over
WHAT CAN YOU DO TO LOWER YOUR RISK OF DEVELOPING TYPE 2 DIABETES?

You can’t do anything about your age or your genetic predisposition. On the other hand, the rest of the factors predisposing to diabetes, such as overweightness, abdominal obesity, sedentary lifestyle, eating habits, physical activity and eating habits and pay attention and smoking, are up to you. Your lifestyle choices can prevent you from developing Type 2 diabetes or at least delay its onset until a much greater age.

If there is diabetes in your family, you should be careful not to put on weight over the years. Growth of the waistline, in particular, increases the risk of diabetes, whereas regular moderate physical activity will lower the risk. You should also pay attention to your diet: eat plenty of fibre-rich cereal products and vegetables every day. Omit excess hard fats from your diet and favour soft vegetable fats.

EARLY STAGES OF TYPE 2 DIABETES

Early stages of type 2 diabetes seldom cause any symptoms. If you scored 12–14 points in the Risk Test, you would be well advised to seriously consider your physical activity and eating habits and pay attention to your weight, to prevent yourself from developing diabetes. Please contact a public-health nurse or your own doctor for further guidance and tests.

If you scored 15 points or more in the Risk Test, you should have your blood glucose measured (both fasting value and value after a dose of glucose or a meal) to determine if you have diabetes without symptoms.

BODY-MASS INDEX

The body-mass index is used to assess whether a person is normal weight or not. The index is calculated by dividing body weight (kg) by the square of body height (m). For example, if your height is 165 cm and your weight 70 kg, your body-mass index will be 70/(1.65 x 1.65), or 25.7.

If your body-mass index is 25–30, you will benefit from losing weight; at least you should take care that your weight doesn’t increase beyond this. If your body-mass index is higher than 30, the adverse health effects of obesity will start to show, and it will be essential to lose weight.

BODY-MASS INDEX CHART

| Height (cm) | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Weight (kg)| 40  | 41  | 42  | 43  | 44  | 45  | 46  | 47  | 48  | 49  | 50  | 51  | 52  | 53  | 54  | 55  | 56  | 57  | 58  | 59  | 60  | 61  | 62  | 63  | 64  | 65  | 66  | 67  | 68  | 69  | 70  | 71  | 72  | 73  | 74  | 75  | 76  | 77  | 78  | 79  | 80  | 81  | 82  | 83  | 84  | 85  | 86  | 87  | 88  | 89  | 90  | 91  | 92  | 93  | 94  | 95  | 96  | 97  | 98  | 99  | 100 |

Weight (kg)
### Fluids (Correct hypovolemia)
- Assess Volume Status then give 1L/hr .9% saline
- Once Na assessed to be Normal switch to .45% Saline 250 - 500mls/hr
- When Plasma Glucose 200mg/dl DKA & 300mg/dl HSS switch to .5% dextrose .45% normal Saline

### Insulin (Correct Hyperglycemia)
- Start dose of regular insulin 0.1U/kg
- Then insulin infusion of 0.1U/kg/hr (10 units of insulin in 1000mls N/S)
- When plasma glucose 200mg/dl DKA or 300mg in HHS↓ infusion to 0.05U/kg/hr
- **NB Maintain Blood glucose at 150 - 200mg/dl**
- **(8.3 -11mmols/L)**
- Hourly blood glucose should be done

### Electrolytes (Correct Acidosis & Hypokalemia)
- **PH <6.9**
  - Give Sodium Bicarb 100mmol in 400mls
  - H2O KCL 20mEq over 2hrs
- **PH >6.9 DO NOT GIVE SODIUM BICARB**
- Serum K <3.3mmols/L → replace K before insulin
- Serum K >5 → start insulin infusion HOLD K

---

**Appendix II: Hospital Care Diabetic Ketoacidosis (DKA) and Hyperosmolar Hyperglycemic Syndrome (HHS)**
Appendix III: Two-Bag Technique in the Treatment of DKA

Introduction to the two-bag technique: The two-bag technique is currently used widely in the United States and has been endorsed by the Academy of Paediatrics since 2004. This technique provides an alternate method for the resuscitation of DKA to the ISPAD guidelines of 2011. The practitioner should be familiar with the two-bag technique prior to the use of this protocol and is encouraged to use whichever method of DKA correction they are most familiar with. Please note the following:

- This protocol aims to correct DKA in a period of 24 hours. Use of this method beyond 24 hours is associated with hyperchloremic acidosis.

