



Massachusetts Guidelines for Adult Diabetes Care

DIABETES
GUIDELINES
WORK GROUP

2009

DIABETES
PREVENTION
AND CONTROL
PROGRAM



Working together for
prevention and control
Massachusetts Department of Public Health

Developed 1999
Revised 2001, 2003, 2005, 2007, 2009

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Baystate  Health



BOSTON MEDICAL CENTER
HealthNetPlan 

fallon 
community
health plan

Harvard Pilgrim
Health Care 

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Health Care

 NETWORK HEALTH

TUFTS  Health Plan



June 2009

Dear Colleague:

The Diabetes Prevention and Control Program of the Massachusetts Department of Public Health and members of the Diabetes Guidelines Work Group are pleased to present the latest update to the *Massachusetts Guidelines for Adult Diabetes Care*, based on the American Diabetes Association's 2009 Clinical Practice Recommendations. First created in 1999, the *Guidelines* are revised every two years. Our initial goals were to: 1) develop uniform guidelines that apply to adults with diabetes regardless of insurer; 2) help eliminate any confusion brought about by differences in guidelines disseminated by individual third party payers; and 3) assist health care professionals in systematizing the care provided to people with diabetes. Many organizations worked together to create and update this document. We hope that it is user-friendly and will serve as a valuable tool to improve diabetes care in the Commonwealth.

Revisions

The 2009 changes to the *Guidelines* include:

- Revised target threshold for preprandial glucose and new *Estimated Average Glucose* (eAG) table
- Revised recommendations for screening prior to starting an exercise program
- Updated *Algorithm for the Metabolic Management of Type 2 Diabetes*
- New *Summary of Glucose-Lowering Interventions* table
- Updated medication tables (moved to Appendix A)
- Revised recommendations for management of cardiovascular disease
- Revised *LDL Cholesterol-Lowering Decision Tree* algorithm
- New *Stages of Kidney Disease* table
- Updated *Tobacco Use and Diabetes* section
- New *Immunizations* section
- Updated *Inpatient Glucose Control* section

Partners

The *Guidelines* are a collaborative effort among many partners:

Baystate Health	Massachusetts Medical Society
Blue Cross Blue Shield of Massachusetts	MassPRO
Boston Medical Center HealthNet Plan	Neighborhood Health Plan
Fallon Community Health Plan	Network Health
Harvard Pilgrim Health Plan	Partners/MGH
Health New England	Primary Care Clinician (PCC) Plan
Massachusetts College of Pharmacy and Health Sciences	Tufts Health Plan
Massachusetts Department of Public Health (MDPH)	University of Massachusetts, Amherst
Massachusetts League of Community Health Centers	

Additional Information

- The *Guidelines* are available online at www.mass.gov/dph/diabetes
- You may also order copies of the Diabetes Care Cards and the laminated *Guidelines Summary* free of charge from the Massachusetts Health Promotion Clearinghouse at www.mclearinghouse.com or via the order form.
- If you have questions about the *Guidelines*, please call the Massachusetts Diabetes Prevention and Control Program at (617) 624-5070.

Sincerely,

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Both national studies and state data indicate that people with diabetes do not receive recommended levels of preventive care, leaving wide gaps between current recommendations and actual practice. The *Massachusetts Guidelines for Adult Diabetes Care* were developed as a way to improve diabetes care in the Commonwealth. The *Guidelines* highlight and summarize essential components of quality diabetes management, and offer accompanying tools for use in the primary care setting. These *Guidelines* are neither intended to replace the clinical judgment of primary care providers, nor are they intended to preclude more extensive evaluation and management of the patient by other specialists as needed.

The *Guidelines* are developed by a Work Group convened by the Massachusetts Department of Public Health's Diabetes Prevention and Control Program and its Advisory Board. The Work Group is comprised of clinicians, representatives from managed care organizations, the Primary Care Clinician Plan, Joslin Diabetes Center, the Massachusetts College of Pharmacy and Health Sciences, the Massachusetts League of Community Health Centers, the Massachusetts Medical Society, MassPRO, and the University of Massachusetts Amherst. First developed in 1999, the *Guidelines* are based on the American Diabetes Association's (ADA) Clinical Practice Recommendations, and are reviewed and revised by the Work Group every two years.

The *Guidelines* are a cooperative effort among many partners. This unique collaboration eliminates the confusion brought about by slight differences in guidelines developed by each managed care organization. The *Guidelines* are not intended to serve as a description of benefits or coverage; coverage may vary by insurer.

The 2009 *Guidelines* have been updated and include statements on:

- Screening and diagnosing diabetes and pre-diabetes
- Lifestyle intervention and/or pharmacological treatment for IFG and IGT
- New target threshold for preprandial plasma glucose
- Estimated average glucose
- Physical activity and resistance training
- Management of hyperglycemia in individuals with type 2 diabetes
- Cardiovascular treatment recommendations and goals
- Stages of kidney disease
- Medications to treat symptomatic distal polyneuropathy
- Immunizations
- Inpatient glucose management

We have also added a grading system developed by the ADA and updated the **Commonly Used Oral Antidiabetic Agents** tables (now in Appendix A).

In addition to the 2009 *Guidelines*, the following tools are available:

Guidelines for Adult Diabetes Care (laminated summary)

This summary of the *Guidelines* highlights basic medical care for people with diabetes. We suggest you post them in each exam room as a reminder of recommendations for care.

Determining Body Mass Index (BMI)

Obesity substantially raises the risk of morbidity from type 2 diabetes and other diseases. The BMI describes relative weight for height and is significantly correlated with total body fat content. The BMI may be used to assess overweight and obesity and to monitor changes in body weight.

Flow Sheet for Diabetes Care

The flow sheet reflects the recommendations found on the *Guidelines for Adult Diabetes Care* laminated summary. It can be copied or modified for use in your practice and included in patients' charts. Diabetes medications, exams, and test results can be documented over time to track diabetes management.

Diabetes Care Card (patient wallet card)

The Diabetes Care Card allows people with diabetes to track their diabetes care and personal goals. The wallet card has space to record test results and services received over four visits. Encourage your patients to bring this card to each office visit.

GRADING OF EVIDENCE

The *Massachusetts Guidelines for Adult Diabetes Care* are based on the Clinical Practice Recommendations of the ADA. A grading system developed by the ADA was utilized for the recommendations. The level of supportive evidence is noted in parentheses after each recommendation using the letters A, B, C, or E.

(A): Clear evidence from well-conducted, generalizable, randomized controlled trials.

(B): Supportive evidence from well-conducted cohort studies.

(C): Supportive evidence from poorly controlled or uncontrolled studies.

(E): Expert consensus or clinical experience.

Recommendations with an “A” rating are based on large well-designed clinical trials or well-done meta-analyses. Generally, these recommendations have the best chance of improving outcomes when applied to the population for which they are appropriate. Recommendations with lower levels of evidence may be equally important but are not as well supported. Expert opinion (E) is a separate category for recommendations for which there is as yet no evidence from clinical trials, for which clinical trials may be impractical, or for which there is conflicting evidence.¹

¹American Diabetes Association. *Clinical Practice Recommendations. Introduction. Diabetes Care 32, S1-S2, 2009.*

Criteria for Testing for Diabetes and Pre-diabetes in Asymptomatic Adults

Testing for diabetes should be considered for all individuals aged 45 and older. Testing should be considered at a younger age in individuals who are overweight (BMI $\geq 25\text{kg/m}^2$ or BMI $\geq 23\text{ kg/m}^2$ for Asian individuals)² and with any of the additional risk factors:³

- Habitually physically inactive
- First-degree relative with type 2 diabetes
- Members of a high-risk ethnic population (African American, Latino, Native American, Asian American, Pacific Islander)
- Delivered a baby weighing > 9 lbs. or have been diagnosed with Gestational Diabetes Mellitus (GDM)
- Hypertensive ($\geq 140/90$ mmHg, or on therapy for hypertension)
- High-density lipoprotein (HDL) cholesterol level ≤ 35 mg/dl and/or a triglyceride level ≥ 250 mg/dl
- Polycystic ovarian syndrome (PCOS)
- Impaired Glucose Tolerance (IGT) or Impaired Fasting Glucose (IFG) on previous testing
- Other conditions associated with insulin resistance (acanthosis nigricans)
- History of vascular disease
- A waist circumference > 102 cm (40”) for men and > 88 cm (35”) for women⁴
- Medication use that may predispose to diabetes (e.g., steroids, atypical antipsychotics, protease inhibitors)

If normal, testing should be repeated at three-year intervals, with consideration of more frequent testing depending on initial results and risk status.

Criteria for the Diagnosis of Diabetes and Pre-diabetes in Nonpregnant Adults

In the absence of unequivocal hyperglycemia, these criteria should be confirmed by repeat testing on a different day.

	Fasting Plasma Glucose (FPG)* (preferred)	Casual Plasma Glucose (CPG)**	Oral Glucose Tolerance Test (OGTT)***
Diabetes Mellitus	FPG ≥ 126 mg/dl	Casual Plasma Glucose ≥ 200 mg/dl plus symptoms of diabetes	Two-hour plasma glucose (2-h PG) ≥ 200 mg/dl
Pre-diabetes	Impaired Fasting Glucose (IFG) FPG ≥ 100 and < 126 mg/dl		Impaired Glucose Tolerance (IGT) 2-h PG ≥ 140 and < 200 mg/dl
Normal	FPG < 100 mg/dl		2-h PG < 140 mg/dl

* A FPG via venipuncture is the preferred diagnostic test due to its ease of administration, convenience, acceptability to patients, and lower cost. Fasting is defined as no caloric intake for at least 8 hours.

** Casual is defined as any time of day without regard to time since last meal. Symptoms are the classic ones of polyuria, polydipsia, and unexplained weight loss. There are currently no guidelines for interpreting CPG values that fall between 140-199 mg/dl. For values in this range, options include routine monitoring of FBGs or alternatively, testing with OGTT.

*** OGTT should be performed using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water. The OGTT is not recommended for routine clinical use, but may be necessary when evaluating patients with IFG or when diabetes is still suspected despite an FPG < 126 mg/dl.

The term A1C is used to represent tests of average glycemic control such as glycosylated or glycated hemoglobin (HbA1c). The A1C test measures average blood glucose over the preceding 2 to 3 months and is used to monitor glucose control in patients with diabetes. The test should be performed in all patients with diabetes at initial assessment and then routinely as part of continuing care. The A1C test can be performed non-fasting, without regard to time since last meal.

An International Expert Committee has recently proposed that hemoglobin A1c (A1C) assays be considered as the principal means of screening and diagnosing type 2 diabetes, essentially replacing fasting blood glucose (FBG) and the oral glucose tolerance test (OGTT). At the time of this printing, however, the criteria for diagnosing diabetes remain as listed.

²National Obesity Forum, Weisell R. Body mass index as indicator of obesity. *Asia Pac J Clin Nutri*: 11 (Supplement 8):S681-S684, 2002. <http://www.nationalobesityforum.org.uk>

³American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 32 (Supplement 1):S13-S61, 2009.

⁴Balkau B, et al. Waist circumference, cardiovascular disease, and diabetes mellitus in 168,000 primary care patients in 63 countries. *Circulation* 116:1942-1951, 2007.

CLASSIFICATION OF DIABETES MELLITUS AND PRE-DIABETES

Not all classifications of diabetes are discussed here. For further information on other types, see the ADA reference below.⁵

Type 1

Type 1 diabetes most often results from a cellular mediated autoimmune destruction of the beta cells of the pancreas. Patients with this form of diabetes are dependent upon insulin for survival and are at risk for ketoacidosis. Type 1 diabetes commonly presents in childhood and adolescence but may present at any age.

Type 2

Individuals with type 2 diabetes have insulin resistance and relative insulin deficiency. Over time, the potential for absolute deficiency exists. Primary treatment centers on beta cell preservation and improving insulin resistance via weight loss, improved nutrition, and increased age-appropriate physical activity. Type 2 diabetes commonly goes undiagnosed for years because it is often asymptomatic in its early stages. Individuals with undiagnosed type 2 diabetes are at increased risk for developing macro- and microvascular complications.

Gestational Diabetes Mellitus (GDM)

GDM, which typically occurs following the 24th week of pregnancy, is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. It does not exclude the possibility that unrecognized glucose intolerance may have preceded, or begun concomitantly with the pregnancy. Six weeks or more after the pregnancy ends, a woman with GDM should be tested to rule out type 1 or type 2 diabetes or pre-diabetes. Women with GDM and their children have a higher risk for development of type 2 diabetes later in life.

Pre-diabetes

Both Impaired Fasting Glucose (IFG) and Impaired Glucose Tolerance (IGT) have been categorized as pre-diabetes and are risk factors for future diabetes and cardiovascular disease. IFG has been defined as a fasting plasma glucose of ≥ 100 mg/dl but < 126 mg/dl. IGT is defined as a 2-hour oral glucose tolerance test (OGTT) value of ≥ 140 mg/dl, but < 200 mg/dl.

⁵American Diabetes Association (Position Statement). *Diagnosis and classification of diabetes mellitus. Diabetes Care 32 (Supplement 1):S62-S67, 2009.*

Summary

Hyperglycemia that does not meet the diagnostic criteria for diabetes is referred to as Impaired Fasting Glucose (IFG) or Impaired Glucose Tolerance (IGT) and officially termed pre-diabetes.

Several well-designed studies have shown that individuals at high risk for developing type 2 diabetes can be given lifestyle modification interventions that significantly delay or prevent the onset of diabetes.⁶ The Diabetes Prevention Program (DPP) was a randomized clinical trial conducted in 27 sites across the United States. DPP results showed that lifestyle intervention was nearly twice as effective as a glucose-lowering medication (metformin) in delaying or preventing the onset of diabetes in individuals at risk.⁷ Study populations often had other recognized risk factors for diabetes including obesity, a prior history of gestational diabetes, or a positive family history of diabetes.⁸

These studies have shown that modest weight loss (5-10% of body weight) and regular physical activity can reduce the rate of progression of IGT to type 2 diabetes. The following lifestyle modifications should be the first treatment modality to employ in persons at high risk:

- Reduced-calorie, reduced-fat meal planning
- Increased moderate-intensity physical activity

Such interventions also provide a variety of other health benefits in addition to delaying diabetes. At every opportunity, health care providers are encouraged to stress the benefits of weight loss and physical activity for overweight or sedentary patients.

Recommendations:

- Patients with IGT (A) or IFG (E) should be referred to an effective ongoing support program for weight loss of 5-10% of body weight and for increasing physical activity to at least 150 minutes per week of moderate activity such as walking.
- In addition to lifestyle counseling, metformin may be considered in those individuals at very high risk of developing diabetes. (E)

⁶American Diabetes Association (Position Statement). *Diagnosis and classification of diabetes mellitus. Diabetes Care* 32 (Supplement 1):S62-S67, 2009.

⁷Diabetes Prevention Program (DPP): Knowler WC, et al. *Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. N Engl J Med* 346:393-403, 2002.

⁸Nathan DM, et al. *Consensus statement. Impaired fasting glucose and impaired glucose tolerance. Implications for care. Diabetes Care* 30:753-759, 2007.

Treatment Recommendations for Individuals with IFG, IGT, or Both⁹

Population	Treatment
IFG or IGT	Lifestyle modification (i.e., 5–10% weight loss and moderate intensity physical activity of at least 150 minutes/week or 30 minutes each day, 5 times per week)
Individuals with IFG and IGT and any of the following: <ul style="list-style-type: none"> • < 60 years of age • BMI ≥ 35 kg/m² • Family history of diabetes in first-degree relatives • Elevated triglycerides • Reduced HDL cholesterol • Hypertension • A1C > 6.0%* 	Lifestyle modification (as above) and consider the addition of metformin**

* Some providers may use A1C to monitor for progression to diabetes.

**Recommended dosing for metformin: 500-850 mg twice per day, based on gastrointestinal tolerance.

Recent trials have evaluated the use of medications, such as metformin and thiazolidinediones (TZDs), to address insulin resistance in delaying or preventing the development of type 2 diabetes. Given current cost estimates, use of insulin sensitizer medications such as metformin as a first line of defense should be given consideration, contraindications not withstanding. Some of the manufacturers of thiazolidinediones have reported observational data of an increased risk of fractures (arm, hand, and ankle and foot of 9.30%, 5.09%, and 3.47% respectively) as compared to metformin and glyburide in women taking these agents for three or more years.^{10,11} See **Commonly Used Antidiabetic Medications** in **Appendix A** for additional information on these medications.

⁹Nathan DM, et al. Consensus statement. Impaired fasting glucose and impaired glucose tolerance. Implications for care. *Diabetes Care* 30:753-759, 2007.

¹⁰The U.S. Food and Drug Administration, http://www.fda.gov/medwatch/safety/2007/Avandia_GSK_Ltr.pdf

¹¹The U.S. Food and Drug Administration, <http://www.fda.gov/medwatch/safety/2007/safety07.htm#Actos>

Treatment Goals

Optimal treatment for type 2 diabetes incorporates a multiple risk factor approach, including self-management education and ongoing support, medical nutrition therapy (MNT), physical activity, weight reduction if appropriate, and the use of glucose-lowering oral agents or insulin. Careful consideration needs to be given to ameliorating associated risk factors such as hypertension, smoking, and dyslipidemia. When possible, care should be provided by a coordinated team that may include physicians, nurse practitioners, physician assistants, diabetes educators, community health workers, nurses, dietitians, pharmacists, social workers, and mental health and other professionals with expertise and special interest in diabetes.

Recommendations:

- Perform the A1C test at least two times a year in patients who are meeting treatment goals and who have stable glycemic control. (E)
- Perform the A1C test quarterly in patients whose therapy has changed or who are not meeting glycemic goals. (E)
- Having lab results available at the time of the visit is advantageous and may allow for timely decisions on therapy changes. (E) The use of point-of-care testing may facilitate this process. However, as with all point-of-care testing, accuracy may be equipment- and user-dependent.

