DIABETES TOOL KIT

PROFESSIONAL & PATIENT EDUCATION MATERIALS

TEXAS DIABETES COUNCIL

www.texasdiabetescouncil.org

STOCK NO. 10-114
08/2007

Acknowledgements

The Texas Diabetes Council wishes to thank the following individuals who have contributed to the development and ongoing review of the *Diabetes Tool Kit.*

4TH EDITION (2007) AUTHORS/EDITORS

Luby Garza-Abijaoude, MS, RD, LD
Mohammed M. Bakdash, MD
Shannon I. Brow, RN, CDE, FNP-C,
Priscilla Hollander, MD, PhD
Jeffrey A. Jackson, MD, FACP, CDE
Javier La Fontaine, DPM
Lance Sloan, MD, FACE
Craig W. Spellman, PhD, DO
Curtis Triplitt, PharmD, CDE, BCPS
Surendra K. Varma, MD
Evangelina T. Villagomez, PhD, RN, CCRN, CDE, CS
Barbara K. Walz, RN, BSN, CDE
Kathleen L. Wyne, MD, PhD, FACE
Susan Young, MSN, RN

PREVIOUS CONTRIBUTORS

Luby Garza-Abijaoude, MS, RD, LD
N. Alteza, RN, BSN
Jim Aycock, PT
Mohammed M. Bakdash, MD
Elda Balle, RD, LD, CDE
A.J. Bell, RN, BSN
Micky Bielamowicz, PhD, RD, LD
Shannon I. Brow, RN, CDE, FNP-C,
Olivia Charlton, RD, LD
Joan Colgin, RN, BSN, CDE
Jaime Davidson, MD
Yolanda Gonzalez, RN, CDE
Carolyn M. Grubb, RD, LD, CDE
Lawrence B. Harkless, DPM
S. Hill, RN, CDE
Priscilla Hollander, MD, PhD
Jeffrey A. Jackson, MD, FACP, CDE
Donna Jones
John A. Menchaca, MD
Douglas P. Murdock, DPM, FACFAS
O. Oviedo, RN, MSN, CDE
Jan Ozias, PhD, RN
Ana Pacheco, RD, LD, CDE
Linda Quattrone, RN, CDE
Molly Rodriguez, PhD, RN, CDE
C. Saavedra, RN
Lita Silva, RN, MSN, CDE
Lance Sloan, MD, FACE
Craig W. Spellman, PhD, DO
Curtis Triplitt, PharmD, CDE, BCPS
Kathleen King-Tryce, RN, MSN
Surendra K. Varma, MD
Hector Verastigui, RN, CDE
Sara Villegas, RN, CDE
Evangelina T. Villagomez, PhD, RN, CCRN, CDE, CS
Barbara K. Walz, RN, BSN, CDE
Aimee D Wauters, MS, RD, LD, CDE
Susan Young, MSN, RN
Virginia Zamudio, RN, MSN, CDE

Diabetes Tool Kit Survey

The *Diabetes Tool Kit* is revised every year. Please complete the survey so that we can improve the information and resources you find most valuable. Your responses to the questions below are optional; however, your feedback will enable us to determine if we are providing the most useful information and if we are reaching our intended audiences. Thank you!!!

1. **How did you learn about the Diabetes Tool Kit?**
   - ☐ Healthcare provider
   - ☐ The Texas Diabetes Council Web site
   - ☐ DSHS (Dept. of State Health Services) Literature & Forms Catalogue
   - ☐ Professional CE event/workshop/exhibit at a conference
   - ☐ Person with diabetes
   - ☐ Other (please describe):

2. **What format do you use most often?**
   ☐ CD ☐ Hardcopy ☐ Web site

3. **What sections of the Tool Kit do you use the most?**

   _____

   _____

4. **What sections of the Tool Kit do you use the least?**

   _____

   _____

5. **What information would you like to see included in the Tool Kit? or What changes could be made to improve the Tool Kit?**

   _____

   _____

6. **In what Texas county do you reside?** _____

7. **What percentages of your patients fall into each of the following groups?**

   Asian _____ Hispanic/Latino _____ Mexican _____ Black _____
   White _____ Native American _____ Other _____ (*please specify:* _____)

8. **Please indicate the type of healthcare provider you are:**
   - ☐ Advanced practice nurse
   - ☐ Physician assistant
   - ☐ Primary care physician
   - ☐ Certified Diabetes Educator
   - ☐ Hospitalist
   - ☐ Specialist (please indicate specialty): _____

9. **Please indicate which algorithms, treatment(s), therapies, and/or protocols you use in your practice (check all that are used):**
   - ☐ Weight Loss for Overweight and Obese Adults
   - ☐ Weight Management for Overweight Children and Adolescents
   - ☐ Prevention & Delay of Type 2 Diabetes in Children and Adults with Impaired Fasting Glucose (IFG) and/or Impaired Glucose Tolerance (IGT)
   - ☐ Exercise for Type 2 Diabetes Prevention & Therapy
   - ☐ Glycemic Control for Type 2 Diabetes in Children & Adults
   - ☐ Oral agents for diabetes
   - ☐ Lipid Treatment for Type 1 & Type 2 Diabetes in Adults
   - ☐ Hypertension for Diabetes in Adults
   - ☐ Insulin for Type 1 Diabetes in Children & Adults
   - ☐ Insulin for Type 2 Diabetes in Children & Adults
   - ☐ Initial Insulin Therapy for Type 2 Diabetes in Children and Adults: a Simplified Approach
   - ☐ IV Insulin Infusion Protocol for Critically Ill Adult Patients in the ICU Setting
   - ☐ Insulin Pump Therapy
   - ☐ Macrovascular Risk Reduction: Antiplatelet Therapy
   - ☐ Foot Care
     - ☐ Foot Screening Mapping Examples
     - ☐ Diabetic Foot Screen
     - ☐ Diabetic Foot Exam
     - ☐ Diabetic Foot Care/Referral
     - ☐ High Risk Scenario & Ulcer Management
   - ☐ Care of the Elderly
     - ☐ Considerations for Elderly Persons with Diabetes
   - ☐ Guidelines for Management of the Elderly with Diabetes in Long-Term Care Facilities
   - ☐ Diabetes Medical Nutrition Therapy & Prevention

10. **If you do not use any of the algorithms listed above, please explain or indicate what treatment algorithms you do use in your practice:**

    _____

    _____

11. **Please provide any additional feedback below:**

    _____

    _____

    _____

Please return this form to:

Diabetes Program
Attn: Nurse Consultant
Texas Diabetes Program, Mail Code 0370
Dept. of State Health Services
1100 W. 49th Street
Austin, TX 78756

Health Care Professional Education

Introduction

The Texas Diabetes Council's (TDC) "Diabetes Tool Kit" was prepared by an interdisciplinary team of volunteer certified diabetes educators (CDEs) and professional staff of the Texas Department of State Health Services Diabetes Control Program to be of service to Texas practitioners, diabetes educators, and residents who live with diabetes. Many partners contributed to its development, revisions, and distribution.