- This relies on two bags of IV solution being created and running through two separate IV’s. One bag contains only normal saline while the other contains 1/2 normal saline with D10 plus electrolytes. Initially, normal saline alone is used for resuscitation at a fixed rate of 1.5 maintenance. Once the blood glucose values fall below 300mg/dL the rate of the normal saline infusion is decreased while simultaneously increasing the rate of the D10 1/2 normal saline, plus electrolytes mix. TOTAL VOLUME INFUSED IS KEPT THE SAME (1.5 maintenance) to ensure blood sugar values do not fall too fast.

- In our practice, the insulin drip is run through a different IV site so the rate of insulin infusion is unaffected by changes in fluid rate.

DKA Treatment Overview

Step 1:
Fluid resuscitation (in ED): 10 cc/kg 0.9 % NS bolus followed by IVF at 1.5XM. Use the table below for composition of IVF.

**Repeat 10 cc/kg NS bolus if peripheral perfusion is inadequate**
Step 2:
Insulin administration for acidotic patients (pH < 7.35 OR bicarbonate < 15) KEEP NPO:
Dose: 0.1 units/kg/hour for patients in puberty.
0.05 units/kg/hour for pre-pubertal patients. Drip Concentration: Mix 500 units regular insulin in 500ml of 0.9% NS (1 unit/ml)

Step 3: Use the two-bag method with a fixed total hourly IV fluid rate at 1.5 times maintenance according to the following table:

<table>
<thead>
<tr>
<th>Table</th>
<th>Bag 1: NS (% of total hourly rate)</th>
<th>Bag 2: D10 1/2 NS (% of total hourly rate)</th>
<th>KCl/KPh in both bags *</th>
</tr>
</thead>
<tbody>
<tr>
<td>K&gt;5 K&lt;5</td>
<td>Patient’s serum glucose</td>
<td>Glucose concentration delivered to patient</td>
<td></td>
</tr>
<tr>
<td>100 0</td>
<td>0/0</td>
<td>20/20</td>
<td>&gt;300 0%</td>
</tr>
<tr>
<td>75 25</td>
<td>0/0</td>
<td>20/20</td>
<td>275-300 2.5%</td>
</tr>
<tr>
<td>50 50</td>
<td>0/0</td>
<td>20/20</td>
<td>250-275 5%</td>
</tr>
<tr>
<td>25 75</td>
<td>0/0</td>
<td>20/20</td>
<td>225-250 7.5%</td>
</tr>
<tr>
<td>0 100</td>
<td>0/0</td>
<td>20/20</td>
<td>&lt;225 10%</td>
</tr>
</tbody>
</table>

* Potassium is added to IVF when potassium is < 5 & patient is making urine. Add 20 mEq KCl/L + 20 mmoL KPhos/L

Additional guidelines
- Labs to follow:
- D-sticks q1hour,
- Arterial or Venous Blood Glucose every 2hours,
- U&Es with phosphorous and ionized calcium every 4 hours.
- Hourly monitoring of cumulative input and output
- Urine ketones with each void
- Cumulative fluid intake should exceed cumulative urine output. If
intake continues to be less than output, IVF should be increased to 2X maintenance.

• When glucose in blood is <150 increase to 2x maintenance. If no response switch to a D12.5% NS solution (with K as above) at desired maintenance rate (1.5 – 2X) and discontinue other IVF. If glucose remains less than 100 despite D12.5% concentration can be increased to D15% if central venous access is available.

• If blood glucose is less than 80mg/dl, administer a bolus of 1 gm/kg of 25% glucose.

• If pH and serum bicarbonate are not improving, despite a positive fluid balance, increase the insulin to 0.15 u/kg/hour. Ensure serum glucose concentration > 200.

• Serum glucose should not decrease in a rate greater than 100/hour. Administer higher concentration of glucose to the patient when this is encountered.