When setting treatment goals for individuals with type 2 diabetes, it is important to assess the risk for severe hypoglycemia and consider the person's ability to comprehend the regimen. Consider as well other factors that may influence the treatment's benefit, including advanced age, end-stage renal disease (ESRD), advanced cardiovascular or cerebrovascular disease, or other comorbidities that may lead to reduced life span.

Both the A1C test and patient self-monitoring of blood glucose (SMBG) may be used to assess effectiveness of the management plan on glycemic control. Achievement of desired glucose targets requires education in self-management techniques, including:

- SMBG
- Recognition, treatment, and prevention of hypoglycemia
- Prevention, early detection, and treatment of chronic complications
- MNT (see page 12 for definition and description)
- Regular physical activity
- Reinforcement, continuing education, and ongoing support

Patients with frequent or severe hypoglycemia may require less intensive glycemic goals. Children, pregnant women, and elderly individuals require special consideration when setting glycemic goals.

Goals for Glycemic Control in Nonpregnant Adults*

	Normal	Goal
Preprandial Plasma Glucose	< 100 mg/dl	70-130 mg/dl
Peak Postprandial (2-hour) Plasma Glucose	< 120 mg/dl	< 180 mg/dl
A1C	< 6%	< 7%

* More stringent goals, including a normal A1C of < 6%, can be considered in individual patients and for women who are planning to become pregnant or who are pregnant. Conversely, less stringent goals may be appropriate depending on age and comorbid conditions.

Clinical trials, such as the Diabetes Control and Complications Trial (DCCT), the United Kingdom Prospective Diabetes Study (UKPDS), and the microvascular evidence from the ADVANCE (Action in Diabetes and Vascular Disease: Preterax and Diamicon MR Controlled Evaluation) trial suggest a small but incremental benefit in microvascular outcomes with A1C values closer to normal. Therefore, for selected individual patients, providers might reasonably suggest even lower A1C goals than the general goal of < 7%, if this

TREATMENT APPROACH PRINCIPLES FOR TYPE 2 DIABETES

can be achieved without significant hypoglycemia or other adverse effects of treatment. Such patients might include those with short duration of diabetes and long life expectancy.¹²

Points to remember when setting glycemic goals:

- Individualize goals based on: duration of diabetes, age/life expectancy, comorbid conditions, known cardiovascular disease (CVD) or advanced microvascular complications, and hypoglycemia unawareness.
- If preprandial glucose goals are within target, but A1C values are still not optimal, target postprandial glucose.
- A lower A1C is associated with lower rates of microvascular complications; however, there is a greater risk of hypoglycemia.¹³
- For patients with frequent or severe hypoglycemia, less intensive glycemic control may be preferable.
- Children, pregnant women, and elderly individuals require special consideration when setting glycemic goals.
- Avoid rapid decline in glycemia when prior adverse control was substantial or prolonged.

For those patients who fail to reach target A1C goals after repeated attempts with their primary care providers, an endocrinologist may be consulted. Patients with recurrent hypoglycemia, hypoglycemia unawareness, or nocturnal hypoglycemia; patients on pump therapy or continuous glucose monitoring systems (CGMS); or pregnant women and geriatric patients may benefit from consultation with an endocrinologist.

To assist in improving patients' understanding of the A1C, the ADA and the American Association of Clinical Chemists have determined that the correlation between A1C levels and mean plasma glucose levels based on data from the A1C-Derived Average Glucose (ADAG) trial support the reporting of the measured A1C as estimated average glucose (eAG). The interpretation of the A1C should provide patients with a more useful index of chronic glycemia. A recently published consensus guideline has endorsed reporting A1C values along with the calculated eAG level.^{14,15}

Estimated average glucose (eAG)¹⁶

A1C (%)	Mean plasma glucose (mg/dl)
6	126
7	154
8	183
9	212
10	240
11	269
12	298

To convert A1C to eAG: $28.7 \times \text{A1C} - 46.7 = \text{eAG}$ (in mg/dl)

A calculator for converting A1C results into eAG, in either mg/dl or mmol/l, is available at:
<http://professional.diabetes.org/eAG>

¹²American Diabetes Association. *Standards of medical care in diabetes. Diabetes Care 32 (Supplement 1):S13-S61, 2009.*

¹³Stratton IM, et al. *Association of glycaemia with macrovascular and microvascular complications of type 2 diabetes (UKPDS 35): Prospective observational study. BMJ 321:405-412, 2000.*

¹⁴Nathan DM, et al. *Translating the A1C into estimated average glucose values. Diabetes Care 31:1473-1478, 2008.*

¹⁵American Diabetes Association. *Standards of medical care in diabetes. Diabetes Care 32 (Supplement 1):S13-S61, 2009.*

¹⁶Ibid.

Purpose

Diabetes Self-Management Education (DSME) should be offered throughout the life span of those diagnosed with diabetes and pre-diabetes. Families and support systems are encouraged to participate. The main aims of DSME are to provide patients with the management skills necessary to achieve optimal control of their diabetes, and to assist them in becoming effective, self-directed decision makers for their own diabetes care, health, and well-being. Without comprehension of the relationship between blood glucose readings, meal planning, and physical activity, patients with diabetes will be hindered in their ability to achieve optimal blood glucose control, and are at higher risk for long-term complications. A referral to a Certified Diabetes Educator (CDE) or clinician who has expertise in culturally competent DSME is strongly recommended. A CDE may be a nurse, physician, dietitian, social worker, exercise physiologist, or pharmacist.¹⁷

National standards for DSME have been established by the American Diabetes Association (ADA) to define quality diabetes self-management education that can be implemented in diverse settings and will facilitate improvement in health outcomes. Standards are reviewed and updated on a regular basis, so the most current standards should be accessed on the ADA website.¹⁸

Goals for DSME

- Prevent type 2 diabetes
- Prevent the acute complications of diabetes, hyperglycemia, and hypoglycemia
- Prevent or delay the chronic complications of diabetes
- Promote healthy birth outcomes through preconception counseling, monitoring, and support during and after pregnancy
- Enhance patient participation in the diabetes treatment
- Plan and improve patient confidence in self-management skills
- Enhance psychosocial adjustment to living with a chronic disease
- Decrease health care costs by reducing the need for expensive hospital stays and the treatment of complications
- Maximize quality of life in a cost-effective manner

A referral for a face-to-face educational assessment is recommended. This allows for an appropriate educational treatment plan to be outlined. DSME is offered at both basic and advanced training levels. Consideration should be given to the patient for dealing with psychosocial aspects of the diagnosis. Literacy and cultural issues that may impact training should also be evaluated. Advances in treatment options are continuing. DSME should be offered annually after initial diagnosis. Ongoing training should ensure that patients are current in changing technology and self-management behavioral strategies.

Assessment of knowledge and needs of individuals with pre-diabetes and diabetes will determine which of the content areas on the following page are to be provided.¹⁹

¹⁷National Certification Board for Diabetes Educators, <http://www.ncbde.org>

¹⁸American Diabetes Association, <http://www.diabetes.org>

¹⁹Funnell MM, et al. National standards for diabetes self-management education. *Diabetes Care* 32:S87-S94, 2009.

Diabetes Disease Process

Overview

- Benefits of optimal diabetes control and factors that influence it
- Effects of insulin resistance, deficiency, and excess
- Treatment of insulin resistance through weight loss, physical activity, and medication
- Nature of diabetes in terms of chronicity and metabolism
- Differences between type 1 diabetes, type 2 diabetes, pre-diabetes, and gestational diabetes, if indicated
- Balance of meals, physical activity, and medication, if prescribed

Nutrition

- Basic vs. advanced training (i.e., basic food groups vs. carbohydrate to insulin ratio)

Physical activity

- Impact of physical activity on blood glucose, lipid levels, hypertension, weight, and stress reduction
- Frequency, level, and benefits of physical activity
- Impact of physical activity on hyperglycemia, ketosis, and hypoglycemia
- Physical activity planning appropriate to age, ability, interest, and willingness
- Potential impact of physical activity on long-term diabetes complications and skills for avoiding injury

Medications

Oral Medication Management

- Action, side effects, timing of dose(s), interactions

Insulin Management

- Action, dosage, onset/peak/duration, pre-filling, mixing, injecting, site selection, storage, syringe/needle/lancet disposal, travel guidelines, adjustments for sick and well days
- Recommendations for syringe reuse: techniques, benefits, and risks
- Pump use, if appropriate
- Use of Glucagon, if appropriate

Injectable medication, if prescribed

- Influences of other medications on blood glucose and possible interactions with oral diabetes and other medications

Monitoring/using results

- Blood glucose meter selection and orientation
- Time(s) to check blood glucose/rationale
- Recording and interpreting results, encouraging dialogue with clinician
- Establish A1C targets
- Use of SMBG to adjust the treatment plan based on approved guidelines
- Disposal of syringes, needles, lancets, and other contaminated materials
- Urinary and blood ketone testing, if appropriate
- Use of advanced technology: Continuous Glucose Monitoring System (CGMS), if appropriate

Acute complications

- Hypoglycemia and hyperglycemia recognition, causes, treatment, and prevention
- Diabetes management during illness
- Trauma, surgery, and/or severe acute illness
- Planning skills for scheduled procedures and surgeries
- Potential changes in blood glucose monitoring
- Meal planning changes: short- and long-term where applicable (e.g., surgeries, illness > 1-2 days)
- Potential changes in medication (e.g., addition of insulin to oral medications or insulin initiation; times and frequency of insulin doses)
- Signs and symptoms of acute changes in status of diabetes control (e.g., Diabetic Ketoacidosis [DKA], dehydration, Hyperosmolar Hyperglycemic State [HHS])
- Importance of strict glycemic control during:
 - Pre-surgical preparation
 - Recovery period

Complications prevention and recognition

- Self-foot care, early detection of problems, and importance of timely access to care
- Early recognition of eye disease and need for complete eye exam
- Impact of lipids: importance of monitoring annually, or every two years if values fall within accepted risk levels
- Importance of blood pressure control: need for regular monitoring
- Identification of the symptoms, treatment, and major factors contributing to the development of complications
- Preventing kidney disease, peripheral vascular disease, cardiovascular disease, periodontal disease, and neuropathy
- Importance of pneumonia vaccine and yearly flu vaccine
- Smoking cessation
- Use of aspirin if not contraindicated

Goal setting and problem solving

Psychosocial adjustment

- Assess adjustment to lifestyle changes; screen for depression, eating disorders, and cognitive impairment; refer to counseling as needed
- Develop psychosocial skills and incorporate into routine care to support emotional well-being
- Ongoing support

Preconception care, pregnancy, and gestational diabetes (GDM)

Women who are pregnant and have diabetes, whether preexisting or GDM, have a goal of delivering a healthy baby after gestation. In order to accomplish this goal, it is critical for the mother's glucose levels to be within the target range, before pregnancy for those with preexisting diabetes and during pregnancy for all women. The treatment plan will include MNT, as well as physical activity and insulin as needed. The treatment plan will need to be adjusted throughout the course of the pregnancy and frequent monitoring will be required.²⁰

²⁰Funnell MM, et al. National standards for diabetes self-management education. *Diabetes Care* 30:1630-1637, 2007.

Summary

Medical nutrition therapy (MNT), defined as nutritional diagnostic, therapeutic, and counseling services provided by a registered dietitian or nutrition professional for the purpose of managing diabetes, is an integral component of assisting patients in acquiring and maintaining the knowledge, skills, and behaviors to successfully meet the challenges of daily diabetes self-management.²¹

The *2006 Nutrition Recommendations and Interventions for Diabetes*, published by the ADA, identifies three categories of MNT: primary prevention to reduce the risk of, or delay the onset of, diabetes; nutrition management for blood glucose control; and management and prevention in the treatment of comorbidities.²² Adequate nutrition advice or an individualized meal plan will assist patients in achieving optimal blood glucose control. Meeting nutrition-related goals requires a coordinated team effort that includes the person with diabetes. A referral to a registered dietitian skilled in the complexities of diabetes management is strongly recommended.

Recommendations:

- People with pre-diabetes or diabetes should receive individualized MNT as needed to achieve treatment goals, preferably provided by a registered dietitian familiar with components of diabetes MNT. (B)
- Weight loss is recommended for all overweight or obese individuals who have or are at risk for diabetes. (A)
- For weight loss, either low-carbohydrate or low-fat, calorie-restricted diets may be effective in the short-term (up to 1 year). (A)
- For patients on low-carbohydrate diets, monitor lipid profiles, renal function, and protein intake (in those with nephropathy) and adjust hypoglycemic therapy as needed. (E)²³

Motivational interviewing, a counseling technique shown to be beneficial in behavioral change, should be utilized in working with clients to modify nutritional intake.^{24,25}

Goals for MNT

- Achieve and maintain near normal blood glucose levels as well as optimal lipid levels, blood pressure, and recommended body weight.
- Prevent and treat the acute and long-term complications of diabetes.
- Improve overall health through optimum nutrition and physical activity.
- Address individual needs, considering cultural preferences, lifestyle, and ability to change.
- Maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence.
- Delay the onset of diabetes in patients with pre-diabetes.
- Provide for the needs of special populations:
 - Youth with type 1 or type 2 diabetes
 - Pregnant and lactating women
 - Older adults
 - Active individuals treated with drugs that may potentially cause hypoglycemia (insulin and insulin secretagogues and meglitinides) to ensure safety during activity
 - Individuals at risk for developing diabetes
 - Individuals with deteriorating renal or cardiac function
 - Individuals with deteriorating visual acuity

²¹Centers for Medicare and Medicaid Services. *Medical nutrition therapy services: overview*. <http://www.cms.hhs.gov/medicalnutritiontherapy>

²²American Diabetes Association (Position Statement). *Nutrition recommendations and interventions for diabetes*. *Diabetes Care* 31:S61-S78, 2008.

²³American Diabetes Association. *Standards of medical care in diabetes*. *Diabetes Care* 32 (Supplement 1):S13-S61, 2009.

²⁴West DS, et al. *Motivational interviewing improves weight loss in women with type 2 diabetes*. *Diabetes Care* 30:1081-1087, 2007.

²⁵Channon SJ, et al. *A multicenter randomized controlled trial of motivational interviewing in teenagers with diabetes*. *Diabetes Care* 30:1390-1395, 2007.

Basic Education

For patients newly diagnosed with diabetes or pre-diabetes, or patients not recently educated, basic survival skills should include:

- Relationship of food and meals to blood glucose levels, medication, and physical activity
- Monitoring of total grams of carbohydrate intake
- Basic food/meal plan guidelines, including portion control
- Consistent times each day for meals and snacks
- Recognition, prevention, and treatment of hypoglycemia
- Diabetes management during illness
- Self-monitoring of blood glucose

Advanced MNT topics should include:

- Weight loss strategies, including reduction in energy intake and/or increase in physical activity, if indicated; consideration of medications and/or bariatric surgery for those with a BMI ≥ 35
- Amount (grams) and type of carbohydrate in food and influence on blood glucose levels
- Use of meal replacements, if desired
- Glycemic index
- Sources of nutrients and their effects on blood glucose and lipid levels
- Carbohydrate counting
- Label reading and grocery shopping guidelines
- Dining out
- Reduced dietary energy from saturated fat (< 7% of total energy); intake of *trans* fat should be minimized
- Use of sugar-containing foods, dietetic foods, and sweeteners
 - Sugar alcohols and nonnutritive sweeteners are safe when consumed within the acceptable daily intake levels established by the Food and Drug Administration (FDA)
- Alcohol guidelines
 - If adults with diabetes choose to use alcohol, daily intake should be limited to a moderate amount (one drink per day or less for adult women and two drinks per day or less for adult men)
- Using blood glucose monitoring for glucose pattern control
- Adjusting meal times
- Adjusting food for physical activity
- Special occasions, holidays
- Travel, schedule changes
- Vitamin and mineral supplementation
 - Routine supplementation with antioxidants, such as vitamins E and C and carotene, is not advised because of lack of evidence of efficacy and concern related to long-term safety
 - Benefit from chromium supplementation in people with diabetes or obesity has not been conclusively demonstrated, and therefore cannot be recommended

Ongoing Nutrition Education

Ongoing nutrition education is recommended for patients recently diagnosed with diabetes or pre-diabetes who have been taught basic survival skills. Patients who may benefit from nutrition education include those who have not received current nutrition education, who are having difficulty with diabetes management, or who are experiencing changes in lifestyle, medication, weight, or childbearing status. Follow-up sessions should focus on increasing the patient's knowledge, skills, and flexibility as he or she gains experience living with diabetes.

A weight loss program should include:

- Individualized counseling
- Structured, intensive lifestyle education
- Promotion of healthy food choices and physical activity

Summary

Physical activity is an important component of a healthy lifestyle that can help to prevent diabetes and its complications. The use of the term “physical activity” is preferred to “exercise” because it includes the spectrum of options from mild (e.g., walking or light housekeeping) to moderate (e.g., brisk walking, dancing, swimming, bicycling) to vigorous (e.g., jogging, bicycling uphill, swimming multiple laps). The metabolic effects of physical activity are generally measurable up to 24–48 hours after a single session. Therefore, repeated sessions of physical activity (generally 5–7 times per week) are recommended to achieve ongoing benefits.^{26,27}

Recommendations:

- People with diabetes should be advised to perform at least 150 minutes/week of physical activity (50–70% of maximum heart rate). (A)
- In the absence of contraindications, people with type 2 diabetes should be encouraged to perform resistance training three times per week; targeting all major muscle groups.²⁸ (A)

Moderate-intensity activity for about 150 minutes a week has been shown to substantially lower the risk of heart disease in people with diabetes.²⁹ For individuals whose goals are weight loss, 300 minutes (5 hours) or more of moderate-intensity activity a week has even greater benefit.³⁰ Health care providers should work with their patients with diabetes to adapt physical activity so that it is appropriate for their condition.