The Tool Kit Features:

- Self-management training content based on the National Standards for Diabetes Education;
- Minimum Standards of Care and evidence-based treatment algorithms prepared by volunteer endocrinologists, physicians, nurses, dietitians, pharmacists, and professionals on the Medical Professionals Advisory Subcommittee of the Texas Diabetes Council.

This Diabetes Tool Kit is a resource that includes professional and patient education materials. The Kit assists primary care providers, educators, and health plans to deliver quality care and to implement quality improvement efforts.

Basic copy masters in English and Spanish help primary care providers and educators address basic self-management education with their clients who have diabetes. These tools assist those who conduct diabetes self-management education, case management, or disease management.

Standards of Care

The Council's adopted Minimum Standards of Care for Diabetes in Texas is accompanied by decision support tools, i.e., a minimum practice recommendations flow sheet, treatment algorithms designed for primary care settings, and information intended for use in professional preparation and continuing education of licensed health care professionals and the medical leadership and case/disease management staff of health plans. The Kit promotes delivery of quality care and quality improvement efforts focused on provider practices and clinic or office systems. Charts and algorithms can be reproduced or integrated into the office's medical record system to remind the providers of critical preventive services and therapeutic targets and to set the basis for feedback on treatment strategies.

Diabetes Management

The Task Force on Community Preventive Services, a non-federal group supported by the Centers for Disease Control and Prevention, reviewed studies and concluded that diabetes disease management and case management can improve glycemic (blood sugar) control and physicians' monitoring rates (A1c testing). Disease management includes identifying clients/members with diagnosed diabetes, implementing care plans that are proven to be effective, and tracking, measuring, and managing health outcomes.

Diabetes Self-Management Education

The Task Force also recommended self-management education for adults with type 2 diabetes in community settings, e.g., community centers, libraries, and places of worship.

Texas professionals may offer diabetes self-management training and information in clinical or community settings. The Council recognizes that most certified diabetes educators and programs credentialed by the American Diabetes Association (ADA) or Indian Health Services are located in metropolitan areas. Many patients receive information from various members of the diabetes care team: primary care physicians, nurses, pharmacists, dietitians, and specialists such as dentists, podiatrists, endocrinologists, and eye specialists. These health care providers may seek assistance with education and reinforcement from trained community health workers/promotores de salud, lay support group leaders, and county extension agents.

Updates

Updates to the algorithms in the Diabetes Tool Kit will be available on the Internet at www.texasdiabetescouncil.org.

Acknowledgements

The Texas Diabetes Council thanks the volunteers on the Health Care Professionals Advisory Committee who developed the first edition of the Diabetes Tool Kit (2001) and oversaw its first significant revision (2003). The effort involved many diabetes professionals across Texas and was supported by organizations that consented to the inclusion of resource information in this reference.

What is Diabetes?

Diabetes is a serious chronic disease. It happens when too much glucose stays in the blood stream because there is either no insulin or not enough insulin that can move the glucose into the body's cells. Most of the food people eat is changed into simpler proteins, fats, or a simple carbohydrate called glucose. Glucose is the form of "sugar" that cells need to make energy. The pancreas, a gland near the stomach, normally makes insulin to move glucose from the blood stream into the cells. In diabetes, the body cannot make insulin or properly use the insulin it has.

Controlling blood sugar helps to prevent the damage to blood vessels and nerves that lead to complications: blindness, amputations, kidney failure, stroke, heart attack, digestive and nerve problems, gum disease, and even depression (sadness). Good control is achieved by daily attention to nutrition, exercise, weight control, self-checks, and taking medicines as ordered. Regular checkups (including blood tests, dental exams, eye exams, and foot exams) are recommended.

TYPES OF DIABETES

There are 2 major types of diabetes. Several less common types of diabetes follow:

TYPE 1 DIABETES

- Characterized by absolute insulin deficiency. This occurs as an auto-immune process destroys the pancreas' ability to produce insulin.
- The person with type 1 diabetes must inject insulin daily.
- Onset occurs most often in childhood or adolescence, but can occur at any age.
- Typical onset may be dramatic with polyuria, polydipsia, and polyphagia. Patients may report rapid weight loss regardless of their oral intake and poor energy/exercise tolerance
- If untreated, can progress to diabetic ketoacidosis (DKA) and coma.
- Does not usually run in families, but there is a higher risk.
- Usually occurs in normal-weight individuals.
- Accounts for up to 10% of all diagnosed cases of diabetes.
- Was called Insulin Dependent Diabetes (IDDM) or Juvenile Onset until 1997.

TYPE 2 DIABETES

- Characterized by relative insulin deficiency. Type 2 diabetes is a progressive disease of insulin resistance in combination with insulin deficiency. The body may produce some insulin, but the body is unable to use it properly.

- Lifestyle modification – nutrition and exercise are fundamental to diabetes therapy.
- The person with type 2 diabetes may begin their medical treatment with a variety of oral, inhaled, or injected therapies.
- Onset occurs most often in people over age 30, but is being found more frequently in youth who are overweight.
- Typical onset gradual. Patients may report mild fatigue, blurred vision, frequent yeast infections or no specific symptoms. Months to years of gradually increasing hyperglycemia contributes to approximately 50% of newly diagnosed patients already having a serious diabetes complication at time of diagnosis.
- Risk factors include:
  - Being overweight (≥ 30 pounds overweight or a Body Mass Index (BMI) ≥25)
  - Family history of diabetes
  - Hispanic, African American, Asian American, or Native American origin
  - Older than 30 years of age
  - Sedentary lifestyle
- Increases the risk for heart attack and stroke because many with type 2 also have high blood pressure and high cholesterol.
- Accounts for most (90%) of all diagnosed cases of diabetes.
- Was called Non-insulin Dependent Diabetes (NIDDM) or Adult Onset until 1997.