• Corrected serum sodium should fall by no more than 2-3 mEq/hour. If in excess of this, change IVF to have a higher concentration of sodium (one or both solutions to NS).

• If a change in mental status occurs, an immediate head CT should be ordered. If cerebral edema is suspected, administer 0.5- 1gm/kg mannitol IV.

• When pH >7.32 AND bicarbonate >16 switch to SC insulin and discontinue ALL IV therapy.
### Appendix IV: Comprehensive Diabetic Foot Evaluation Form

#### COMPREHENSIVE DIABETIC FOOT EXAM

<table>
<thead>
<tr>
<th>HISTORY</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Numbness or tingling in the feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Burning sensation in legs or feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pain in the legs or walking that limits mobility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Leg/foot symptoms that resolve on sitting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• History of foot ulcers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Swelling of the legs/feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Hot/cold sensations in the feet.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

YES response to any of the above should be an indication that the patient may be at high risk for diabetic foot disease.

#### CLINICAL EXAM

<table>
<thead>
<tr>
<th>BLOOD PRESSURE</th>
<th>PULSE</th>
</tr>
</thead>
</table>

**Touch Pressure Sensation**

Using a 10g microfilament assess the plantar surface of metatarsal areas and the hallux.

Avoid testing areas that are callused as you may get a false positive result. Place the monofilament on each area perpendicularly until it buckles; allow 2 seconds for each test. The patient should be instructed to say YES if they feel the sensation or NO if they do not.

If the patient does not have sensation in one of the four areas tested, that is determined as a positive test/confirmation of peripheral neuropathy.

#### RESULTS TOUCH PRESSURE SENSATION

<table>
<thead>
<tr>
<th>NORMAL</th>
<th>DIMINISHED</th>
<th>ABSENT</th>
</tr>
</thead>
</table>

---

149
Test for Vibration Loss

- Ask the patient to close his/her eyes
- Place his/her foot on a flat surface
- Using a 128Hz tuning fork, tap on tuning fork
- Place it on the patient’s hand/sternum so patient knows what the vibration feels like.
- Then place vibrating fork on the big toe (Distal Hallux) and ask patient to answer “yes/no” if they are/are not feeling the vibration. If no vibration sensation is felt, check other bony prominences

<table>
<thead>
<tr>
<th>RESULTS TOUCH</th>
<th>NORMAL</th>
<th>DIMINISHED</th>
<th>ABSENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESSURE SENSATION</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Temperature Sensation

Temperature sensation is generally lost in conjunction with pain sensation. It can be assessed clinically with a “Tip Therm” or by using test tubes; one hot filled with warm water (35-45°C) and one filled with cold water (5-10°C). Put on the dorsum aspect of the patient’s foot, directly onto the skin. The patient should then be asked if they feel the sensation. The sensation can then be documented as being normal, diminished or absent

<table>
<thead>
<tr>
<th>RESULTS TOUCH</th>
<th>NORMAL</th>
<th>DIMINISHED</th>
<th>ABSENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESSURE SENSATION</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ID Pain scale</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Did the pain feel like pins and needles?</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2. Did the pain feel hot or burning?</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3. Did the pin feel numb?</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>4. Did the pain feel like electric shocks?</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5. Is the pain made worse by touch or clothes or bedsheets?</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6. Is the pain limited to joints?</td>
<td>-1</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TOTAL SCORE</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Normal</td>
<td>Diminished</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>ANKLE REFLEX</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PLANTAR REFLEX</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position sense of big toe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Motor neuropathy can more accurately be determined by flexion extension of the big toe or splaying of the lesser digits.
### REFERRAL FORM TO TERTIARY CARE Centre

<table>
<thead>
<tr>
<th>REFER TO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PATIENT’S NAME:</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.O.B.:</td>
</tr>
<tr>
<td>AGE:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DEAR DOCTOR:</th>
</tr>
</thead>
<tbody>
<tr>
<td>KINDLY CONTINUE URGENT CARE OF THIS PATIENT WHO PRESENTS WITH:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(REASON FOR REFERRAL):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

### Clinical Findings

- [ ]

### Investigations Done/Treatment Started

- [ ]

### Differential Diagnosis

- [ ]

### Thank you, for assisting with continued care.

Sincerely