Recommendations for screening asymptomatic patients with diabetes for coronary artery disease (CAD) before starting on a program of physical activity remain unclear. A recent ADA Consensus Statement on this issue concluded that routine screening is not recommended and providers should use clinical judgment in this area, including encouraging high-risk patients to start with short periods of low-intensity physical activity and to increase the duration and intensity gradually.³¹ Providers should also assess patients with diabetes for conditions that might contraindicate certain types of physical activity or predispose to injury.

Conditions that may contraindicate moderate to vigorous activity include:

- Uncontrolled hypertension
- Peripheral neuropathy (risk for lower extremity injury)
- Severe autonomic neuropathy or hypoglycemia unawareness
- Pre-proliferative or proliferative retinopathy or macular edema (risk for retinal detachment or vitreous hemorrhage)
- Blood glucose concentration ≥ 250 mg/dl with ketones or ≥ 300 mg/dl without ketones

²⁶Sigal RJ, et al. Physical activity/exercise and type 2 diabetes. *Diabetes Care* 27:2518–2539, 2004.

²⁷Department of Health and Human Services: Physical activity and health: A report of the Surgeon General. Atlanta, GA, Centers for Disease Control and Prevention, 1996.

²⁸American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 32 (Supplement 1):S13–S61, 2009.

²⁹Sigal RJ, et al. Physical activity/exercise and type 2 diabetes. *Diabetes Care* 27:2518–2539, 2004.

³⁰U.S. Department of Agriculture, <http://www.mypyramid.gov>

³¹Bax JJ, et al. Screening for coronary artery disease in patients with diabetes. *Diabetes Care* 30:2729–2736, 2007.

Goals for Physical Activity

The overall goals of physical activity are to improve glycemic control, maintain a healthy weight, decrease cardiovascular risk, reduce blood pressure, improve balance to prevent falls, reduce stress, and improve well-being. These goals should address the individual's preferred method of becoming more physically active. Aerobic activity should be distributed over at least three days per week with no more than two days between activities.

For substantial health benefits, adults should aim for:

- 150 minutes per week of moderately intense physical activity, or
- 75 minutes per week of vigorously intense physical activity, or
- Some combination of the two.

For more extensive health benefits, adults should aim for:

- 300 minutes per week of moderately intense physical activity, or
- 150 minutes of vigorously intense physical activity, or
- Some combination of both.³²

Resistance Training

Resistance exercise has been shown to improve insulin sensitivity to about the same extent as aerobic exercise.^{33,34} Studies have shown that either aerobic or resistance training alone improves glycemic control in type 2 diabetes, but the improvements are greatest with combined aerobic and resistance training.³⁵

- The goal is three times per week targeting all major muscle groups. Start by identifying a weight that cannot be lifted more than 8-10 times. Use this weight and gradually increase to three sets of 8-10 repetitions.
- Resistance training is not recommended for people with significant retinopathy due to risk of retinal detachment or vitreous hemorrhage.

Basic Education

- Relationship of physical activity to change in blood glucose levels
- Impact of physical activity on risk for hypoglycemia (especially in patients taking sulfonylureas, meglitinides, or insulin preparations). Added carbohydrate should be ingested if pre-exercise glucose is < 100 mg/dl.
- Potential for impact of physical activity on blood glucose levels up to 12-24 hours after completion
- Types of physical activity
- Injury prevention

³²U.S. Department of Health and Human Services. 2008 Physical Activity Guidelines for Americans: <http://www.health.gov/paguidelines/guidelines/chapter7.aspx>

³³Dunstan DW, et al. High-intensity resistance training improves glycemic control in older patients with type 2 diabetes. *Diabetes Care* 25:1729–1736, 2002.

³⁴Castaneda C, et al. A randomized controlled trial of resistance exercise training to improve glycemic control in older adults with type 2 diabetes. *Diabetes Care* 25:2335–2341, 2002.

³⁵Sigal RJ, et al. Effects of aerobic training, resistance training, or both on glycemic control in type 2 diabetes. *Annals of Internal Med* 147:357–369, 2007.

The ADA and the European Association for the Study of Diabetes published a consensus statement on the approach to management of hyperglycemia in individuals with type 2 diabetes. Highlights of this approach are: intervention at the time of diagnosis with metformin in combination with lifestyle changes (MNT and physical activity), and continuing timely augmentation of therapy with additional agents (including early initiation of insulin therapy) as a means of achieving and maintaining recommended levels of glycemic control (i.e., A1C < 7% for most patients). The overall objective is to achieve and maintain glycemic control and to change interventions when therapeutic goals are not being met.^{36,37}

The U.S. Food and Drug Administration (FDA) has approved many classes of oral agents for monotherapy (see **Metabolic Management of Type 2 Diabetes** on page 18 in this document). The choice of a particular agent must depend, however, on the individual's characteristics, self-monitoring of blood glucose (SMBG) profiles, clinical scenario, cost-effectiveness, and physician preferences. Before initiating therapy, renal status and hepatic function should be evaluated. Appropriate nutrition and physical activity should be maintained even if the diabetes is being managed pharmacologically. This suggested treatment approach reflects current thinking; however, changes will continue to be made in this recommended algorithm as the science evolves.

In the case of monotherapy not achieving target glycemic goals, combinations of oral agents or injectable therapies should be attempted. The adverse effect profile of a particular course of therapy may determine which combination regimen is chosen for a specific patient. Individual concerns over hypoglycemia, gastrointestinal (GI) side effects, or edema may tip the scale away from one permutation towards another. Cardiac, renal, and hepatic function should be evaluated as appropriate for each oral agent. The table on page 19 compares the oral antidiabetic agents. Insulin can be used either alone or in combination with an indicated oral/injectable drug regimen.

New drugs to treat diabetes are in development and in various stages of approval by the FDA. Since 2007, the FDA has been concerned about cardiovascular side effects of diabetes drugs due to increased risk of heart attacks associated with rosiglitazone (Avandia®).³⁸ The FDA now requires manufacturers to evaluate cardiovascular risks for all new drugs for diabetes before approval. Some new medications, saxagliptin (Onglyza®) and liraglutide (Victoza®), may not need to meet this requirement, as they were under development prior to the new regulation.

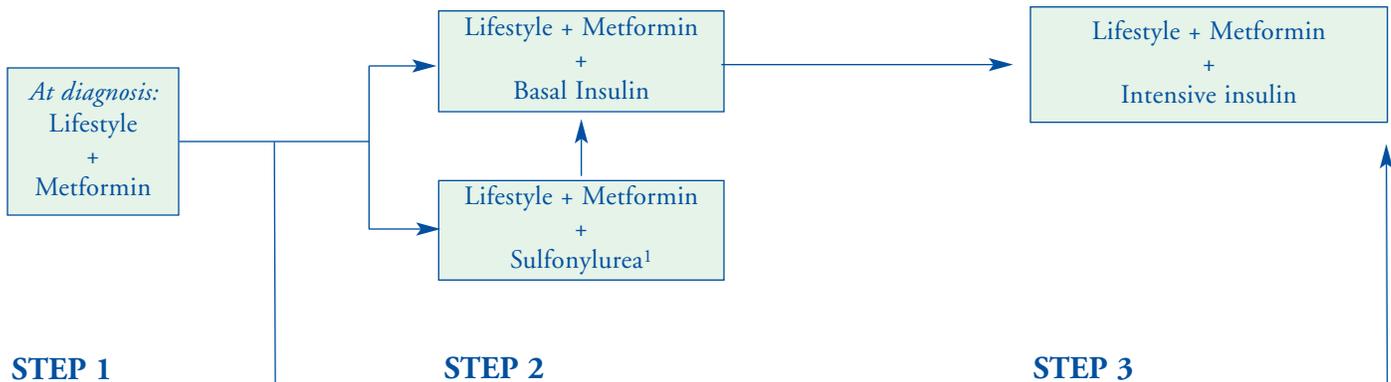
See **Appendix A: Commonly Used Antidiabetic Agents** (pages 45-50).

³⁶American Diabetes Association. *Standards of medical care in diabetes. Diabetes Care* 32 (Supplement 1):S13-S61, 2009.

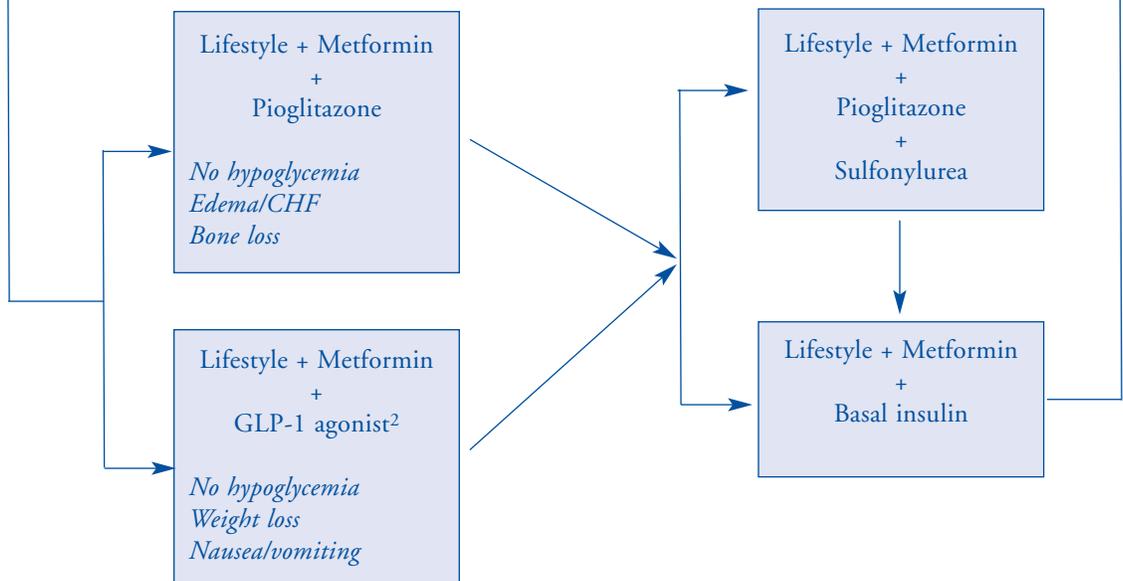
³⁷Nathan DM, et al. *Medical management of hyperglycemia in type 2 diabetes: a consensus algorithm for the initiation and adjustment of therapy: a consensus statement of the American Diabetes Association and the European Association for the Study of Diabetes. Diabetes Care* 32:193–203, 2009.

³⁸http://www.fda.gov/cder/drug/InfoSheets/HCP/rosiglitazone200707HCP.htm#2007_5

Tier 1: Well-validated core therapies



Tier 2: Less well-validated therapies



Reinforce lifestyle interventions at every visit and check A1C every 3 months until A1C is < 7%, and then at least every 6 months. The interventions should be changed if A1C is ≥ 7%.

Renal dysfunction is considered a contraindication to metformin use because it may increase the risk of lactic acidosis, an extremely rare (less than 1 case per 100,000 treated patients) but potentially fatal complication. However, recent studies have suggested that metformin is safe unless the estimated glomerular filtration rate falls to < 30 ml/min.

¹Sulfonylureas other than glyburide or chlorpropamide
²Insufficient clinical use to be confident regarding safety

Adapted from: Nathan D, et al. Medical management of hyperglycemia in type 2 diabetes: A consensus algorithm for the initiation and adjustment of therapy. *Diabetes Care* 32:193-203, 2009.

SUMMARY OF GLUCOSE-LOWERING INTERVENTIONS³⁹

INTERVENTION	EXPECTED DECREASE IN A1C WITH MONOTHERAPY (%)	ADVANTAGES	DISADVANTAGES
TIER 1: WELL-VALIDATED CORE			
Step 1: <i>initial therapy</i> Lifestyle to decrease weight and increase activity	1.0–2.0	Broad benefits	Insufficient for most within first year
Metformin	1.0–2.0	Weight neutral	GI side effects, contraindicated with renal insufficiency
Step 2: <i>additional therapy</i> Insulin	1.5–3.5	No dose limit, rapidly effective, improved lipid profile	One to four injections daily, monitoring, weight gain, hypoglycemia, analogues are expensive
Sulfonylurea	1.0–2.0	Rapidly effective	Weight gain, hypoglycemia (especially with glibenclamide or chlorpropamide)
TIER 2: LESS WELL-VALIDATED			
TZDs	0.5–1.4	Improved lipid profile (pioglitazone), potential decrease in Myocardial Infarction (pioglitazone)	Fluid retention, CHF, weight gain, bone fractures, expensive, potential increase in Myocardial Infarction (rosiglitazone)
GLP-1 agonist	0.5–1.0	Weight loss	Two injections daily, frequent GI side effects, long-term safety not established, expensive
OTHER THERAPY			
<i>α</i> -Glucosidase inhibitor	0.5–0.8	Weight neutral	Frequent GI side effects, three times/day dosing, expensive
Glinide	0.5–1.5 ^a	Rapidly effective	Weight gain, three times/day dosing, hypoglycemia, expensive
Pramlintide	0.5–1.0	Weight loss	Three injections daily, frequent GI side effects, long-term safety not established, expensive
DPP-4 inhibitor	0.5–0.8	Weight neutral	Long-term safety not established, expensive

^a Repaglinide more effective in lowering A1C than nateglinide.

³⁹Nathan D, et al. Medical management of hyperglycemia in type 2 diabetes: A consensus algorithm for the initiation and adjustment of therapy. *Diabetes Care* 32:193-203, 2009.

Insulin Considerations

The use of insulin requires the following considerations:

- The onset, peak, and duration of any insulin preparation may vary depending on injection site, exercise, depth of injection, and other variables. Hypoglycemia is a side effect of insulin, and patients must be instructed on the risks as well as appropriate treatments for hypoglycemia.
- Reduced hyperglycemia and an improvement in glucose toxicity will occur in patients with type 2 diabetes, given sufficient doses of insulin. Individuals with moderately controlled type 2 diabetes, defined as a fasting plasma glucose ≥ 140 and < 200 mg/dl, will often show sufficient response to a single or twice-daily dose of insulin.
- Insulin therapy often results in weight gain as a result of improved blood glucose utilization. Attention should be given to lifestyle adjustments, such as modifications to diet and implementing an exercise program, which can counteract insulin-induced weight gain.⁴⁰
- Individuals with uncontrolled type 2 diabetes, defined as a fasting plasma glucose of ≥ 200 mg/dl, or those who have proved not responsive to the above-mentioned regimens, may require frequent insulin dosing. This usually requires the addition of short-acting insulin before meals.
- The total daily insulin doses for type 2 diabetes may range from 0.4 - 1.2 U/kg/day. Be aware that in insulin-resistant patients, doses of > 1.5 U/kg/day may be required.
- Total daily dosage for people with type 1 diabetes may range from 0.3 - 0.8 U/kg/day.
- The degree of glucose-lowering effect is dose-related. Studies have demonstrated a lowering of fasting glucose of up to 190 mg/dl from baseline in patients with type 2 diabetes treated with insulin.
- Insulin can be delivered via syringe, pen, or pump.⁴¹

Insulins listed in the medications chart in Appendix A are U-100 (100 units per ml). In some cases, U-500 (500 units of insulin per ml) may be used. This may be an option for patients requiring very high doses of insulin (i.e., ≥ 200 units per day). Using this high-potency alternative allows injections of smaller volumes, but increases the potential for serious hypoglycemia. Extreme caution in dosing is advised.⁴²

Continuous Glucose Monitoring Systems (CGMS)

An endocrinologist may be consulted for evaluation and possible use of CGMS in appropriately selected patients. Candidates for CGMS are patients who have: hypoglycemia unawareness, recurrent hypoglycemia (E), or nocturnal hypoglycemia; who are geriatric or pregnant; are on pump therapy; or are on insulin and failing treatment.⁴³

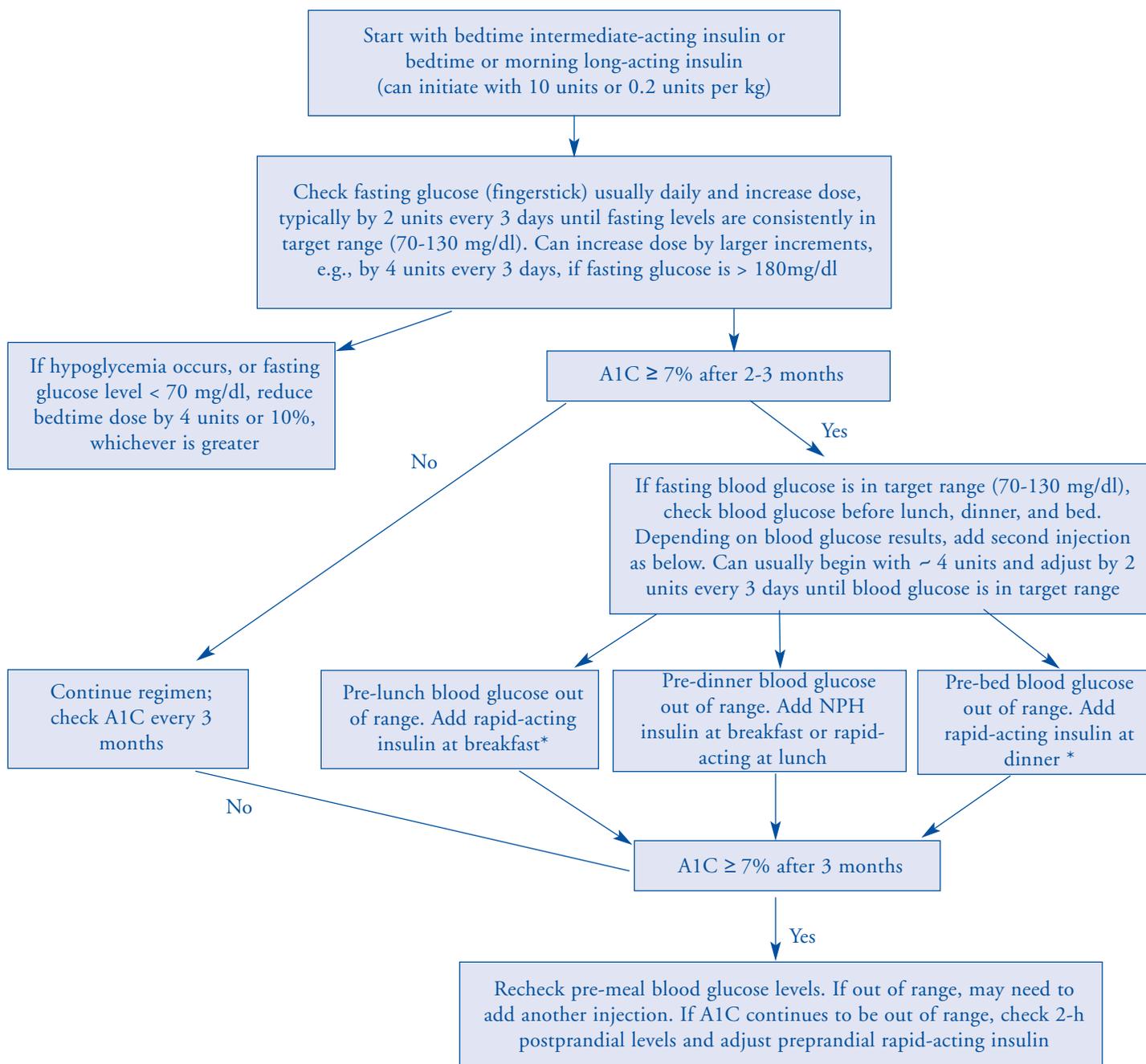
⁴⁰Carver C. Insulin treatment and the problem of weight gain in type 2 diabetes. *The Diabetes Educator* 32:910-917, 2006.