Gestational Diabetes Mellitus (GDM[1,2]):

- Characterized by any degree of glucose intolerance with onset or first recognition during pregnancy.
- Incidence- occurs in approximately 7% of all pregnancies, resulting in more than 135,000 cases in the United States annually. Prevalence may range from 1-14% of all pregnancies, depending on the population studied and diagnostic tests employed.
- Usually diagnosed between the 24th and 28th week of pregnancy.
- Treatment may include insulin and dietary changes. Medications are often discontinued in the post-partum period.
- Risk factors include:
  - Obesity
  - Maternal age

- History of GDM with previous pregnancy
- Family history of diabetes
- Ethnicity – African American, Hispanic American, and American Indian origin

- Maternal hyperglycemia may result in increased maternal and fetal complications, including macrosomia, birth trauma, hypoglycemia, hypocalcemia, and jaundice. Rarely, fetal death may occur.
- Women with GDM have an increased risk of developing type 2 diabetes later in life. Staying physically active and achieving weight loss may help to prevent or delay type 2 diabetes.

Maturity Onset of Diabetes in Youth (MODY[3]):

- A subtype of Type 2 diabetes occurring in individuals < 25 yrs of age (age of onset 15-25 yrs). A monogenic form that is inherited in a autosomal-dominant fashion (MODY 1-5).
- Characterized by a pure insulin secretory defect rather than an impairment of insulin sensitivity. Individuals secrete little insulin but require only small doses of exogenous insulin to control their glucose.
- Women with MODY often present with GDM[4]

Latent Autoimmune Diabetes of Adulthood (LADA[5,6]):

- Characterized by adult age at onset, the presence of diabetes associated autoantibodies (+ GAD and ICA), and delay from diagnosis in need for insulin therapy to manage hyperglycemia. Patients often have low to normal BMI, poor glycemic control in spite of adequate compliance to diet and oral agents, and decreasing body weight during a constant diet.
- Epidemiology of LADA is influenced by geography (more common in North America and Europe), genetic susceptibility, environmental factors, gender (males predominate), and age at diagnosis (30-60 yrs).
- A slowly progressive autoimmune diabetes, often mistaken for type 2 diabetes mellitus. LADA patients generally have more insulin secretory capacity than children with type 1, require less exogenous insulin for glucose control, and may have residual persistent c-peptide secretion.
- Treatment with oral agents fails relatively quickly. Patients progress to insulin dependence.

Other types:

- Steroid Induced Diabetes
- Cystic Fibrosis Related Diabetes
- Diabetes of the Elderly
- Diabetes in the HIV patient
- Other Medical Types of Diabetes- thalassemia, sp whipple procedure, etc.

- Impaired Fasting Glucose*
  1. Fasting plasma glucose ≥ 110 mg/dL but < 126 mg/dL.
- Impaired Glucose Tolerance*
  1. Oral glucose tolerance test value ≥ 140 mg/dL but < 200 mg/dL. May have normal or near normal glycated hemoglobin (A1c) level.
- Insulin Resistance
  1. Condition in which blood glucose levels are held within non-diabetic ranges by rising insulin levels (2–3 times higher than normal).
  2. Can progress to type 2 diabetes and increase cardiovascular risk in overweight people.
  3. Conditions in which insulin resistance occurs:
     a. Type 2 diabetes
     b. Obesity, especially with central (abdominal) fat distribution with waist circumference > 40 inches (male), > 35 inches (female)
     c. Late pregnancy
     d. Stress (major trauma, surgery, critical illness)
     e. Puberty: transient and developmentally normal reduced insulin sensitivity due to growth hormone
     f. Acanthosis nigricans (a skin marker seen in skin folds that indicates high insulin)
     g. Polycystic ovarian disease (PCOS) with accompanying hyperinsulinemia can occur in obese or non-obese females
     h. Hypertension (blood pressure > 140/90 mm Hg in adults)
     i. Dyslipidemia
  4. Can be improved by weight loss (physical activity and diet changes).

* Can be reversed in many obese people through weight reduction (at least 5–7%) by daily physical activity (30 minutes a day at least 5 days a week) and reduced-fat/calories nutrition.

1. Metzger BE, Coustan DR, and the Organizing Committee. Summary and recommendations of the fourth international workshop-conference on gestational diabetes mellitus. *Diabetes Care*. 1998: 21 (S2): B161.
2. American Diabetes Association: Position Statement on Gestational Diabetes Mellitus. *Diabetes Care*. 2003; S103-105
3. Doria, A, Yang Y, Maleki M, et al. Phenotypic characteristics of early-onset autosomal-dominant type 2 diabetes unlinked to known Maturity-Onset Diabetes of the Young (MODY) genes. *Diabetes Care* 1999; 22(2):253-261.
4. Weng J, Skelund M, Lehto M, et al. Screening for MODY mutations, GAD antibodies, and type 1 diabetes- associated HLA genotypes in women with gestational diabetes mellitus. *Diabetes Care* 2002; 25(1):68-71.
5. Leslie RDG, Williams R, and Pozzolli P. Clinical review: Type 1 diabetes and latent autoimmune diabetes in adults: One end of the rainbow. *J Clin Endocrinol Metab* 2006; 91(5): 1654-1659.
6. Monge L, Brunot G, Pinach S, et al. A clinically oriented approach increases efficiency of screening for latent autoimmune diabetes in adults (LADA) In a large clinic-based cohort of patients with diabetes onset over 50 years. *Diabetic Medicine* 2004; 21:456-459.

Facts about Diabetes

A. Diabetes is a chronic disease. It affects daily life, most body systems, and is a family concern.

B. Diabetes affects 20.8 million adults (7%) in the United States, 6.2 million of whom do not yet know it.

C. Diabetes affects more than one million Texans, and another million are at high risk of impaired glucose tolerance/insulin resistance.