⁴¹White Jr. JR. The pharmacological reduction of blood glucose in patients with type 2 diabetes mellitus. *Clinical Diabetes* 16:1998.

⁴²Cochrane E, et al. The use of U-500 in patients with extreme insulin resistance. *Diabetes Care* 28:1240-1244, 2005.

⁴³The Juvenile Diabetes Research Foundation Continuous Glucose Monitoring Study Group. Continuing glucose monitoring and intensive treatment of type 1 diabetes. *NEJM* 359:1464-1476, 2008.

Initiation and Adjustment of Insulin Regimens⁴⁴



Insulin regimens should be designed taking lifestyle and meal schedule into account. The algorithm can only provide basic guidelines for initiation and adjustment of insulin.

*Premixed insulins, combining rapid- and longer-acting insulin in a single injection, are not recommended during adjustment of doses; however, they can be used conveniently, usually before breakfast and/or dinner, if the proportional adjustments of rapid- and intermediate-acting insulins are the same as the fixed proportions available.

⁴⁴Nathan D, et al. Medical management of hyperglycemia in type 2 diabetes: A consensus algorithm for the initiation and adjustment of therapy. *Diabetes Care* 32:193-203, 2009.

Summary of Lipid-Lowering Therapy

Diabetes has been classified as a coronary equivalent and patients with diabetes should be treated as if they have underlying cardiovascular disease (CVD). They are likely to benefit from early intervention with lifestyle modification and cardio-protective drugs, if necessary.

Evidence from clinical trials published over the past decade suggests that broad-based treatment of dyslipidemia, hypertension, microalbuminuria, and hypercoagulability (as well as interventional cardiology and cardiovascular surgery during acute coronary syndrome) can improve the event-free survival rate in people with diabetes who already have clinical CVD.⁴⁵

Recommendations:

- Annual fasting test for lipid disorders. More often if necessary to reach goal levels. (E)
- Testing every two years is adequate for those with low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides (TG) within the target levels listed. (E)
- Lifestyle modification focusing on reduction of saturated fat, *trans* fat, and cholesterol intake; weight loss (if indicated) and increased physical activity should be recommended to improve lipid profile. (A)
- Statin therapy should be added to lifestyle therapy, regardless of baseline lipid levels, for patients with diabetes with overt CVD (A) and for patients without CVD who are over the age of 40 and have one or more other CVD risk factors (see **Coronary Heart Disease** on page 26). (A)
- In patients without overt CVD and under age 40, or those with multiple CVD risk factors, statin therapy should be considered in addition to lifestyle therapy if LDL cholesterol remains above 100 mg/dl. (E)
- In individuals without overt CVD, the primary goal is an LDL cholesterol goal of < 100 mg/dl. (A)
- In individuals with overt CVD, a lower LDL cholesterol goal of < 70 mg/dl, using a high dose of a statin, is an option. (B)
- If patients treated with drugs do not reach targets on maximal tolerated statin therapy, a reduction in LDL cholesterol of ~ 30-40% from baseline is an alternative therapeutic goal. (A)
- Triglyceride levels < 150 mg/dl and HDL cholesterol > 40 mg/dl in men and > 50 mg/dl in women are desirable. However, LDL cholesterol-targeted statin therapy remains the preferred strategy. (C)
- Statin therapy is contraindicated in pregnancy. (E)

Lifestyle Modifications

Specific lifestyle changes aimed at improving lipid profiles are recommended for all patients with diabetes. Lifestyle intervention should include MNT, increased physical activity, smoking cessation, and weight loss, if indicated. MNT should be tailored to the individual patient and focus on the reduction of saturated fat, cholesterol, and *trans* fat intake.⁴⁶

According to the American Dietetic Association's Evidence Analysis Library, there is fair evidence to support the use of omega-3 fatty acids in decreasing the risk of death from cardiac events and non-fatal myocardial infarctions (MI). If not contraindicated, omega-3 fatty acids can be added to the diet. They can be from both marine and plant sources: two 4-oz. servings of fish per week (preferably fatty fish such as mackerel, salmon, herring, trout, sardines, or tuna) and plant-based foods containing 1.5 g alpha-linolenic acids (1 Tbsp canola or walnut oil, 0.5 Tbsp ground flax seed, < 1 tsp flax seed oil). The FDA does warn that fatty fish can be high in methylmercury and should be limited accordingly in women who are or may become pregnant, nursing mothers, and young children.⁴⁷

⁴⁵Remuzzi G, et al. Prevention and treatment of diabetic renal disease in type 2 diabetes: The BENEDICT study. *J Am Soc Nephrol* 17:S90–S97, 2006.

⁴⁶Grundy SM, et al. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III Guidelines. *Circulation* 110:237-239, 2004.

⁴⁷U.S. Food and Drug Administration, Center for Food Safety and Nutrition, <http://www.cfsan.fda.gov/~dms/admebg3.html>

Target Levels of Risk Factors in Patients with Diabetes

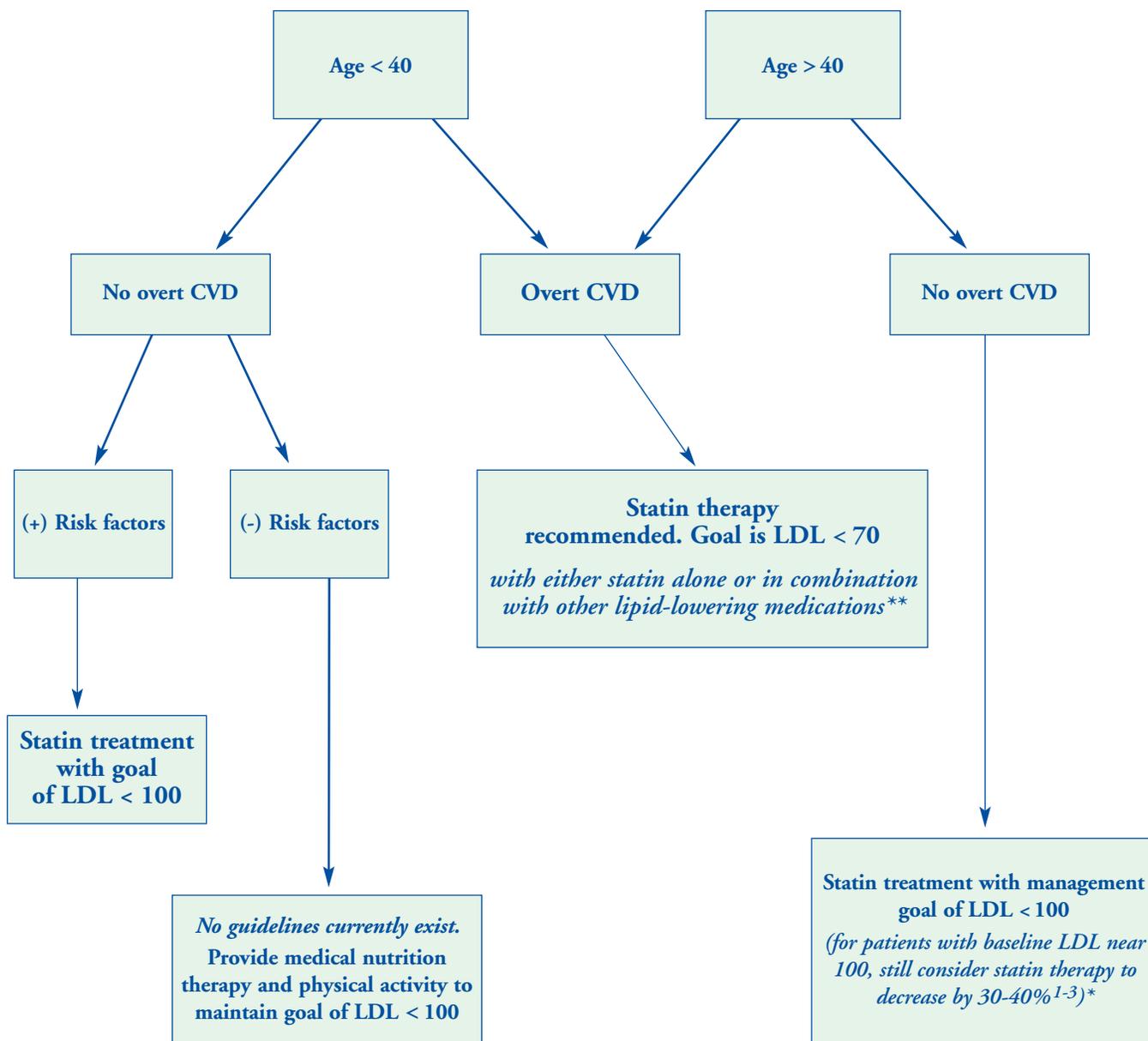
First priority		
	LDL cholesterol (mg/dl)	Non-HDL cholesterol (mg/dl)
Highest-risk patients, including those with: diabetes plus one or more additional major CVD risk factors	< 70	< 100
High-risk patients, including those with: diabetes but no other major CVD risk factors	< 100	< 130
Second priority		
Triglycerides	< 150 mg/dl	
HDL cholesterol	> 40 mg/dl (male); > 50 mg/dl (female)	

Non-HDL cholesterol (total cholesterol minus HDL cholesterol) reflects the concentration of cholesterol within all lipoprotein particles currently considered atherogenic. The Adult Treatment Panel III (ATP III) proposed that in individuals with hypertriglyceridemia (which would include many with diabetes), non-HDL cholesterol levels are a secondary goal of therapy after targeting LDL cholesterol levels. Many studies have demonstrated that non-HDL cholesterol is a better predictor of CVD risk than is LDL cholesterol and this may be especially true of statin-treated patients. Additional benefits of non-HDL cholesterol measurement are its lack of additional expense in patients already getting lipid panel measurements and that it can be calculated from nonfasting samples.⁴⁸

See: **LDL Cholesterol-Lowering Decision Tree in Type 2 Diabetes** on page 24.

⁴⁸U.S. Food and Drug Administration, Center for Food Safety and Nutrition, <http://www.cfsan.fda.gov/~dms/admehg3.html>

LDL Cholesterol-Lowering Decision Tree in Type 2 Diabetes



¹Collins R, Armitage J, Parish S, Sleight P, Peto R. MRC/BHF Heart Protection Study Collaborative Group. MRC/BHF Heart Protection Study of cholesterol-lowering therapy and of antioxidant vitamin supplementation in a wide range of patients at increased risk of coronary heart disease death: early safety and efficacy experience. *European Heart Journal* 20:725–741, 1999.

²Ray KK, et al. Early and late benefits of high-dose atorvastatin in patients with acute coronary syndromes. Results from PROVE IT-TIMI 22 Trial. *J Am Coll Cardiol* 46:1405-1410, 2005.

³Colhoun HM, et al. Primary prevention of cardiovascular disease with atorvastatin in type 2 diabetes in the Collaborative Atorvastatin Diabetes Study (CARDS): multicentre randomised placebo-controlled trial. *Lancet*. 364(9435):685-96, 2004.

*Based on randomized studies for type 2 diabetes: may or may not be applicable for type 1 diabetes.

**If unable to achieve LDL < 70 mg/dl, minimal goal should be 30-40% decrease from baseline with maximal tolerated dose of statin or a tolerable combination regimen.

Pharmacological Therapy

Statins are the preferred drugs for LDL reduction. Other drugs that lower LDL include nicotinic acid, ezetimibe (18% reduction), bile acid sequestrants (15-30%), and fibric acid derivatives (fenofibrate and gemfibrozil, 5-20%). Niacin and fibric acid derivatives are used primarily for TG lowering. Colesevelam (Welchol®), traditionally used as a cholesterol-lowering agent by binding intestinal bile acids, may be used as add-on therapy in type 2 diabetes. It lowers LDL by ~20% and A1C by ~0.5%. Other bile acid resins lower blood glucose as well, but colesevelam is better tolerated. Colesevelam may increase triglycerides, so caution is needed if TG level is over 300 mg/dl. Colesevelam should be avoided if TG level is over 500 mg/dl.

Liver function should be evaluated before the start of pharmacotherapy and post initiation, as directed by package insert.

Current Available Statin Therapies for Lipid Disorders

Generic Name	Trade Name®	Dose (mg)*	LDL % Reduction**
atorvastatin ^{49,50}	Lipitor	10-80	29-45%
fluvastatin	Lescol	20-80	17-25%
lovastatin	Mevacor	10-80	16-29%
pravastatin	Pravachol	10-80	16-27%
rosuvastatin	Crestor	5-40	33-46%
simvastatin	Zocor	5-80	19-36%

Highlighted drugs are available as generic formulations

* All of these statins are available at doses up to 80 mg except for rosuvastatin. For every doubling of the dose above starting dose, an approximate 6% decrease in LDL cholesterol level can be obtained.⁵¹

** Estimated LDL reductions were obtained from U.S. FDA package inserts for each drug.

⁴⁹Raikou M, et al. Cost-effectiveness of primary prevention of cardiovascular disease with atorvastatin in type 2 diabetes: Results from the Collaborative Atorvastatin Diabetes Study (CARDS). *Diabetologia* 50:733-40, 2007.

⁵⁰Ray KK, et al. Early and late benefits of high-dose atorvastatin in patients with acute coronary syndromes. Results from PROVE IT-TIMI 22 Trial. *J Am Coll Cardiol* 46:1405-1410, 2005.

⁵¹Buse JB, et al. Primary prevention of cardiovascular diseases in people with diabetes mellitus: A scientific statement from the American Heart Association and the American Diabetes Association. *Diabetes Care* 30:162-172, 2007.

Coronary Heart Disease

Cardiovascular risk factors should be assessed at least annually in people with diabetes. For patients without clear or suggestive symptoms of coronary artery disease, a risk factor-based approach is recommended, evaluating for dyslipidemia, hypertension, smoking, a positive family history of premature coronary disease, or the presence of micro- or macroalbuminuria. A recent study, however, concluded that the presence of traditional and emerging cardiac risk factors failed to identify a significant percentage of patients with silent ischemia.⁵²

Recommendations:

- In patients with known CVD: angiotensin-converting enzyme (ACE) inhibitor (C), aspirin (A), and statin therapy (A) (if not contraindicated) should be used to reduce risk of cardiovascular events.
- In patients > 40 years of age with another cardiovascular risk factor (hypertension, premature family history, dyslipidemia, microalbuminuria, cardiac autonomic neuropathy, or smoking) aspirin and statin therapy (if not contraindicated) should be used to reduce the risk of cardiovascular events. (B)
- A beta-blocker, if not contraindicated, should be added for patients with a prior myocardial infarction. (A)
- Screening tests such as a stress electrocardiogram (ECG), and/or stress echocardiography, and/or perfusion imaging may be beneficial for those with: 1) typical or atypical cardiac symptoms, and/or
2) an abnormal resting electrocardiogram (E)

Other considerations with less clear evidence:

- A risk factor evaluation aimed at stratifying patients by 10-year risk should be considered. (B)
- Metformin is contraindicated in patients with acute or unstable heart failure, however may be used in patients with stable congestive heart failure (CHF) if renal function is normal. (C)
- In patients with CHF, thiazolidinediones use is contraindicated. (C)
- Use caution in prescribing thiazolidinediones for patients with preexisting edema or heart disease. (E)

Aspirin Therapy in Diabetes

Both men and women with diabetes have a two- to four-fold increased risk of dying from the complications of cardiovascular disease. Evidence suggests that aspirin therapy should be prescribed as a secondary prevention strategy and, if no contraindications exist, should also be used as a primary prevention strategy in men and women with diabetes who are at high risk (over age 40 or with other CVD risk factors). The use of aspirin has not been studied in individuals under the age of 30.⁵³

Aspirin Therapy Recommendations:

- Use aspirin therapy (75-162 mg/day) as a secondary prevention strategy in men and women with diabetes and a history of myocardial infarction, vascular bypass procedure, stroke or transient ischemic attack, peripheral vascular disease, claudication, and/or angina. (A)
- Use aspirin therapy (75-162 mg/day) as a primary prevention strategy in men and women with type 1 or type 2 diabetes at increased cardiovascular risk, including those over 40 years of age or who have additional risk factors (family history of CVD, hypertension, smoking, dyslipidemia, albuminuria). (C)
- People with aspirin allergy, bleeding tendency, recent gastrointestinal bleeding, and clinically active hepatic disease are not candidates for aspirin therapy. Other antiplatelet agents, such as clopidogrel, may be a reasonable alternative for high-risk patients with contraindications to aspirin therapy. (B)
- Combination therapy with aspirin (75–162 mg/day) and clopidogrel (75 mg/day) is reasonable for up to a year after an acute coronary syndrome. (B)

⁵²Wackers FJ, et al. Detection of ischemia in asymptomatic diabetic subjects. *Diabetes Care* 27:1954-1961, 2004.

⁵³American Diabetes Association (Position Statement). Aspirin therapy in diabetes. *Diabetes Care* 27 (Supplement 1):S72-S73, 2004.

Summary

Hypertension contributes to the development and progression of chronic complications of diabetes. The primary goal of therapy for adults with diabetes should be to decrease blood pressure to < 130/80 mmHg. Epidemiological analysis of the United Kingdom Prospective Diabetes Study (UKPDS) showed a continuous relationship between the level of systolic blood pressure and the risk of stroke, diabetes-related deaths, heart failure, microvascular complications, and vision loss.

Recommendations:

- Patients with diabetes should be treated to a systolic blood pressure (SBP) < 130 mmHg (C) and to a diastolic blood pressure (DBP) < 80 mmHg. (B)
- Patients with SBP of 130-139 mmHg or DBP of 80-89 mmHg may be given lifestyle therapy alone for a maximum of 3 months and then, if targets are not achieved, be treated with the addition of pharmacological agents. (E)
- Patients with more severe hypertension (SBP ≥ 140 mmHg or DBP ≥ 90 mmHg) at diagnosis or follow-up should receive prescriptions for both antihypertensive medication and lifestyle/behavioral changes.^{54,55} (A)
- All patients with diabetes and hypertension should be treated with ACE inhibitors, or angiotensin II receptor blockers (ARBs). If one class is not tolerated, the other should be substituted. Add a thiazide diuretic in those with estimated GFR ≥ 30 ml/min per 1.73 m² or a loop diuretic for those with estimated GFR < 30 ml/min per 1.73 m² if needed to reach target blood pressure. (C)
- Monitor renal function and serum potassium levels when using ACE inhibitors, ARBs, or diuretics. (E)
- Multiple drug therapy utilizing two or more agents at proper doses is often necessary to reach target levels. (B)
- Clinical trials provide evidence that ACE inhibitors and ARBs have an additional impact on nephropathy and CVD.⁵⁶ (A) Refer to the section on **Nephropathy** (on page 29) and **CVD Risk-Reduction** (on page 22).
- Beta-blockers should be added for those who have had a recent myocardial infarction (MI) if not contraindicated; caution should be used in those with hypoglycemia unawareness. (A)
- In pregnant patients with diabetes and chronic hypertension, target blood pressure goals of 110-129/65-79 mmHg are suggested. ACE inhibitors and ARBs are contraindicated during pregnancy and should be discontinued in women planning pregnancy due to their teratogenic effects. (E)
- In elderly patients, blood pressure should be lowered gradually.

Benefit of Aggressive Treatment

Control of hypertension has been demonstrated conclusively to reduce the rate and progression of nephropathy and retinopathy, and to reduce the complications of cerebrovascular disease and cardiovascular disease (CVD). Recent data suggests that the addition of amlodipine to an ACE inhibitor may be used instead of an ACE inhibitor and thiazide, as some data suggests improved reduction of cardiovascular outcomes in at-risk patients.⁵⁷

⁵⁴Adler A, et al. Association of systolic blood pressure with macrovascular and microvascular complications of type 2 diabetes (UKPDS 36): Prospective observational study. *BMJ* 321:412-419, 2000.

⁵⁵Chobanian AV, et al. Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. National Heart, Lung, and Blood Institute; National High Blood Pressure Education Program Coordinating Committee. *The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7). Hypertension* 42:1206-52, 2003.

⁵⁶Schrier RW, et al. Appropriate blood pressure control in hypertensive and normotensive type 2 diabetes mellitus: a summary of the ABCD trial. *Nat Clin Pract Nephrol* 3:428-438, 2007.

⁵⁷Jamerson K, et al. Benazepril plus amlodipine or hydrochlorothiazide for hypertension in high-risk-patients. *NEJM* 359:2417-2428, 2008.

Lifestyle Modifications

The Dietary Approaches to Stop Hypertension (DASH) diet, which encourages the intake of fruits, vegetables, whole grains, poultry, fish, and low-fat dairy products, particularly when combined with sodium restriction, has been associated with substantial improvements in blood pressure.⁵⁸ Weight loss, increased physical activity, smoking cessation, and prudent reduction of sodium and alcohol should be major components of treatment of hypertension. A maximum three-month trial of lifestyle/behavioral modification is recommended for those with a SBP of 130-139 mmHg or a DBP of 80-89 mmHg.

Treatment Categories

Systolic	Diastolic	Comment
< 130 mmHg	< 80 mmHg	Target blood pressure
130-139 mmHg	80-89 mmHg	Lifestyle changes alone (maximum 3 months), then add drug therapy
≥ 140 mmHg	≥ 90 mmHg	Lifestyle changes plus drug therapy

Blood Pressure Measurement

- Measure blood pressure at every routine visit. Patients with SBP ≥ 130 mmHg or DBP ≥ 80 mmHg require confirmation on a separate day. (C)
- Measure blood pressure in a seated position, with feet flat on the floor and arm supported at heart level after 5 minutes of rest.⁵⁹ (A)
- Orthostatic measurement is recommended to identify autonomic neuropathy. (E)

Cardiovascular autonomic neuropathy is common in patients with diabetes and can cause falsely low or high blood pressure readings, depending on the position of the patient when the blood pressure is taken.⁶⁰ Blood pressure and pulse should ideally be measured both in the supine and standing position, leaving two minutes between readings. Two or more determinations in each position should be obtained using an appropriately sized cuff. If the first two readings differ by more than 5 mmHg, additional readings should be obtained and averaged. Orthostatic hypotension is defined as a fall in SBP of at least 20 mmHg or a fall in DBP of at least 10 mmHg within three minutes of standing up.^{61,62}

⁵⁸Buse JB, et al. Primary prevention of cardiovascular diseases in people with diabetes mellitus: A scientific statement from the American Heart Association and the American Diabetes Association. *Diabetes Care* 30:162-172, 2007.

⁵⁹Chobanian AV, et al. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *JAMA* 289:2560-2571, 2003.

⁶⁰Maser RE, et al. Diabetic autonomic neuropathy and cardiovascular risk: The Pittsburgh Epidemiology of Diabetes Complications Study III. *Arch Intern Med* 150:1218-1222, 1990.

⁶¹The Consensus Committee of the American Autonomic Society and the American Academy of Neurology. Consensus statement on the definition of orthostatic hypotension, pure autonomic failure, and multiple system atrophy. *Neurology* 46:1470-1471, 1996.

⁶²Arauz-Pacheco C, et al. The treatment of hypertension in adult patients with diabetes. *Diabetes Care* 25:134-147, 2002.

Summary

The earliest clinical evidence of nephropathy is microalbuminuria, the appearance of low but abnormal levels of albumin in the urine. A harbinger of renal failure and cardiovascular complications in diabetes, microalbuminuria is an albumin concentration in the urine that is greater than normal but is not detectable with common urine dipstick assays for protein.

When to Screen

- Type 2 diabetes: assess urine albumin excretion at diagnosis and yearly thereafter. (E)
- Type 1 diabetes: assess urine albumin excretion after five years of disease duration and yearly thereafter. (E)
- Serum creatinine should be measured annually for the estimation of glomerular filtration rate (GFR) and to stage the level of chronic kidney disease.⁶³ (E)

Screening Tests

Urine Albumin:Creatinine Ratio

Most authorities recommend the analysis of a spot sample for the albumin-to-creatinine ratio. Additional options, including a 24-hour urine collection or a timed collection, are rarely necessary for screening but do provide a more complete evaluation. Due to the variability in albumin excretion, 2 of 3 samples done in a three to six month period should show elevated levels before diagnosing microalbuminuria. If normal, repeat yearly.

Random spot collection (preferred):

- Normal: < 30 $\mu\text{g}/\text{mg}$ creatinine
- Microalbuminuria: 30-299 $\mu\text{g}/\text{mg}$ creatinine
- Macroalbuminuria: ≥ 300 $\mu\text{g}/\text{mg}$ creatinine

Several factors may elevate the albumin excretion rate. Screening should be postponed in the following situations: strenuous physical activity within the previous 24 hours, marked hypertension or hyperglycemia, infection, hematuria, fever, or heart failure.

Serum Creatinine

Serum creatinine should be measured annually for the estimation of glomerular filtration rate (GFR) in all adults with diabetes regardless of the degree of urinary albumin excretion. The serum creatinine alone should not be used as a measure of kidney function but instead used to estimate GFR and estimate the stage of chronic kidney disease. The use of prediction equations to estimate GFR from serum creatinine and other variables (age, sex, race, and body size) is recommended by the National Kidney Foundation as a cost-effective method of diagnosis and stratification of chronic kidney disease. If the GFR is low, check the parathyroid hormone (PTH) and vitamin D levels to rule out secondary hyperparathyroidism. Consider referral to a physician experienced in the care of diabetic renal disease when the estimated GFR has fallen to < 60 ml/min per 1.73 m², or if difficulties occur in the management of hypertension or hyperkalemia.

⁶³American Diabetes Association. *Standards of medical care in diabetes. Diabetes Care* 32 (Supplement 1):S13-S61, 2009.

Calculation of Glomerular Filtration Rate

Cockcroft-Gault Equation⁶⁴

$$\frac{(140 - \text{Age}) \times \text{Body Weight (kg)}}{10 \times \text{Creatinine (mg/dl)}} \times K$$

K is a constant
For males, K = 1.39 For females, K = 0.118

Online resource for estimating GFR:
National Kidney Disease Education Program (NKDEP), National Institutes of Health: <http://www.nkdep.nih.gov>
PDA downloadable resource for GFR: http://nkdep.nih.gov/professionals/gfr_calculators/gfr_application.htm

Stages of Kidney Disease⁶⁵

Stage	Description	GFR (ml/min per 1.73 m ² body surface area)
1	Kidney damage* with normal or increased GFR	≥ 90
2	Kidney damage* with mildly decreased GFR	60-89
3	Moderately decreased GFR	30-59
4	Severely decreased GFR	15-29
5	Kidney Failure	< 15 or dialysis

* Kidney damage is defined as abnormalities on pathologic urine, blood or imaging tests.

⁶⁴Rigalleau V, et al. Estimation of glomerular filtration rate in diabetic subjects. *Diabetes Care* 28:838-843, 2005.

⁶⁵American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 32 (Supplement 1):S13-S61, 2009.

Nephropathy and Hypertension

To reduce the risk or slow the progression of nephropathy, optimal glucose and blood pressure control are recommended. Both systolic and diastolic hypertension markedly accelerate the progression of diabetic nephropathy. Control of hypertension has been demonstrated to reduce the rate and progression of nephropathy and to reduce the complications of cerebrovascular disease and CVD. Refer also to the **Cardiovascular** (page 22) and **Hypertension** (page 27) sections of these Guidelines.

Pharmacological Therapy

Recommendations:

- For patients with both micro- and macroalbuminuria, either angiotensin-converting enzyme (ACE) inhibitors or Angiotensin II receptor blockers (ARBs) should be used except during pregnancy. To assess hyperkalemia and acute kidney disease, serum potassium levels and serum creatinine should be monitored in patients treated with either class of medication. (E)
- Continued assessment of albumin excretion after diagnosis of microalbuminuria and institution of ACE inhibitor or ARB therapy and blood pressure control is unclear. Continued surveillance can assess both response to therapy and progression of disease. Some suggest that reducing abnormal albuminuria (≥ 30 mcg/g) to the normal or near-normal range may improve renal and cardiovascular prognosis, but this approach has not been formally evaluated in prospective trials.⁶⁶ (E)

Clinical trials reveal the following observations:

- In patients with type 1 diabetes with microalbuminuria and hypertension, ACE inhibitors delay the progression of nephropathy. (A)
- For patients with type 2 diabetes with both hypertension and microalbuminuria, both ACE inhibitors and ARBs delay the progression to macroalbuminuria. (A)
- In patients with type 2 diabetes who have hypertension, macroalbuminuria, and renal insufficiency, ARBs delay the progression of nephropathy. (A)
- Dihydropyridine calcium channel blockers (DCCBs) are less likely to slow the progression of nephropathy compared with ACE inhibitors or ARBs. DCCBs should be used only as an additional therapy in patients already treated with ACE inhibitors or ARBs.⁶⁷ (A)
- For patients with albuminuria or nephropathy who cannot tolerate ACE inhibitors and/or ARBs, consider using beta-blockers, diuretics, or non-DCCBs. Non-DCCBs may reduce albuminuria in patients with diabetes, including during pregnancy. (A)
- Due to their teratogenic potential, caution is advised when using either ACE inhibitors or ARBs in women of childbearing age.

⁶⁶American Diabetes Association. *Standards of medical care in diabetes. Diabetes Care* 32 (Supplement 1):S13-S61, 2009.

⁶⁷Berl T, et al. *Cardiovascular outcomes in the Irbesartan Diabetic Nephropathy Trial of patients with type 2 diabetes and overt nephropathy. Annals of Internal Medicine* 138:542-554, 2003.

Kidney Disease and Medical Nutrition Therapy

Medicare and other payers provide coverage of MNT for beneficiaries diagnosed with diabetes or renal disease (except for those receiving dialysis) when provided by a registered dietitian or nutrition professional who meets the provider qualifications. A referral by the beneficiary's treating physician indicating a diagnosis of diabetes or renal disease is required. Medicare provides coverage for 3 hours of MNT in the first year and 2 hours in subsequent years.

Nutrition Recommendations for People with Diabetes and Kidney Disease

- Protein: 0.8-1.0 g/kg body wt/day. Several small studies suggest that vegetable or soy protein sources may protect kidney function compared with red meat sources. Reduction of protein intake to 0.8 g/kg body wt/day in the later stages may improve measures of renal function. Regardless of the level of protein intake, 50% to 75% of the protein should be of high biological value, derived predominantly from lean poultry, fish, and soy- and vegetable-based proteins.
- Energy: 35 kcal/kg (high in complex carbohydrate), unless patient is obese
- Fat: < 30% of total calories:
 - Polyunsaturated fatty acids \leq 10%
 - Fish oil may be useful for IgA nephropathy (12 g/day)
- Cholesterol: < 200 mg/day
- Sodium: 1,000-2,000 mg/day
- Potassium: Individualize based on labs
- Phosphorus: < 12 mg/kg/day
- Calcium: 1,000-1,500 mg/day, not to exceed 2,000 mg
- Vitamins/minerals: Dietary Reference Intakes for B-complex and vitamin C, individualize vitamin D and iron
- Fluid restriction: May be indicated because of the high incidence of edema in nephrotic syndrome

Diabetic retinopathy is estimated to be the most frequent cause of new cases of blindness among adults aged 20-74 years in the United States. The prevalence of retinopathy is strongly related to the duration of diabetes. Follow-up from the Diabetes Prevention Program (DPP) indicated nearly 8% of people with pre-diabetes (IGT and IFG) already had evidence of retinopathy.⁶⁸ Intensive diabetes management with the goal of achieving near normal glycemia has been shown to prevent and/or delay the onset of diabetic retinopathy. High blood pressure is an established risk factor for the development of macular edema and is linked to the presence of proliferative diabetic retinopathy. Nephropathy is also associated with retinopathy. Patients with diabetic retinopathy or macular edema are often asymptomatic. Early diagnosis and prompt application of laser photocoagulation surgery is useful in preventing vision loss, but generally not beneficial in reversing already diminished acuity.⁶⁹

Screening Recommendations:

- An ophthalmologist or optometrist who is knowledgeable and experienced in diagnosing the presence of diabetic retinopathy and is aware of its management should perform comprehensive eye exams. (E)
- Adults with type 1 diabetes should have an initial dilated and comprehensive eye examination within 5 years of the diagnosis of diabetes. (B)
- Adults with type 2 diabetes should have an initial dilated and comprehensive eye examination shortly following the diagnosis of diabetes. (B)
- Subsequent examinations for patients with type 1 and type 2 diabetes should be repeated annually. A qualified eye care professional may recommend less frequent exams (i.e., every 2 years).⁷⁰ (B)
- Examinations will be required more frequently if retinopathy is progressing. (B)
- Women with preexisting diabetes should have a comprehensive eye exam when planning pregnancy and should be counseled on the risk of development and/or progression of diabetic retinopathy.⁷¹ (B)
- Women with diabetes who become pregnant should have a comprehensive eye exam in the first trimester with close follow-up at intervals determined by retinopathy status throughout pregnancy and for one year postpartum. (B)
- Retinal screening is not necessary for women who develop gestational diabetes because these women are not at increased risk for diabetic retinopathy. (B)
- In general, small doses of aspirin are safe for preventive therapy in patients with retinopathy; when in doubt, consult a diabetic eye disease specialist. (A)
- Anyone with a change or loss of vision requires prompt referral to an eye care specialist. (A)

⁶⁸National Institutes of Health and American Diabetes Association. *Diabetic retinopathy occurs in pre-diabetes.* NEWSROOM June 10-14, 2005.

⁶⁹American Diabetes Association (Position Statement). *Retinopathy in diabetes.* *Diabetes Care* 27 (Supplement 1):S84-S87, 2004.

⁷⁰American Diabetes Association. *Standards of medical care in diabetes.* *Diabetes Care* 32 (Supplement 1):S13-S61, 2009.