D. People with diabetes are:

   1. 17 times more prone to kidney disease;
   2. 25 times more prone to vision loss from eye disease;
   3. 15–20 times more prone to nerve damage and lower limb amputation; and
   4. 2–4 times more prone to heart disease or stroke.

E. Prevalence of diabetes by age groups:

   1. Age 60 or older – 20.9%
   2. Age 20 or older – 9.6%

F. Prevalence of diabetes by race/ethnicity in people 20 years or older:

   1. Non-Hispanic whites – 8.7%
   2. Non-Hispanic blacks – 13.3%
   3. Hispanic/Latino – 9.5% (an estimate)
   4. American Indians and Alaska Natives – 12.8% (Indian Health Services) varies among tribes. Ranges from 8.2% (Alaska Natives) to 55%.
   5. Asian American and Pacific Islanders – total prevalence data is not available. Data (1996–2000) suggest that Native Hawaiians are 2 times more likely to have diagnosed diabetes as white residents of Hawaii.

G. Direct and indirect costs of diabetes in the United States (2002) were almost $132 billion, including:

   1. $92 billion in direct costs (includes Medicaid and other state programs)
   2. $40 billion in indirect costs (lost wages and early death)

Source: CDC National Diabetes Fact Sheet, 2005

Texas Diabetes Fact Sheet, 2006

I. 2005 DIABETES PREVALENCE

Prevalence of Diagnosed[1] Diabetes in Persons 18 and Older

An estimated 1.3 million persons aged eighteen years and older in Texas (7.9% of this age group) have been diagnosed with diabetes. Nationwide, 15.3 million persons eighteen years of age and older have been diagnosed with diabetes (7.3% of this age group).

Prevalence of Undiagnosed[2] Diabetes in Persons 18 and Older

Another estimated 418,134 persons aged eighteen years and older in Texas are believed to have undiagnosed diabetes (based on 1999-2000 NHANES age-adjusted prevalence estimate of 2.5% of the 2005 adult population). The total for both diagnosed and undiagnosed diabetes is 1,739,437.

Prevalence of Diagnosed[1] Diabetes by Sex in Persons 18 and Older

Male.....612,716 (7.4%)

Female 709,414 (8.4%)

Prevalence of Diagnosed[1] Diabetes by Race/Ethnicity in Persons Older

White, non-Hispanic 663,603 (7.5%)

Black, non-Hispanic.....240,674 (13.1%)

Hispanic 435,328 (8.1%)

Other 33,950 (5.1%)

Prevalence of Diagnosed[1] Diabetes by Race/Ethnicity and Age Group in Persons 18 and Older

AGE GROUP	WHITE, NON-HISPANIC	BLACK, NON-HISPANIC	HISPANIC	OTHER
18 - 44	2.2%	4.5%	1.6%	2.1%
45 - 64	10.1%	21.2%	24.8%	9.6%
65+	14.8%	32.5%	27.3%	**
Overall	7.5%	13.1%	8.1%	5.1%

**Sample size too small to report a reliable estimate (n<20).

Prevalence of Diagnosed[1] Diabetes by Age Group in Persons 18 and Older

18-29 Years..... 0.6%

30-44 Years..... 3.3%

45-64 Years..... 14.1%

65+ 17.6%

Prevalence of Diagnosed[1] Diabetes by Educational Level in Persons 18 and Older

No High School Diploma 10.6%

High School Graduate 9.1%

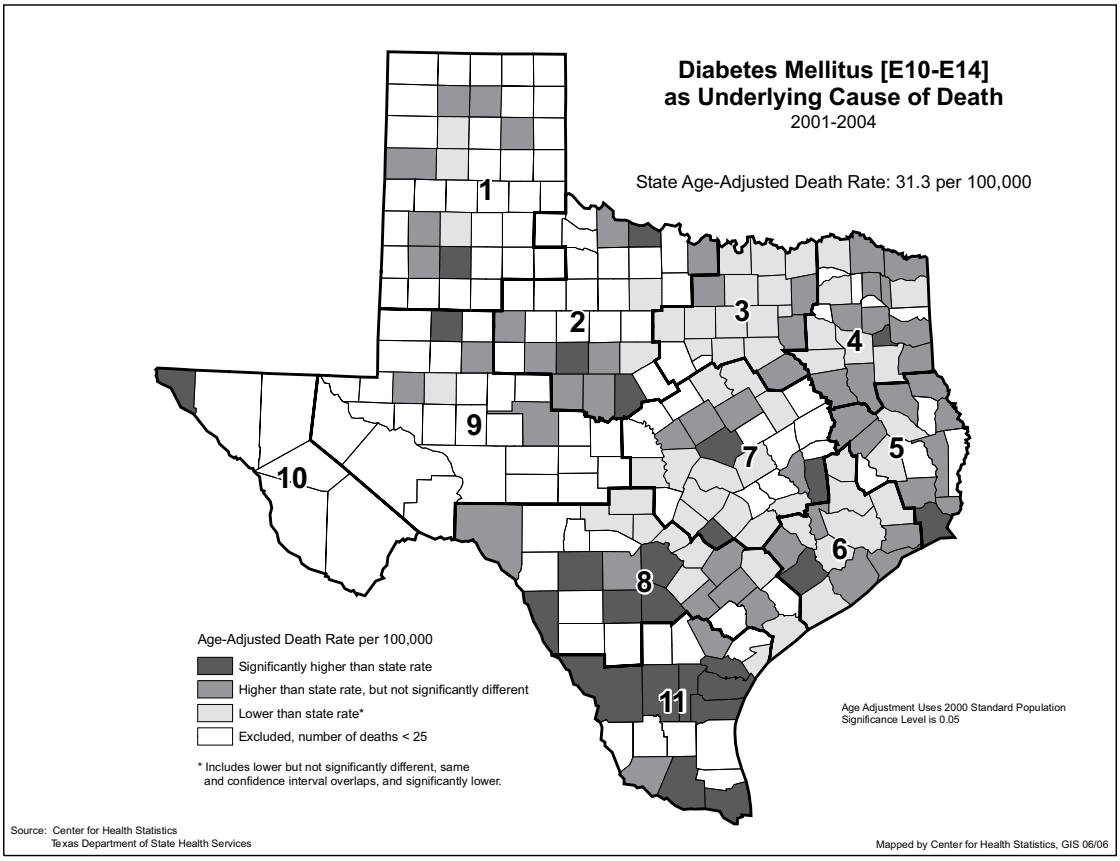
Some College 7.0%

College+ 5.8%

II. DIABETES MORTALITY [3]

Deaths Among Persons with Diabetes

Diabetes was the sixth leading cause of death in Texas in 2002 through 2004. In 2004, **5,426** deaths were directly attributed to diabetes. Diabetes was also the sixth leading cause of death nationally in 2002 through 2004. Diabetes is believed to be under-reported on death certificates in Texas and the nation, both as a condition and as a cause of death.