⁷¹Kitzmiller JL, et al. *Managing preexisting diabetes for pregnancy. Summary of evidence and consensus recommendations for care.* *Diabetes Care* 31:1060-1079, 2008.

Summary

Neuropathy is a disorder of the peripheral nervous system resulting in loss of nerve fibers affecting many bodily functions. There are several syndromes of diabetic neuropathy, the most common being autonomic neuropathy and distal symmetric polyneuropathy (DPN). The diabetic neuropathies are heterogeneous with diverse clinical manifestations. Specific treatment for the underlying nerve damage is currently not available. Improved glycemic control may slow progression but rarely reverses neuronal loss. Effective symptomatic treatments are available for the manifestations of DPN and autonomic neuropathy. Early recognition and appropriate management of neuropathy in the patient with diabetes is important for a number of reasons:

- Non-diabetic neuropathies may be present in patients with diabetes and may be treatable.
- A number of treatment options exist for symptomatic diabetic neuropathy.
- Up to 50% of DPN may be asymptomatic and patients are at risk of insensate injury to their feet.
- Autonomic neuropathy may involve every system in the body.
- Cardiovascular autonomic neuropathy causes substantial morbidity and mortality.

Diabetic Autonomic Neuropathy Recommendations:

- Patients with diabetes should be screened for presenting signs and symptoms of diabetic autonomic neuropathy as part of the initial history and review of systems. (B)
- Screening for signs and symptoms of cardiovascular autonomic neuropathy should be instituted at diagnosis of type 2 diabetes and 5 years after the diagnosis of type 1 diabetes. (E)

Signs and Symptoms of Autonomic Neuropathy

<p>Cardiac</p> <ul style="list-style-type: none"> • Resting tachycardia (>100 bpm) • Exercise intolerance • Orthostatic hypotension (a fall in systolic blood pressure > 20 mmHg or diastolic blood pressure > 10 mmHg upon standing) 	<p>Genitourinary Tract</p> <ul style="list-style-type: none"> • Recurrent urinary tract infections • Pyelonephritis • Incontinence • Palpable bladder • Loss of penile erection • Retrograde ejaculation • Sexual dysfunction in female
<p>Gastrointestinal</p> <ul style="list-style-type: none"> • Esophageal enteropathy • Gastroparesis • Constipation • Diarrhea • Fecal incontinence 	<p>Other Symptoms</p> <ul style="list-style-type: none"> • Hyper- or hypohidrosis (excessive sweating or inability to sweat) • Impaired neurovascular function • Hypoglycemia unawareness

Treatment for Autonomic Neuropathy

The first step towards the goal of slowing the progression of diabetic neuropathies is to achieve and maintain optimal glycemic control. Improving labile blood glucose values may have an impact on symptoms as well. A number of pharmacological agents are used to treat the symptoms of autonomic neuropathies such as gastroparesis, bladder dysfunction, and sexual dysfunction. Although they do not change the underlying pathology of the disease, they may improve the patient's quality of life.

Distal symmetric polyneuropathy (DPN)

Foot ulcers and amputations resulting from neuropathy and/or peripheral vascular disease (PVD) are major causes of disability and morbidity among people with diabetes. The risk of ulcers or amputations is increased in people who have had diabetes for 10 or more years; are male; have poor glucose control; smoke; or have cardiovascular, retinal, or renal complications. Early recognition of problems and risk factor management can delay or prevent unfavorable outcomes.⁷²

DPN Recommendations:

- Conduct a comprehensive foot exam at least annually. The exam may take place in the primary care setting and should include a visual inspection and palpation for pulses as well as a sensory evaluation using a tuning fork or a Semmes-Weinstein monofilament. (B)
See **Foot Inspection and Monofilament Guide** (pages 37-38).
- Perform a visual foot inspection at every visit for patients who have neuropathy. (E)
- Provide self-care education to all patients, especially those with risk factors such as smoking or prior lower extremity complications. (B)
- Refer patients who have loss of protective sensation and structural abnormalities, or who have a prior history of lower-extremity complications, to a podiatrist for ongoing preventive care. (C)
- Screen for peripheral artery disease (PAD) by assessing the pedal pulses and evaluating for a history of claudication. Consider obtaining an ankle-brachial index (ABI), as many patients with PAD are asymptomatic. (C)
- Refer patients with significant claudication or a positive ABI for further vascular assessment. (C)
- Offer a multidisciplinary approach for patients with foot ulcers and high-risk feet. (B)

Screening

Low Risk	High Risk: associated with an increased risk for amputation
<i>All of the following:</i>	<i>One or more of the following:</i>
<ul style="list-style-type: none"> • Intact protective sensation • Pedal pulses present • No severe deformity • No prior foot ulcer • No amputation 	<ul style="list-style-type: none"> • Smoking • Peripheral neuropathy with loss of protective sensation • Altered biomechanics • Evidence of increased pressure (hemorrhage under a callus, erythema) • Bony deformity • PVD • History of ulcers or amputation of the other limb • Severe nail pathology • Absent pedal pulses

⁷²Boulton AJM, et al. *Comprehensive Foot Examination and Risk Assessment: A report of the Task Force of the Foot Care Interest Group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists. Diabetes Care 31:1679-1685, 2008.*

Symptomatic Treatments

- Aim for stable and optimal glycemic control.
- Avoid extreme blood glucose fluctuations.
- Some patients may need pharmacological treatment for pain associated with distal symmetric polyneuropathy (DPN).

Table of drugs to treat symptomatic DPN⁷³

Class	Examples	Typical doses*
Tricyclic drugs	amitriptyline nortriptyline imipramine	10-75 mg at bedtime 25-75 mg at bedtime 25-75 mg at bedtime
Anticonvulsants	gabapentin carbamazepine pregabalin [†]	300-1,200 mg t.i.d. 200-400 mg t.i.d. 100 mg t.i.d.
5-hydroxytryptamine and norepinephrine uptake inhibitor	duloxetine [†]	60-120 mg daily
Substance P inhibitor	capsaicin cream	0.025-0.075% applied t.i.d. or q.i.d.

*Dose response may vary; initial doses should be low and titrated up.

[†]Has FDA indication for treatment of painful diabetic neuropathy.

Many agents have efficacy confirmed in published randomized controlled trials. The choices of treatment will depend on contraindications as well as reimbursement. Doses should be started low and titrated to efficacy. Particular care should be given to adverse effects in the elderly. Capsaicin is effective but requires up to 4 weeks to show an effect.

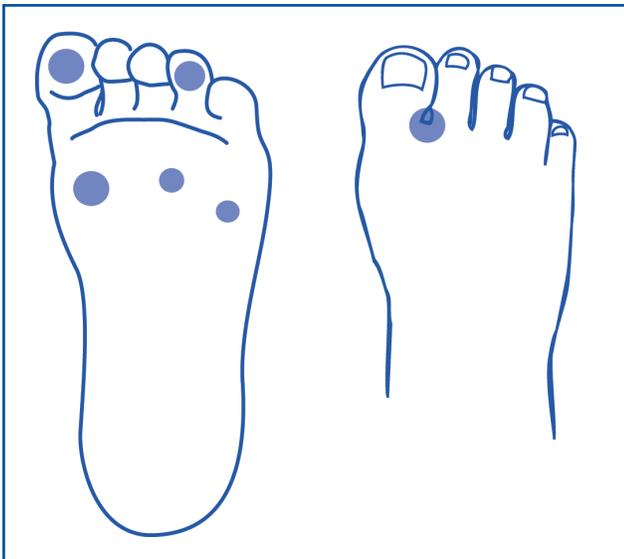
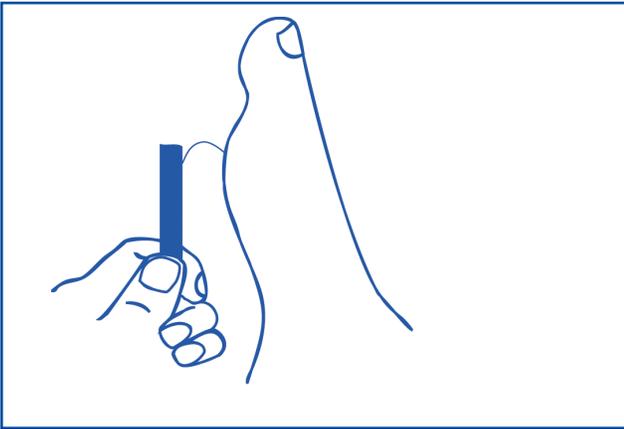
⁷³American Diabetes Association. Standards of medical care in diabetes. Diabetes Care 32 (Supplement 1):S13-S61, 2009.

Foot Inspection and Monofilament Guide

Assessing for Loss of Protective Sensation

Use of the Semmes-Weinstein monofilament

- Have the patient look away or close his or her eyes.
- Hold the filament perpendicular to the skin.
- Avoiding any ulcers, calluses, or sores, touch the monofilament to the skin until it bends (see picture below). Hold in place for approximately 1.5 seconds, then gently remove it.
- Randomly test the sites shown on the diagram below.
- Elicit a response from the patient at each site. Lack of sensation at any site may indicate diabetic neuropathy.⁷⁴
- Non-disposable monofilaments may be cleaned with 1:10 sodium hypochlorite (household bleach) solution if contaminated with blood or body fluids.



⁷⁴Boulton AJM, et al. *Comprehensive Foot Examination and Risk Assessment: A report of the Task Force of the Foot Care Interest Group of the American Diabetes Association, with endorsement by the American Association of Clinical Endocrinologists. Diabetes Care 31:1679-1685, 2008.*

Tuning fork instructions

- Strike a 128 Hz tuning fork (hard enough to make a noise).
- Place the vibrating tuning fork on the dorsum of the great toe, just proximal to the nail bed.
- With the hand that is not holding the tuning fork, place a finger on the plantar surface of the same toe.
- Have the patient close his or her eyes and inform you when vibration is no longer perceived.
- Gauge the difference between when the patient stops feeling the vibrating tuning fork and when you stop sensing vibration. Severe sensory loss is indicated when feeling the vibration stops almost immediately.
- If the patient and the examiner stop feeling the vibration at nearly the same moment, vibratory perception is considered normal.
- Intermediate losses can be judged as mild or moderate loss of perception.
- Some clinicians recommend counting how long the patient perceived the vibration and use 10 seconds as the cut-off for normal perception.

MONOFILAMENT RESOURCES

All monofilaments are 5.07 (10 gm.)

<p>Lower Extremity Amputation Program (LEAP) Bureau of Primary Health Care (BPHC) 1-888-ASK-HRSA (275-4772) www.hrsa.gov/leap/default.htm Disposable</p>	<p>North Coast Medical, Inc. 1-800-821-9319 www.ncmedical.com Durable \$31.95 each Set of six, assorted sizes: \$146.95</p>
<p>Medical Monofilament Manufacturing, LLC 1-508-746-7877 www.medicalmonofilament.com Disposable \$0.29-\$0.39 each</p>	<p>Sammons, Pruss, Rolyan 1-800-558-8633 www.sammonspreston.com Durable \$29.99 each Set of five, assorted sizes: \$169.95</p>
<p>Mid-Delta Home Health and Hospice 1-800-543-9055 www.middelta.com Durable \$10.00 each</p>	

Summary

Periodontal disease is more common among people with diabetes compared to the general population. Almost one-third of people with diabetes have severe periodontal disease with loss of attachment of the gums to the teeth measuring 5 millimeters or more. Periodontal disease progresses more rapidly and is often more aggressive and difficult to treat in people with diabetes than in people without diabetes.

Defined as a bacterially induced chronic inflammatory process, periodontal disease destroys connective tissue and bone supporting the teeth, leading to tooth loss. Recent research suggests a bidirectional relationship in that people with diabetes are more susceptible to periodontal disease and the presence of periodontal disease can negatively impact glycemic control.

Symptoms of periodontal disease include red, swollen, tender, and bleeding gums; receding gums; evidence of pus upon gum compression; persistent bad breath; loose permanent teeth; change in bite; or change in the fit of dentures. Most individuals with diabetes do not have pain with periodontal disease and some may be asymptomatic.

Concurrent risk factors that increase the chances of developing periodontal disease include disease duration; poor metabolic control; presence of other long-term complications; smoking; plaque; and hormonal variations as in adolescence, pregnancy, and menopause. Mouth care is often overlooked when managing other issues associated with diabetes.

Recommendations:⁷⁵

- Conduct an oral exam as part of the yearly comprehensive visit. (E)
- Advise patients of the importance of oral hygiene. (E)
- Promptly refer patients with symptoms of periodontal disease for dental evaluation. (E)
- Encourage patients to receive dental follow-up twice a year, and more often if necessary. (E)
- Encourage patients who smoke to stop. (E)

⁷⁵Moore B, et al. *Diabetes and oral health promotion: A survey of disease prevention behavior.* *J Am Dent Assoc* 13:1333-1341, 2000.

Summary

People with diabetes, in particular those with end organ complications of cardiac and renal disease, are at high risk for complications, hospitalization, and death from influenza and pneumococcal disease.⁷⁶ Vaccines can greatly reduce the risk of serious complications from these diseases. In particular, influenza vaccine has been shown to reduce diabetes-related hospital admissions by as much as 79% during flu epidemics.⁷⁷ The CDC and the Advisory Committee on Immunization Practices (ACIP) recommend influenza and pneumococcal vaccines for all individuals with diabetes.⁷⁸

Recommendations:

- Annually provide an influenza vaccine to all patients with diabetes \geq 6 months of age. (C)
- Administer pneumococcal polysaccharide vaccine to all patients with diabetes \geq 2 years of age. A one-time revaccination is recommended for individuals \geq 65 years of age previously immunized when they were $<$ 65 years of age if the vaccine was administered $>$ 5 years ago.⁷⁹ Other indications for repeat vaccination include nephrotic syndrome, chronic renal disease, and other immunocompromised states. (C)

In addition to influenza and pneumococcal vaccines, early vaccination against hepatitis B is indicated in patients likely to progress to end-stage kidney disease.⁸⁰ Zoster vaccine was recently recommended by the ACIP to reduce the risk of shingles and its associated pain in people $>$ 60 years of age.⁸¹ Creation of registries to identify patients with diabetes, and implementation of recall and reminder systems, are effective strategies to improve immunization rates.⁸²

⁷⁶American Diabetes Association: *Influenza and pneumococcal immunization in diabetes (Position Statement)*. *Diabetes Care* 27 (Supplement 1):S111–S113, 2004

⁷⁷Colquhoun AJ, et al. *Effectiveness of influenza vaccine in reducing hospital admissions in people with diabetes*. *Epidemiol Infect* 119:335–341, 1997.

⁷⁸<http://www.cdc.gov/vaccines/recs/>

⁷⁹American Diabetes Association. *Standards of medical care in diabetes*. *Diabetes Care* 32 (Supplement 1):S13–S61, 2009.

⁸⁰*Ibid.*

⁸¹MMWR *Recommendations and Reports*. *Prevention of Herpes Zoster: Recommendations of the Advisory Committee on Immunization Practices (ACIP)*, 57(05):1–30, June 6, 2008.

⁸²Centers for Disease Control and Prevention. *Recommended adult immunization schedule – United States, 2009*. *MMWR* 57(53), 2008.

Summary

Patients with diabetes who smoke have a heightened risk of morbidity and premature death due to macrovascular complications. Smoking is also related to the premature development of microvascular disease and may have a role in the development of type 2 diabetes.⁸³ The cardiovascular burden of diabetes, especially in combination with smoking, needs to be effectively communicated to people with diabetes and to health care providers. There is little evidence that this risk factor is being addressed as consistently and comprehensively as its importance requires.

Smoking Cessation Recommendations:

- Advise all patients not to smoke. (A)
- Include smoking cessation counseling and other forms of treatment as a routine component of diabetes care.⁸⁴ (B)

Prevention and cessation of tobacco use is recommended as an important component of state-of-the-art clinical diabetes care.⁸⁵ All patients should be advised not to smoke and smoking cessation counseling and other forms of treatment should be included as a routine component of diabetes care. Tobacco dependence is a chronic condition that often requires repeated intervention by a clinician or team of clinicians and multiple attempts to quit. Many patients relapse several times before quitting for good. Effective treatments exist that can significantly increase rates of long-term abstinence.⁸⁶

It is essential that clinicians and health care delivery systems consistently identify and document tobacco use status and treat every tobacco user seen in a health care setting. Clinicians should offer every patient who uses tobacco at least the brief “5 A’s” treatment shown to be effective. The “5 A’s” of treating tobacco use and dependence is a useful way of understanding smoking cessation interventions and organizing the clinical team to intervene with patients who smoke.

⁸³Willi C, et al. Active smoking and the risk of type 2 diabetes: A systematic review and meta-analysis. *JAMA* 298(22):2654–2664, 2007.

⁸⁴American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 32 (Supplement 1):S13–S61, 2009.

⁸⁵American Diabetes Association (Position Statement). Smoking and diabetes. *Diabetes Care* 27 (Supplement 1):S74–S75, 2004.

⁸⁶Clinical Practice Guideline. Treating Tobacco Use and Dependence: 2008 Update. <http://www.ahrq.gov/clinic/tobacco/tobaqrg.pdf>

The “5 A’s” model for treating tobacco use and dependence

Ask:

- Identify and document tobacco use status of every patient at every visit.

Advise:

- In a clear, strong and personalized manner, urge every tobacco user to quit.
- Provide reasons why quitting is beneficial for people with diabetes.

Assess:

- For a current smoker, is the patient willing to make a quit attempt at this time?
- For a former smoker, how recently did you quit and are there any challenges to remaining abstinent?

Assist:

- For a patient willing to make a quit attempt, offer medication. Provide or refer for counseling or additional behavioral treatment (see resources below).
- Acknowledge weight management concerns, and discourage smoking as a tool for weight control.
- Acknowledge the possible presence of depression or other mood disorders. Depression can interfere with successful cessation efforts.
- For a patient unwilling to quit at this time, provide motivational interventions designed to increase future quit attempts.
- For the recent quitter and anyone with remaining challenges, provide relapse prevention.