The map above shows the age-adjusted mortality rates per 100,000 persons for Texas by county for the years 2001 through 2004, with diabetes as the underlying cause of death. The state rate for the four years is **31.3 per 100,000**. More of the counties in Health Service Regions 8 and 11 fall into the "significantly higher than state rate" and "higher than state rate, but not significantly different" categories. Many counties along the eastern part of our state fall into the "higher than state rate, but not significantly different" category.

Diabetes Mortality[3] Rate (Per 100,000) by Race/Ethnicity, Texas, 2004

The 2004 diabetes mortality rate for Texas was 30 per 100,000. Mortality rates for each race/ethnicity were applied to the 2004 population by race/ethnicity.

Of persons who have diabetes, in 2004:

- 30 per 100,000 were likely to die from it.
- 23 per 100,000 whites (non-Hispanic) were likely to die from it.
- 52 per 100,000 blacks (non-Hispanic) were likely to die from it.
- 47 per 100,000 Hispanics were likely to die from it.
- 17 per 100,000 persons who fall in the "Other" category were likely to die from it.

The 2004 mortality rates (per 100,000) for blacks (non-Hispanic) and Hispanics were more than double that of whites (non-Hispanic).

III. DIABETES IN PERSONS LESS THAN 18 YEARS OF AGE

Diabetes in childhood is mainly type 1, an autoimmune disorder that destroys insulin-producing cells, requiring multiple daily insulin injections or a pump. About one in every 400 to 600 Texas children and adolescents has type 1 diabetes. It is the second most prevalent chronic disease of childhood (after asthma).

It is important to note that the incidence of type 2 diabetes in persons less than 18 years of age has been increasing in recent years. However, representative data that would be needed to monitor diabetes trends in youth by type are not available for Texas or the nation.

[1] *Source:* 2005 Texas Behavioral Risk Factor Surveillance System, Statewide BRFSS Survey, for persons who are eighteen years of age and older. Data include both type 1 and type 2 diabetes. Persons with diabetes include those who report that they have been told by a doctor that they have diabetes. Women who report diabetes only during pregnancy are not included in prevalence. Prevalence data for 2006 will be available in fall of 2007 (Prevalence data are available for the year prior to the current year).

[2] Persons 20 years of age and older. Centers for Disease Control and Prevention. Prevalence of Diabetes and Impaired Fasting Glucose in Adults, United States, 1999-2000. *MMWR*. September 5, 2003; 52(35);833-837

[3] Texas Department of State Health Services, Texas Vital Statistics. Data include male and female, and all ages. Data are provisional.

Revised: 02/05/07

Pre-diabetes

Definitions: Impaired glucose tolerance (IGT) or impaired fasting glucose (IFG) are considered significant risk factors for type 2 diabetes and are called "pre-diabetes" in public campaigns. The term is used with patients who have higher than normal blood glucose levels (IFG) or insulin resistance (IGT) but not at diagnostic levels. Most people with "pre-diabetes" are statistically likely to develop type 2 diabetes within 10 years of assessment.

[Similarly, women who experience gestational diabetes are also at high risk for developing type 2 diabetes in later years, i.e., a 20–50% chance of developing diabetes within 5-10 years.] Source: CDC.

Research findings: The Diabetes Prevention Program (DPP) reported in *Diabetes Care,* April 2002, established that overweight people with impaired glucose tolerance could delay or prevent the onset of type 2 diabetes over the three-year study course with modest lifestyle changes, namely regular physical activity and dietary changes. Metformin, used in one arm of the study, was found to contribute to reducing the risk of type 2 diabetes among younger (25–40 years old) and heavier (50–80 pounds overweight) subjects.

Screening and making recommendations to manage "pre-diabetes" should be a priority for all health care providers and considered at any health care visit.

Co-morbidity: "Pre-diabetes" is not just an "early warning" for type 2 diabetes. Persons with IGT have a higher risk of cardiovascular disease. This risk is constant even if they do not develop type 2 diabetes, thus, they warrant evaluation and intervention for other cardiovascular risk factors, usually hypertension and dyslipidemia.

Diagnostic guidelines: Diagnosis of IGT is preferably done by the 2-hour oral glucose tolerance test (OGTT) using 75-gram glucose solution after an 8- to 12-hour fast. OGTT is more likely to identify insulin resistance while fasting plasma glucose (FPG) can detect limited insulin secretion. Impaired Fasting Glucose: Fasting plasma glucose = 100 mg/dL – 125 mg/dL.

Impaired Glucose Tolerance: Oral glucose tolerance test value is 140 mg/dl – 199 mg/dL. May have normal or near normal A1c level.

Treatment guidelines: Type 2 diabetes prevention or delay among persons at high risk (pre-diabetes) involves modest weight loss (5 to 7% of total body weight) through diet changes to reduce calories and moderate exercise (30 minutes a day, at least 5 days a week) to burn calories.

Concomitant risk for CVD and stroke should be addressed. Evaluate and aggressively treat hypertension and/or dyslipidemia and counsel patients who smoke to quit.

- **See Weight Loss Algorithm:**
  Weight Management for Overweight Children and Adolescents
- **See Weight Loss Algorithm:**
  Weight Loss for Overweight and Obese Adults
- **See Exercise Algorithm:**
  Exercise for Type 2 Diabetes Prevention and Therapy
- **See Prevention Algorithm:**
  Prevention and Delay of Type 2 Diabetes in Children and Adults with Impaired Fasting Glucose (IFG) and/or Impaired Glucose Tolerance (IGT)

Criteria for Diagnosing Diabetes

A. Fasting plasma glucose (FPG) ≥ 126 mg/dL

or

B. Symptoms plus casual plasma glucose ≥ 200 mg/dL

or

C. 2-hour post prandial (PP) in OGTT value ≥ 200 mg/dL

D. 2 tests of any combination required – separated by ≥ 24 hours.

	TEST		
Stage	Fasting Plasma Glucose (FPG) (Preferred)*	Casual Plasma Glucose	Oral Glucose Tolerance Test (OGTT)
Diabetes	FPG ≥ 126 mg/dL (7.0 mmol/1)**	Casual Plasma Glucose ≥ 200 mg/dL (11.1mmo1/1 plus symptoms)***	Two-hour Plasma Glucose 2hPG ≥ 200 mg/dL****
Impaired Glucose Homeostasis (Pre-Diabetes)	Impaired Fasting Glucose (IFG) IFG = FPG 110–125 mg/dL		Impaired Glucose Tolerance(IGT) = 2hPG 140–199 mg/dL
Normal	FPG < 100 mg/dL		2hPG < 140 mg/dL

* The FPG is the preferred test for diagnosis, but any one of the three listed is acceptable. In the absence of unequivocal hyperglycemia with acute metabolic decompensation, one of these three tests should be used on a different day to confirm diagnosis.

** Fasting is defined as no caloric intake for at least 8 hours.

*** Casual is any time of day without regard to time since last meal. Symptoms are polyuria, polydipsia, and unexplained weight loss.

**** 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.

Source: Diabetes Care, 2007 Jan; 30 Suppl 1, S5

Diabetes Management Goals of Therapy

GOALS FOR NON-PREGNANT DIABETIC PATIENTS	
Blood Sugar Before Meals	90-130 mg/dL (normal: < 100 mg/dL)* <110 mg/dL**
Blood Sugar 2 hrs. After Meals	< 180 mg/dL* (peak) <140 mg/dL**
Blood Sugar at Bedtime	110 -150 mg/dL* (normal <110 mg/dL)
Blood Sugar at 3:30 a.m.	goal = 100 mg/dL*
Blood Sugar Before Exercising	100 mg/dL* If < 100 mg/dL, snack before exercising (one carb [15 g] for every 30 minutes). If type 1 diabetes with blood sugar > 250 mg/dL, caution against exercise, check ketones, drink water, and notify doctor (may need to increase insulin).
A1c	≤ 6.5%**, ***
Ketones	Negative
Blood Pressure	≤ 130/80 mmHg; if ≥ 1 g proteinuria, ≤ 125/75 mmHg
Triglycerides	< 150 mg/dL
LDL-Cholesterol	< 100 mg/dL
HDL-Cholesterol	≥ 40 mg/dL
Microalbuminuria	< 30 mg/24 hour
Body Mass Index (BMI)	< 25 (Overweight 25–29.9; Obesity ≥ 30)

* American Diabetes Association: Clinical Practice Recommendations, 2007.

** American Association of Clinical Endocrinologists (AACE), Medical Guidelines for the Management of Diabetes Mellitus: The AACE System of Intensive Diabetes Self-Management - 2002 Update.

*** AACE (2002) and the Texas Diabetes Council (2007).

Diabetes Minimum Practice Recommendations

TEXAS Department of State Health Services

TEXAS DIABETES COUNCIL

Name:

Sex: M☐ F☐ **D.O.B.:** **ID #:**

	Exam/Test/Counseling	Schedule		Suggested Result Codes: O=Ordered, N=Normal, A=Abnormal, E=Done Elsewhere, R=Referred						
INITIAL VISIT	1. Complete history & physical	Initial visit and at clinician's discretion (including risk factors, exercise & diet)		Date Result						
	2. Diabetes Education*	Initial visit and at clinician's discretion		Date Result						
	3. Medical Nutrition Therapy	Initial visit and at clinician's discretion		Date Result						
	4. Exercise Counseling	Initial visit and at clinician's discretion		Date Result						
	5. Psychosocial Counseling	Initial visit and at clinician's discretion		Date Result						
	6. Lifestyle/Behavior Changes Counseling	Initial visit and at clinician's discretion	Smoking cessation Alcohol reduction	Date Result						
EVERY VISIT	7. Weight/Height/BMI Adult Overweight=BMI 25–29.9 Adult Obesity=BMI≥30	Every Visit		Date Result						
	8. Blood Pressure Target: <130/80 mm Hg Target: < 125/75 mm Hg if ≥ 1g proteinuria	Every Visit		Date Result						
	9. Foot Inspection Visual inspection for skin and nail lesions, calluses, infections	Every Visit		Date Result						
	10. Oral/Dental Inspection Refer for dental care annually or as needed	Every Visit		Date Result						
	11. Growth and Development (including height) in Children	Every Visit		Date Result						
	12. Aspirin/Antiplatelet Prophylaxis (if no contraindications) Type 1 or 2 ≥ age 30	Every Visit		Date Result						
	13. A1c Target: ≤6.5%	Every 3–6 months		Date Result						
ANNUALLY	14. Kidney evaluation Estimate GFR (eGFR) & microalbumin determination (≥30mg = abnormal). Consider nephro/endocrine evaluation at Stage 3 CKD (eGFR <60); also consider PTH & Hgb if CKD Stage 3 If significant proteinuria, monitor serum creatinine every 3–6 months	Type 1: Annually beginning 5 years from diagnosis Type 2: Initial, then annually		Date Result						
	15. Dilated funduscopic eye exam By an ophthalmologist or therapeutic optometrist	Type I: Annually beginning 5 years from diagnosis Type 2: Initial, then annually		Date Result						
	16. Oral/Dental Exam Refer to appropriate provider	Annually or as needed		Date Result						
	17. Foot Exam Complete foot exam and neurologic assessment	Annually or as needed		Date Result						
	18. Lipid Profile Targets: LDL-C <100 mg/dL (CHD <70mg/dL) Triglycerides <150 mg/dL	Annually if at goal; otherwise every 3–6 months (> age 18)		Date Result						
	19. Immunizations Influenza (Flu) Vaccine Td Vaccine Pneumococcal Vaccine Childhood Immunizations	Annually Every 10 Years Initial; repeat per ACIP Per CDC Schedule		Date Result						

See web site (http://www.texasdiabetescouncil.org) for latest version and disclaimer.