Arrange:

- All those receiving the previous A’s should receive follow-up.

While coverage will vary by plan, many health insurance plans, including MassHealth, Commonwealth Care, and Medicare, cover all or some of the cost of FDA-approved prescription and over-the-counter cessation medications. Some plans also provide coverage for counseling support. Members of any health plan may also be referred to free telephone support available through the QuitWorks fax referral program.

QuitWorks

QuitWorks is a free, evidence-based smoking cessation referral service that links patients who want to quit smoking to the full range of tobacco treatment services offered by the Massachusetts Smoker’s Helpline. QuitWorks, www.quitworks.org, was developed by the Massachusetts Department of Public Health in collaboration with all major health plans in Massachusetts.

- Using a simple enrollment form, a physician, nurse, or other clinician can easily and quickly enroll patients who use tobacco, regardless of health insurance status.
- Referring providers will receive faxed information on the services each patient selects and, 6 months later, a report on each patient's quit status.

Resource: *The Quick Reference Guide for Clinicians* contains strategies and recommendations from the Public Health Service-sponsored Clinical Practice Guideline. *Treating Tobacco Use and Dependence: 2008 Update*. <http://www.abrq.gov/clinic/tobacco/tobaqrg.pdf>

Summary

Psychological and socioeconomic issues can impair the individual's or family's ability to carry out diabetes care tasks and therefore compromise health status. In particular, depression in people with diabetes requires careful management due to its severe impact on comorbid conditions as well as on the individual's quality of life. In addition to obtaining a history of previous psychiatric treatment, clinicians should assess psychosocial status in a timely and efficient manner so that referral for appropriate services can be accomplished. Stressors such as family issues, insufficient financial or social resources, eating disorders, and cognitive impairment may impact a patient's ability to carry out necessary diabetes care tasks.

Recommendations:

- Incorporate psychological screening and treatment into routine care rather than waiting for identification of a specific problem or deterioration in psychological status. (E)
- Psychosocial screening and follow-up should include, but is not limited to, attitudes about the illness, expectations for medical management and outcomes, affect/mood, general and diabetes-related quality of life, resources (financial, social, and emotional), and psychiatric history. (E)
- Screen for psychosocial problems such as depression, anxiety, eating disorders, and cognitive impairment when adherence to the medical regimen is poor.⁸⁷ (E)

Depression is known to affect glycemic control and micro/macrovacular complications. In addition, depressive symptoms play a more important role in mortality among people with diabetes than in those without diabetes. For adults with diabetes, the presence of two or more coexisting chronic conditions, particularly coronary artery disease, chronic arthritis, and stroke, increase the chances of developing major depression. Compared to patients with diabetes who are not depressed, people with diabetes and depression require more costly care. These differences are partly related to non-adherence to medication regimens and worsened self-care skills. Depressive symptoms impact subsequent physical symptoms of poor glucose control by influencing patients' ability to adhere to their self-care regimen.

Although the clinician may not feel qualified to treat psychological problems, utilizing the patient-provider relationship as a foundation for further treatment can increase the likelihood that the patient will accept referral for other services. It is important to establish that emotional well-being is part of diabetes management.

The following two questions have shown high sensitivity and specificity:

“During the past month, have you often been bothered by feeling down, depressed, or hopeless?”

“During the past month, have you often been bothered by little interest or pleasure in doing things?”⁸⁸

Treat depression or refer to a mental health specialist for depression treatment.

- Immediately refer to a mental health specialist familiar with diabetes management if self-harm or an eating disorder is suspected. A referral is also recommended if a problem is suspected to be organic in origin or when cognitive function is impaired.

Resource:

PHQ Screeners: <http://www.phqscreeners.com>

⁸⁷American Diabetes Association. *Standards of medical care in diabetes. Diabetes Care* 32 (Supplement 1):S13-S61, 2009.

⁸⁸Arroll B, et al. *Screening for depression in primary care with two verbally asked questions: Cross sectional study. BMJ* 327:1144-1146, 2003.

Summary

People with diabetes are more likely to be hospitalized and to have longer durations of hospital stay than those without diabetes. Hyperglycemia in hospitalized patients has been associated with poor outcomes, such as longer length of stay, increased rates of infections, and in-hospital deaths.⁸⁹ Interventions to normalize glycemia, however, have yielded inconsistent results. The ADA and the American Association of Clinical Endocrinologists (AACE) recently issued a joint statement maintaining the need for good glucose management in the hospital setting with revised glucose targets of 140-180 mg/dl in the ICU setting, and between 100-180 mg/dl for most patients admitted to general medical-surgical wards.⁹⁰

Recommendations:

- All hospitalized patients with diabetes should have their diabetes clearly identified in the hospital record. (E)
- All patients with diabetes should have an order for blood glucose monitoring, with results available to all members of the health care team. (E)
- Scheduled prandial insulin doses should be appropriately timed in relation to meals and should be adjusted to point-of-care glucose levels. (C)
- For patients being treated with insulin in the ICU setting, target glucose levels between 140-180 mg/dl. (A)
- For non-critically ill patients treated with insulin, premeal blood glucose target should be < 140 mg/dl in conjunction with random blood glucose values < 180 mg/dl, provided these targets can be safely achieved.⁹¹ (A)

Insulin infusions effectively decrease blood glucose concentrations in intensive care settings and reduce morbidity and mortality in surgical intensive care unit patients. Regimens for intensive insulin therapy should utilize general principles expressed throughout the literature, but should also be modified based on specifics of the individual institution. Regimens should be responsive to factors that may rapidly affect the risk for hyper- or hypoglycemia such as:

- Changes in enteral/parenteral feeds (content, rate of delivery, temporary or permanent cessation)
- Order for NPO
- Prolonged period outside of ICU
- Changes in intravenous glucose solution content
- Use of steroids or pressors (increasing or decreasing doses)
- Sudden changes in clinical status (sepsis, acute renal failure)

Institutions should prepare for transition from ICU to general areas of the hospital by arranging for follow-up glucose testing after intravenous insulin is stopped, and planning for follow-up insulin needs (short-acting during transfer and long-acting during subsequent days). The traditional sliding-scale insulin regimens, when used as monotherapy, have been shown to be ineffective.⁹²

Patients need to be educated that inpatient use of insulin does not commit them to permanent insulin therapy after discharge. Patients with hyperglycemia as inpatients, but without a previous diagnosis of diabetes, should have follow-up fasting glucose testing as outpatients.

For the Summary of ADA/AACE Recommendations, see: www.aace.com/pub/pdf/guidelines/InpatientGlycemicControlConsensusStatement.pdf

⁸⁹Pomposelli U, et al. Early postoperative glucose control predicts nosocomial infection rate in diabetic patients. *Journal of Parenteral and Enteral Nutrition* 22: 77-81, 1998.

⁹⁰Moghissi ES, et al. American Association of Clinical Endocrinologists and American Diabetes Association. Consensus statement on inpatient glycemic control. *Endocr Pract* 15, May/June 2009. Published ahead of print.

⁹¹*Ibid.*

⁹²American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care* 32 (Supplement 1):S13-S61, 2009.

APPENDIX A: COMMONLY USED ANTIDIABETIC AGENTS

Commonly used oral antidiabetic agents

Drug information in the following tables was obtained from pharmaceutical inserts. These tables do not include all the information needed to use medications safely and effectively, and do not reflect individual provider opinions or practices. See full prescribing information in package inserts.

CLASS	GENERIC NAME STRENGTH	TRADE NAME®	USUAL DOSAGE	COMMENTS <i>Regular self-monitoring of blood glucose should be considered for medication initiation, adjustments, or additions.</i>
Biguanides	metformin 500, 850, 1000 mg 500 mg/5 ml	Glucophage Riomet	500-1000 mg bid	Decreases hepatic glucose production and increases insulin sensitivity. When used as monotherapy, does not cause hypoglycemia. Take with food to lessen gastrointestinal (GI) side effects. Do not use with impaired renal or hepatic function. Hold for iodinated contrast study. Start at 500 mg bid or 850 mg qd, increase 500 mg weekly or 850 mg every 2 weeks. Max 2550 mg/day; however, most studies show little benefit over 2000 mg/day. Start dose low and titrate slowly to minimize GI effects. Extended release formulation may be given once daily. Do not crush. Monitor Serum Creatinine (SCr) at baseline and at least yearly, more often if indicated. Discontinue if age greater than 80 or SCr is > 1.5 in males and > 1.4 in females. Hold if dehydrated or septic; increases risk of lactic acidosis. Potential for vitamin B-12 deficiency.
	metformin extended release (ER) 500, 750, 1000 mg	Glucophage XR Glumetza Fortamet	1000-2000 mg q pm 1000-2500 mg q pm May be divided bid	
Second-generation Sulfonylureas First-generation Sulfonylureas are rarely used and are not included in this table. Caution in elderly patients	glipizide 5, 10 mg	Glucotrol	5-20 mg qd to bid	Stimulates pancreatic islet beta cell insulin release. Start at 5 mg qd or 2.5 mg qd if elderly. The extended release (ER) formulation may allow for once daily dosing. For non-ER form, divide doses > 15 mg/day. Max 40 mg qd. Do not cut or crush the ER form.
	glipizide extended release (ER) 2.5, 5, 10 mg	Glucotrol XL	2.5-20 mg qd	
	glyburide 1.25, 2.5, 5 mg	Micronase Diabeta	1.25-20 mg qd	Start at 2.5 to 5 mg qd or 1.25 mg qd if at risk for hypoglycemia. Max 20 mg qd. Take with breakfast or first meal.
	glyburide (micronized) 1.5, 3, 6 mg	Glynase PresTab	0.75-12 mg qd	No advantage over the nonmicronized products. Start at 1.5-3 mg qd or 0.75 mg qd if at risk for hypoglycemia. Take with breakfast or first meal.
	glimepiride 1, 2, 3, 4, 6, 8 mg	Amaryl	1-4 mg qd	Dosage once daily with first main meal. Start at 1-2 mg po qd. Titrate by 1-2 mg every 1-2 weeks. Max 8 mg qd. Take with first main meal.

APPENDIX A: COMMONLY USED ANTIDIABETIC AGENTS

Commonly used oral antidiabetic agents (continued)

CLASS	GENERIC NAME STRENGTH	TRADE NAME®	USUAL DOSAGE	COMMENTS
Insulin Secretagogues Meglitinides	repaglinide 0.5, 1, 2 mg	Prandin	0.5-4 mg before meals	Similar mechanism of action as the sulfonylureas (insulinotropic). Unlikely to cause hypoglycemia if given with meals. Start at 0.5 mg before each meal, double preprandial dose weekly. Max 4 mg/dose; 16 mg/day. Take 15-30 minutes before a meal. Skip dose if meal is skipped. Do not use in combination with sulfonylureas or other secretagogues.
	nateglinide 60, 120 mg	Starlix	60-120 mg tid 1-30 minutes before meals	Similar mechanism of action as the sulfonylureas (insulinotropic). Use with caution in chronic liver disease. Unlikely to cause hypoglycemia if given with meals. Should not be added to regimens of patients who have not been adequately controlled by glyburide or other insulin secretagogues. Start 60-120 mg po tid. Skip dose if meal is skipped. Do not use in combination with sulfonylureas or other secretagogues.
Thiazolidinediones (TZD)	rosiglitazone 2, 4, 8 mg	Avandia	Start 4 mg	Increases peripheral and hepatic sensitivity to insulin. Approved for use as monotherapy or in combination with insulin, metformin, or sulfonylureas. Neither causes hypoglycemia when used as monotherapy. Start Actos at 15 mg qd. Start Avandia at 4 mg qd or 2 mg bid. May increase dose after 12 weeks. Maximum dose of Actos is 45 mg qd and Avandia is 8 mg qd. Use with caution in the presence of hepatic disease. Monitor baseline transaminase when initiating therapy, then periodically as clinically indicated.
	pioglitazone 15, 30, 45 mg	Actos	15-45 mg	Monitor for symptoms and signs of congestive heart failure at 6 weeks and 3 months. In patients with CHF, thiazolidinediones use is contraindicated.* Use caution in prescribing thiazolidinediones for patients with preexisting edema or heart diseases. It has been suggested that rosiglitazone may increase the risk of myocardial infarction. If a glitazone is used, pioglitazone should be preferred. May cause anovulatory premenopausal women to resume ovulation.

* Package insert states contraindicated in NYHA class III-IV CHF or symptomatic CHF, caution with class I-II.

APPENDIX A: COMMONLY USED ANTIDIABETIC AGENTS

Commonly used oral antidiabetic agents (continued)

CLASS	GENERIC NAME STRENGTH	TRADE NAME®	USUAL DOSAGE	COMMENTS
Alpha-glucosidase Inhibitors	acarbose 25, 50, 100 mg	Precose	50-100 mg tid	Delays and decreases absorption of starch after a meal. Take with first bite of food. When used as a monotherapy, does not cause hypoglycemia. Most common side effects are excessive flatulence, diarrhea, and abdominal pain. Start 25 mg tid. Max 100 mg tid. Start dose low and titrate slowly to minimize GI effects. Contraindicated in diabetic ketoacidosis (DKA), inflammatory bowel disease, colonic ulceration, or partial intestinal obstruction. If hypoglycemia occurs in patients who are being treated with Precose or Glyset, it MUST be treated with glucose, not sucrose or complex carbohydrates.
	miglitol 25, 50, 100 mg	Glyset	50-100 mg tid	
Dipeptidyl Peptidase-4 (DPP-4) Inhibitors	sitagliptin 25, 50, 100 mg	Januvia	100 mg qd	Inhibits dipeptidyl peptidase-4, slowing incretin metabolism, increasing insulin synthesis and release, and decreasing glucagon levels. Regulates glucose by affecting the beta cells and alpha cells in the pancreas. Approved as monotherapy and as add-on therapy to metformin or TZDs.

Medications: Oral Combination

Glyburide/ Metformin	1.25/250, 2.5/500, 5/500 mg	Glucovance	1-2 tabs bid	Refer to comments on individual drugs.
Glipizide/ Metformin	2.5/250, 2.5/500, 5/500 mg	Metaglip	1-2 tabs qd-bid	
Metformin/ Rosiglitazone	500/2, 500/4, 1000/2, 1000/4 mg	Avandamet	1-2 tabs bid	
Metformin/ Pioglitazone	500/15, 850/15 mg	ACTOplusmet	1 tab qd-bid	
Rosiglitazone/ Glimepiride	4/1, 4/2, 4/4 mg	Avandaryl	1 tab q am	
Sitagliptin/ Metformin	50/500, 50/1000 mg	Janumet	1 tab bid	

APPENDIX A: COMMONLY USED ANTIDIABETIC AGENTS

Commonly used injectable antidiabetic agents

CLASS	GENERIC NAME STRENGTH	TRADE NAME®	USUAL DOSAGE	COMMENTS
Incretin Mimetic	exenatide injection	Byetta	5 mcg-10 mcg	<p>Incretin mimetics stimulate insulin production in response to elevated blood glucose levels, inhibit post-meal glucagon release, and slow nutrient absorption. Adjunct therapy for type 2 patients who have not achieved adequate glycemic control. When added to sulfonylurea therapy, a reduction in the dose of sulfonylurea may be considered to reduce the risk of hypoglycemia. Byetta is supplied for subcutaneous (SC) injection. Starting dose is 5 mcg bid. Increase to 10 mcg bid in one month if tolerated. Injected within 60 minutes before the morning and evening meals.</p> <p>PRECAUTIONS: Byetta is not a substitute for insulin in insulin-requiring patients. Byetta should not be used in patients with type 1 diabetes or for the treatment of DKA. The concurrent use of Byetta with insulin, TZDs, D-phenylalanine derivatives, meglitinides, or alpha-glucosidase inhibitors has not been studied. Not recommended for use in patients with end-stage renal disease or severe renal impairment or in patients with severe gastrointestinal disease. Byetta slows gastric emptying and may reduce the absorption of orally administered drugs. Drugs requiring food at the time of administration should be taken with a meal or snack when Byetta is not administered. Medications dependent on threshold concentrations for efficacy, such as contraceptives and antibiotics, should be taken at least 1 hour before Byetta injection.</p> <p>SIDE EFFECTS: Observe for hypoglycemia if prescribed with a sulfonylurea. Other adverse events associated with Byetta (vs. placebo) include nausea (44% vs. 18%), vomiting (13% vs. 4%), and diarrhea (13% vs. 6%). Cases of acute pancreatitis have been reported. Inform patients to discontinue Byetta if they have persistent severe abdominal pain with or without vomiting. Do not start or restart Byetta in patients with a history of pancreatitis.</p>
Amylin Analogue	pramlintide injection	Symlin	<p>Type 1 30-60 mcg before meals</p> <p>Type 2 60-120 mcg before meals</p>	<p>Used in both type 1 and type 2 patients on insulin. Decreases postprandial plasma glucose rise, suppresses glucagon secretion, delays gastric emptying, and promotes satiety. Used with meals.</p> <p>Start patients with type 1 diabetes at 15 mcg sc tid and titrate at 15-mcg increments to a maintenance dose of 30 mcg or 60 mcg as tolerated. Start type 2 patients at 60 mcg sc tid and titrate to 120 mcg tid as tolerated.</p>

APPENDIX A: COMMONLY USED ANTIDIABETIC AGENTS

Medications: Insulin

INSULIN TYPE Trade name ®	ONSET	PEAK	DURATION	COMMENTS <i>Regular self-monitoring of blood glucose should be considered for medication initiation, adjustments, or additions.</i>
Very short-acting insulin lispro Humalog (Eli Lilly)	15-30 minutes	1-4 (0.8-4.3) hours	3-5 hours	Insulins lispro, aspart, and glulisine are very short-acting products. Both lispro and aspart are available mixed with intermediate-acting preparations as fixed-ratio combinations, which provide the benefit of rapid and intermediate action. All clear insulins. Can mix with NPH. Do not mix with detemir or glargine.
Very short-acting insulin aspart NovoLog (Novo Nordisk)	10-20 minutes	1-3 hours	3-5 hours	
Very short-acting insulin glulisine Apidra (Sanofi-Aventis)	10-15 minutes	1-1.5 hours	3-5 hours	
Short-acting regular insulin	30 minutes-1 hour	4-5.5 hours	6-10 hours	Clear insulin. Can mix with NPH. Do not mix with detemir or glargine.
Intermediate-acting NPH insulin	1-2 hours	3.5-9.5 hours	16-24 hours	NPH and regular insulins are also available as fixed-ratio combinations of 50/50 and 70/30.
Long-acting insulin glargine Lantus (Aventis) approved in pediatric population > 6 years Insulin detemir Levemir (Novo Nordisk) approved in pediatric population ≥ 6 years	1 hour 0.8-2 hours (dose dependent)	No pronounced peak	24 hours Up to 24 hours (dose dependent)	Once daily subcutaneous administration at a consistent time in patients who require basal (long-acting) insulin (glargine) or once or twice daily (detemir) for the control of hyperglycemia. Neither should be diluted nor mixed with any other insulin or solution. Neither is intended for intravenous administration.