Revised 07/27/06 Publication #45-12085

*** Diabetes Education should address:**

a. Self-management skills (i.e., monitoring, sick day management)
b. Medications
c. Frequency of hypoglycemia
d. High-risk behaviors (e.g., smoking, alcohol)
e. Adherence with self-care (self-management plan from the last visit (i.e. diet, medication use, exercise plan)
f. Assessment of complications
g. Diabetes knowledge
h. Follow-up of referrals

Gestational Diabetes (GDM) Standards of Care 2006

Gestational Diabetes (GDM) **defined** as "glucose intolerance with onset or first recognition during pregnancy."

I. Who to Screen (Universal screening is suggested)

1. Those at High Risk for GDM

The following pregnant women are at high risk for developing GDM:

- Member of an ethnic group with a higher than normal rate of type 2 diabetes
- Glycosuria at the first prenatal visit
- Polycystic ovary syndrome
- A family history of diabetes, especially in first degree relatives
- Prepregnancy weight 110 percent of ideal body weight or significant weight gain in early adulthood
- Age greater than 25 years
- Previous delivery of a baby greater than 9 pounds (4.1 kg)
- Personal history of abnormal glucose tolerance
- Previous unexplained perinatal loss or birth of a malformed child
- Maternal birth weight greater than 9 pounds (4.1 kg) or less than 6 pounds (2.7 kg)
- Current use of glucocorticoids
- Personal birth weight of over 9 lbs

(Jovonovic, 2006, Parretti, et al., 2001, Bevier, et al., 1999, Scholl, et al., 2001, Laird & McFarland, 1996)

2. Those at Low Risk for GDM

Although, there is little agreement regarding who should be screened between American College of Obstetricians and Gynecologists (ACOG) and ADA, Jovonovic (2006) suggests universal screening since identifying pregnant women with hyperglycemia has proven to improve outcomes. Jovonovic and ACOG believe that universal screening is more practical and that selective screening is not sensitive enough.

ACOG and ADA suggested that screening may be omitted in low risk women. Such women must have all of the following characteristics:

- Age less than 25 years
- Normal weight before pregnancy

- Member of an ethnic group with a low prevalence of GDM (i.e., patient is NOT Hispanic, African, Native American, South or East Asian, Pacific Islander)
- No first degree relative with diabetes mellitus
- No history of abnormal glucose tolerance
- No history of poor obstetric outcome

(*Diabetes Care*, 2004; ACOG, 1994 & 2001).

II. Guidelines for Screening

1. Screen pregnant women at first prenatal visit if undiagnosed type 2 diabetes is suspected and/or the following characterize the pregnant woman:
   - Marked obesity
   - Personal history of GDM [33 to 50 percent risk of recurrence, and some of these recurrences may represent unrecognized type 2 diabetes (ACOG, 2001)]
   - Glycosuria
   - Strong family history of diabetes
2. Screening is optimally performed at 24 to 28 weeks of gestation (Jovonovic & Peterson, 1985).
3. Further screening unnecessary in the following scenario that is diagnostic of diabetes if confirmed on a subsequent day:
   - Evaluation of any woman who has a random serum glucose value ≥ 200 (11.1 mmol/L)
   - Fasting serum glucose value ≥ 126 (7.0 mmol/L) is unnecessary, because these findings alone are diagnostic of diabetes, if confirmed on a subsequent day (Diabetes Care Suppl, 2004)

III. Tests for Screening

Note: 50-g oral glucose challenge test is suggested with ≥ 130 as threshold for abnormal test

50-g oral glucose challenge test for screening (without regard to timing of last meal) is done, followed by serum glucose measurement one hour later:

Abnormal Finding is as follows:

- Value 130 to 140 (7.8 mmol/L). Jovonovic (2006) uses 130 as the threshold for outpatients. Avoid the use of capillary blood for testing.

Sensitivity of values:

- At the 130 threshold, the test is positive in 20 to 25 percent of pregnant women and detects 90 percent of gestational diabetics.
- At the 140 threshold, 14 to 18 percent of tests will screen positive and 80 percent of gestational diabetics will be detected (Brody, et al., 2003). ACOG and the ADA have stated that either threshold may be used.

- Women with an abnormal value are then given a 100-g, three hour oral glucose tolerance test (GTT).
- Universal screening using a threshold serum glucose concentration of 130 (7.2 mmol/L) had 100 percent sensitivity, but 25 percent of women screened required a GTT and the cost per case diagnosed was $249 (ACOG, 2004). Raising the serum glucose threshold value to 140 (7.8 mmol/L) dropped the sensitivity to 90 percent with 15 percent of women screened requiring a GTT. In this protocol, the cost per case diagnosed was $222.
- According to Jovonovic (2006) an A1c higher than 6.5 percent suggests diabetes, but A1c below this level should not be taken as evidence against the diagnosis of diabetes.

IV. Diagnostic Testing for Women that Screen Positive

- A three hour oral GTT for definitive diagnosis is warranted
- In populations/patients at very high risk of GDM, obtaining a GTT without performing a prior screening test (glucose challenge test) may be cost-effective

GDM is present if two or more of the following serum glucose values are met or exceeded :

- Fasting serum glucose concentration ≥95 (5.3 mmol/L)
- One-hour serum glucose concentration ≥180 (10 mmol/L)
- Two-hour serum glucose concentration ≥155 (8.6 mmol/L)
- Three-hour serum glucose concentration ≥140 (7.8 mmol/L)
- Carbohydrate loading for three days has been recommended before the GTT, but is probably not necessary

(Fourth International Workshop-Conference on Gestational Diabetes)

The Fourth International Workshop-Conference on Gestational Diabetes GTT values cited above are based upon the Carpenter and Coustan modification of earlier values (Carpenter and Coustan, 1982).

They are lower than those proposed by the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus and the National Diabetes Data Group (NDDG), (*Diabetes Care*, Suppl, 2000). The values are lower because the thresholds derived from the older Somogyi-Nelson method of glucose analysis were corrected to account for the enzymatic assays currently in use. (See following table.)