APPENDIX A: COMMONLY USED ANTIDIABETIC AGENTS

Medications: Insulin

INSULIN TYPE Trade name ®	ONSET	PEAK	DURATION	COMMENTS <i>Regular self-monitoring of blood glucose should be considered for medication initiation, adjustments, or additions.</i>
Humalog Mix 75/25 (Eli Lilly) 25% insulin lispro/ 75% insulin lispro protamine	Faster than Humulin 70/30	1-6.5 hours	Up to 24 hours (similar to Humulin 70/30)	Give within 15 minutes of a meal; suspension is cloudy, mix gently/ do not shake
Humulin 70/30 (Eli Lilly) 70% NPH/ 30% regular	30-60 minutes	1.5-16 hours	Effective: 10 to 16 hours Max: Up to 18 to 24 hours	Give 30 minutes before meals; suspension is cloudy, mix gently/ do not shake
NovoLog Mix 70/30 (Novo Nordisk) 30% insulin aspart/ 70% insulin aspart protamine	10-20 minutes	1-4 hours	Effective: 15 to 18 hours Max: Up to 24 hours	Give within 15 minutes of a meal; suspension is cloudy, mix gently/ do not shake
Novolin 70/30 (Novo Nordisk) 70% NPH/ 30% regular	30-60 minutes	2-12 hours	Effective: 10 to 16 hours Max: Up to 18 to 24 hours	Give 30 minutes before meals; suspension is cloudy, mix gently/ do not shake
Humulin 50/50 (Eli Lilly) 50% NPH/ 50% regular	30-60 minutes	2-5.5 hours	Effective: 10 to 16 hours Max: Up to 18 to 24 hours	Give 30 minutes before meals; suspension is cloudy, mix gently/ do not shake
Humalog 50/50 (Eli Lilly) 50% NPH/ 50% lispro	Faster than Humulin 50/50	0.8-4.8 hours	Similar to Humulin 50/50	Give within 15 minutes of a meal; suspension is cloudy, mix gently/ do not shake

Components of the Comprehensive Diabetes Evaluation¹

Medical History

- Age and characteristics of onset of diabetes (e.g., DKA, routine laboratory evaluation)
- Prior A1C records
- Eating patterns, nutritional status, and weight history
- Diabetes education history
- Review of previous treatment programs
- Current treatment of diabetes, including medications, meal plan, and results of glucose monitoring and patient's use of data
- Physical activity history
- DKA frequency, severity, and cause
- Hypoglycemic episodes
 - Any severe hypoglycemia: frequency, severity, and cause
- History of diabetes-related complications
 - Microvascular: eye, kidney, nerve (sensory, including history of foot lesions; autonomic, including sexual dysfunction and gastroparesis)
 - Macrovascular: cardiac, cerebrovascular disease, PAD
- Psychosocial history
- Tobacco use
- Pneumococcal immunization
- Last influenza immunization

Physical Examination

- Height, weight, BMI
- Blood pressure determination, including orthostatic measurements when indicated
- Fundoscopic examination
- Thyroid palpation
- Skin examination (for acanthosis nigricans and insulin injection sites)
- Neurological/foot examination
- Palpation of dorsalis pedis (DP) and posterior tibial (PT) pulses
- Presence/absence of patellar and Achilles reflexes
- Determination of proprioception, vibration, and monofilament sensation
- Cardiovascular exam (neck vein distention, resting heart rate, peripheral pulses, irregular rhythm, S3 for heart failure)
- Pulmonary exam (check for heart failure)
- Abdominal exam (check for enlarged liver or tenderness due to gallbladder disease, etc.)

Depression Screening

- Psychosocial assessment

Laboratory Evaluation

- A1C
- Fasting lipid profile, including total, LDL and HDL cholesterol and triglycerides
- Liver function tests
- Test for microalbuminuria
- Serum creatinine and calculated GFR
- Thyroid-stimulating hormone (TSH)
- Consider screening for celiac disease in type 1 diabetes and as indicated in type 2 diabetes

Referrals

- Eye exam, if indicated
- Family planning for women of reproductive age
- Medical nutrition therapy (MNT)
- Diabetes self-management education (DSME) upon diagnosis and update annually
- Dental exam
- Mental health referral, if indicated

¹Adapted from: American Diabetes Association. Standards of medical care in diabetes. Diabetes Care 32 (Supplement 1):S13-S61, 2009.

Disaster Preparations for People with Diabetes

People with diabetes face particular challenges to their health care if there is a disaster. If told to evacuate, it is important for patients to let people know they have diabetes and any related conditions so they can obtain appropriate care. It is also important to prevent dehydration by drinking enough fluids, which can be difficult if drinking water is in short supply. In addition, it is helpful for people with diabetes to keep something containing sugar with them at all times, in case they develop hypoglycemia. To prevent infections, to which people with diabetes are more susceptible, careful attention should be paid to the feet and getting medical treatment for any wounds. The following list can be used as a guide for disaster preparation.

1. Good diabetes education with a special focus on self-management skills and stress management
2. Immunizations, including tetanus, should be up-to-date
3. Keep a waterproof and insulated disaster kit containing the following items:^{*}
 - a. List of items to pack during an evacuation
 - i. Glucose testing strips, lancets, and a glucose testing meter
 - ii. Medications, including insulin
 - iii. Syringes
 - iv. Glucose tabs or gel
 - v. Antibiotic ointments/creams for external use
 - vi. Glucagon kit
 - b. A list of contact information for national organizations, such as the American Diabetes Association, available from their help lines or the Internet
 - c. Photocopies of relevant medical information, such as lab tests or procedures
 - d. Up-to-date information on all oral medications and insulin, including formulation and dosing. If possible, have the prescription number available. Many chain pharmacies throughout the country may be able to refill based on the prescription number alone.
4. Evacuate early if possible, taking the above items with you

^{*} Check for expiration dates on supplies; disaster kits should be reviewed and replenished at least twice a year.

Source:

Cefalu WT, et al. *The Hurricane Katrina aftermath and its impact on diabetes care. Diabetes Care* 29:158-160, 2006.

APPENDIX D

Determining Body Mass Index from Height and Weight

Body Mass Index (kg/m ²)		19	20	21	22	23	24	25	26	27	28	29	30	35	40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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MASSACHUSETTS GUIDELINES FOR ADULT DIABETES CARE

Summary of Diabetes Care

		FREQUENCY	DESCRIPTION/COMMENTS
History & Physical	Blood Pressure, Height and Weight	Every 3-6 months	If BP \geq 130/80, initiate measures to lower
	Dilated Eye Exam	Annual ¹	Refer to ophthalmologist or optometrist
	Foot Exam	Every 3-6 months	Visual exam w/o shoes and socks every routine diabetes visit
	Comprehensive Lower Extremity Sensory Exam	Initial/Annual ²	Teach protective foot behavior if sensation diminished. Refer to podiatrist if indicated. <i>See Foot Inspection and Monofilament Guide</i>
	Dental Exam	Every 6 months	Refer to dentist
	Smoking Status	Ongoing	Check every visit/Encourage smoking cessation <i>See Tobacco Use and Diabetes</i>
Labs	A1C	Every 3-6 months ³	Ideal goal < 7.0% for most patients ⁴ Action required \geq 7.0%, make changes in regime
	Fasting/Casual Blood Glucose	As Indicated	Compare lab results with glucose self-monitoring
	Fasting Lipid Profile	Annual ⁵	<i>See Cardiovascular Risk-Reduction Guidelines</i>
	Urine Microalbumin/Creatinine	Initial/Annual ⁶	If abnormal, recheck x2 in a 3-month period, then treat if 2 out of 3 collections show elevated levels
	Serum Creatinine	Annual	Measure annually for estimation of glomerular filtration rate (GFR)
	EKG	Initial	If patient is > 40 years old or DM \geq 10 years
	Thyroid Assessment	Initial/As Indicated	Thyroid palpation, thyroid function test(s) if indicated
Recommended Immunizations	Flu	Every Fall	
	Pneumovax	Recommended Once	Also revaccination x1 if \geq 65 and 1st vaccine > 5 years ago and patient < 65 at the time of 1st vaccine
Self-Management	Review Self-Management Skills	Initial/Ongoing	
	Review Treatment Plan	Initial/Ongoing	Check self-monitoring log book, diet, physical activity, and meds
	Review Education Plan	Initial/Ongoing	Refer for Diabetes Self-Management Education if indicated
Counseling	Review Nutrition Plan	Initial/Ongoing	Refer for Medical Nutrition Therapy if indicated
	Review Physical Activity Plan	Initial/Ongoing	Assess/Prescribe based on patient's health status
	Tobacco Use	Annual/Ongoing	Assess readiness/Counsel on cessation/Refer to QuitWorks or other tobacco cessation program
	Psychosocial Adjustment	Initial/Ongoing	Suggest diabetes support group/Counsel/Refer
	Sexuality/Impotence/Erectile Dysfunction	Annual/Ongoing	Discuss diagnostic evaluation and therapeutic options
	Preconception/Pregnancy	Initial/Ongoing	Need for tight glucose control 3-6 months preconception. Consider early referral to OB/GYN.

¹Type 1: Initial exam after 3-5 years disease duration. Type 2: Initial exam shortly after diagnosis. A qualified eye care professional may recommend less frequent exams; more frequent exams will be required if retinopathy is progressing.

²Every 3-6 months if patient has high-risk foot conditions.

³2x/yr for stable glycemic control. 4x/yr if change in therapy or if not meeting glycemic goals.

⁴More stringent goals, including a normal A1C of < 6%, can be considered in individual patients and during pregnancy. Less stringent goals may be appropriate for some patients.

⁵If values fall in lower risk levels, assessment may be repeated every 2 years.

⁶Type 1: Initial test after 5 years disease duration and annually thereafter. Type 2: Initial test at diagnosis and annually thereafter.

These Guidelines are intended for community-dwelling adults. The Guidelines are not intended to replace the clinical judgment of health care providers.

FLOW SHEET FOR DIABETES CARE

Visit Frequency: 2x/yr if meeting treatment goals, 4x/yr if not meeting treatment goals

Patient		DOB		MR#			
Provider		Height					
Date of Visit		Date	Date	Date	Date	Date	Date
EVERY VISIT	Diabetes Medications & Doses						

	ASA Therapy						
	ACE inhibitor or ARB, if indicated ¹						
	Weight	Value					
	BMI: Goal BMI < 25 kg/m ²	Value					
	BP: Goal < 130/80	Value					
	A1C every 3-6 months: Target < 7% for most patients	Value					
	Fasting/Casual Glucose: Goal 70-130 ac, < 180 1-2 hrs pc	Value					
	Review Blood Glucose Records	✓ when done					
	Tobacco Cessation Counseling	✓ when done					
	Foot Exam	✓ when done					
Psychosocial Assessment as needed	✓ when done						
YEARLY	Flu Vaccine	Date					
	Microalbumin ²	Date					
	Dilated Eye Exam ³	Date					
	Fasting Lipid Profile						
	LDL (goal < 100; < 70 if overt CVD) ^{4,5}	Value					
	HDL (men, goal > 40; women, goal > 50)	Value					
	Triglycerides (goal < 150)	Value					
	Creatinine/GFR	Date/Value					
	Comprehensive Lower Extremity Exam ⁶	Date					
	Diabetes Self-Management Education referral	Date					
ONCE	Medical Nutrition Therapy referral	Date					
	Dental Exam (2x/year)	Date					
	Pneumococcal Vaccine ⁷	Date					
	EKG: if > 40 years and/or DM ≥10 years	Date					

¹See discussion under CVD, HTN and Nephropathy in Massachusetts Guidelines for Adult Diabetes Care.

²Initial urinalysis at diagnosis; annual microalbumin thereafter. See discussion under Nephropathy in Massachusetts Guidelines for Adult Diabetes Care.

³Type 1: initial exam after 3-5 years disease duration. Type 2: initial exam shortly after diagnosis. A qualified eye care professional may recommend less frequent exams; more frequent exams will be required if retinopathy is progressing.

⁴Fasting Lipid Profile every 2 years if values fall in lower risk levels.

⁵Recommendations for an LDL goal < 70 should be considered for the patient at very high risk. See Cardiovascular Risk-Reduction Guidelines in Massachusetts Guidelines for Adult Diabetes Care.

⁶Comprehensive lower extremity evaluation (LEE) every 3-6 months if patient has high-risk foot conditions.

⁷See Immunizations section in Massachusetts Guidelines for Adult Diabetes Care.

2009 ADULT DIABETES GUIDELINES
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The following health promotion materials on diabetes are free of charge and available in bulk quantities. To order, please complete the order form on the reverse side or visit www.maclearinghouse.com.

revised!

Massachusetts Guidelines for Adult Diabetes Care laminated summary

For health care professionals only. Laminated wall chart highlights essential components of quality diabetes management. Revised 2009 • 8-1/2" x 11" English (#DB721)

Diabetes Care Card wallet card

For adults with diabetes. Helps people with diabetes to maintain records of medical tests and identify personal goals. Provides space to list medication and contact information for health care providers. 2-3/4" x 4-1/2" • 4-panel English (#DB720) Portuguese (#DB731) Spanish (#DB730)

Control Your Diabetes. For Life. fact sheet

For adults with diabetes. Provides a three-part action plan. Encourages people with diabetes to know their A1C, blood pressure, and cholesterol numbers, and manage their diabetes to reach their target numbers. 8-1/2" x 11" • double-sided English (#DB742) Portuguese (#DB743) Spanish (#DB744)

If You Have Diabetes, You Are at High Risk for Heart Attack & Stroke brochure

For adults with diabetes. Explains the link between diabetes and heart disease. Encourages people with diabetes to work with their health care team to set targets and manage the ABCs of diabetes: A1C, blood pressure, and cholesterol. Also includes a record form to track the ABCs. 3-1/2" x 8" • 3-panel English (#DB745)

Diabetes Fact Sheets

For adults with diabetes. Set of five bilingual fact sheets shares information and resources on diabetes management (What Is Diabetes?; Do I Have Diabetes?; What Can I Do to Stay Healthy?; Low Blood Sugar, High Blood Sugar, and Sick Days; What is the Hemoglobin A1c Test?). 8-1/2" x 11" • 5 sheets • reproducible • double-sided English/Spanish (#DB729) limit of 1 set

Diabetes Eye Exam Referral and Communication Form 3-part form

For health care professionals only. Allows for documentation of referral for patients with diabetes to an eye care specialist for their annual eye exam. Space is provided for the specialist to document the retinal examination findings and return to the physician. 3-part form allows physician, patient, and eye care specialist to maintain records of referral and exam. 8-1/2" x 11" • 3-part English (#DB777)

Diabetes and Your Feet brochure

For adults with diabetes. Provides information about foot injuries that can be caused by diabetes. Describes symptoms and provides instructions for preventive foot care. 3-3/4" x 8-1/2" • 3-panel English (downloadable only) Haitian Creole (#DB708) Spanish (#DB709)

Diabetes: Are You at Risk? brochure

For health care professionals (for use with patients). Describes type 1 and type 2 diabetes, risks for diabetes, and symptoms. Includes space for health care professionals to record blood glucose screening results and recommendations for follow-up. 3-3/4" x 8-1/2" • 3-panel • reproducible English (downloadable only) Chinese (#DB758) Haitian Creole (#DB702) Khmer (#DB759) Vietnamese (#DB761)

Diabetes Can Harm Your Vision brochure

For adults with diabetes. Features two people with diabetes who encourage the reader to have an annual eye examination. Presents facts about diabetes and eye disease. Large type. 3-3/4" x 8-1/2" • 4-panel English (#DB704) Haitian Creole (#DB705) Portuguese (#DB757) Spanish (#DB706)

Know Your Blood Sugar Numbers brochure

For adults with diabetes. Easy-to-read brochure emphasizes the importance of blood sugar control and describes two important tests (HbA1c and finger stick blood glucose) that tell if blood sugar is at a healthy level. A checklist helps remind people of important tests and services they need. 3-3/4" x 8-1/2" • 3-panel English (#DB726) Chinese (#DB734) Khmer (#DB735) Portuguese (#DB754) Spanish (#DB727) Vietnamese (#DB736)

Easy Eating for Busy People brochure

For adults with diabetes. Easy-to-read brochure emphasizes the importance of a balanced diet in diabetes management. Describes food groups using examples and demonstrates how to balance a meal. Includes sample daily menu and additional tips for diabetes control. Spanish version includes culturally appropriate photos and foods. 3-3/4" x 8-1/2" • 4-panel English (#DB752) Spanish (#DB753)