TWO DIAGNOSTIC CRITERIA		
Status	**Plasma or Serum Glucose Level Carpenter/Coustan Conversion mg/dL/ mmol/L**	**Plasma Level National Diabetes Data Group Conversion/mmol/L**
Fasting	95 mg/dL/ 5.3 mmol/L	105 mg/dL/ 5.8 mmol/L
One Hour	180 mg/dL/ 10 mmol/L	190 mg/dL/ 10.6 mmol/L
Two Hours	155 mg/dL/ 8.6 mmol/L	165 mg/dL/ 9.2 mmol/L
Three Hours	140mg/dL/ 7.8 mmol/L	145 mg/dL/ 8.0 mmol/L

Thus, application of the more stringent Fourth International Workshop criteria to all women with positive screening test results reduced the prevalence of infants weighing < 4000 grams from 17.1 to 16.9 percent, and the prevalence of infants weighing < 4500 grams from 3.0 to 2.9 percent.

ACOG considers use of either the Fourth International Workshop or the National Diabetes Data Group criteria acceptable for diagnosis of GDM. The ADA recommends use of the Fourth International Workshop-Conference on Gestational Diabetes criteria.

Treating women with one abnormal GTT value decreases the risk of a macrosomic infant and is cost-effective. These women often have insulin resistance along with fasting insulin levels similar to women with GDM.

There is not complete agreement on treatment of women with abnormal GTT.

- Some treat them as GDM would be treated if GDM criteria is met
- Some wait and consider further intervention following repeated oral GTT in four weeks

Jovonovic and others consider use of :

- Two-hour 75-g GTT often more cost-effective than the three-hour test
- The ADA and World Health Organization (WHO) have endorsed use of the two-hour 75-g oral GTT for diagnosis of GDM
- Criteria for diagnosis vary:
  - Some use test as a one step approach for both screening and diagnosis, no benefits drawn

Other tests that should be considered:

- GDM confirmed with abnormal GTT (ADA)
- Serum glucose concentration that is >140 (7.8 mmol/L) after the 50-g glucose challenge is associated with a 25 to 30 percent risk of a macrosomic infant if no treatment is offered (Jovonovic & Peterson, 1985)
- Fasting serum glucose concentration > 90 (5 mmol/L) at 24 to 28 weeks of gestation, and
- A1c value above normal, are highly sensitive and a specific predictor of subsequent infant macrosomia in the general obstetrical population (Schrader, et al., 1995). Hemoglobin values alone were not sufficiently sensitive to predict those women at risk of delivering a macrosomic infant.

The ADA will not re-address the criteria for screening and diagnosis until the results of the National Institutes of Health sponsored Hyperglycemia and Adverse Pregnancy (HAPO) Clinical Trial is complete in 2007.

Treatment of Gestational Diabetes

I. Medical Nutrition Therapy (MNT)

MNT Recommended in the following situations:

- Those who do not meet GDM criteria, but have fasting blood glucose > 90
- Abnormal glucose challenge test
- Or one abnormal value on the oral GTT

Goals are to:

- Contribute to fetal well-being
- Prevent ketosis
- Provide adequate weight gain
- Achieve normoglycemia

Caloric Requirements Needed Based on Ideal Body Weight

The suggested caloric intake is approximately:

- 30 kcal per kg current weight per day in pregnant women (BMI 22 to 27)
- 24 kcal per kg current weight per day in overweight pregnant women (BMI 27 to 29)
- 12 to 15 kcal per kg current weight per day for morbidly obese pregnant women (BMI >30)
- 40 kcal per kg current weight per day in pregnant women with a BMI less than 22

1. Carbohydrates
   - Approximately 35 to 40 percent of calories
2. Protein
   - Approximately 20 percent of calories
3. Fat
   - Approximately 40 percent of calories

According to Jovonovic (2006), 75 to 80 percent of women with GDM will achieve normoglycemia with the above suggested caloric distribution. Postprandial blood glucose concentrations are directly dependent upon the carbohydrate content of a meal. The postprandial glucose rise, therefore, can be blunted if the diet is carbohydrate restricted. Complex carbohydrates, such as those in starches and vegetables, are more nutrient dense and raise postprandial blood glucose concentrations less than simple sugars.

Caloric Distribution

Breakfast

- Approximately 10% of total calories
- Carbohydrate limited, due to time of greatest insulin resistance

Lunch

- 30% of total calories

Supper

- 30% of total calories

Snacks

- Approximately 30% of calories are distributed as needed
- Leftover calories

II. Monitoring

Glucose Monitoring Guidelines

- Daily monitoring documented on a log:
  - Upon awakening
  - 1-hour post meals
  - The difference between measuring 1-hour versus 2-hours postprandially has not been established
  - Postprandial glucose control leads to improve outcomes (decreases incidence of large-for-gestational age, decreases risk for cesarean delivery)

Degree of fasting does not predict the need for insulin therapy (Jovonovic, 2006)

III. A1c Measurements

- Utilized as feedback, evaluate merit of glucose monitoring
- A1c is lower in pregnancy (average, 20% lower)
- Rise in red cell mass in 1st trimester and decrease in red blood cell life span

IV. Exercise

- ADA approves moderate exercise in individuals without medical or obstetrical contradictions to exercise

V. Medication Regimen

Insulin Therapy is the only recommended medical therapy approved in the United States. Oral

anti-hyperglycemic agents are not endorsed by the ADA or ACOG and have not been approved by the United States Food and Drug Administration.

A. Initiating Insulin Therapy

Start insulin therapy when glucose concentrations reach the values below in order to prevent macrosomia, shoulder dystocia, and/or birth trauma, despite MNT:

JOVONOVIC, 2006	ACOG	ADA
Fasting blood glucose concentration ≥ 90 (5 mmol/L)	Fasting glucose concentration ≥ 95 (5.3 mmol/L) or	Fasting plasma glucose concentration > 105 (5.8 mmol/L) or
One-hour postprandial blood glucose concentration ≥ 120 (6.7 mmol/L)	One-hour postprandial glucose >130 to 140 (7.2 to 7.8 mmol/L) or	One-hour postprandial plasma glucose > 155 (8.6 mmol/L) or
The Texas Diabetes Council suggests following Jovonovic's guidelines; Fasting hyperglycemia higher threshold (>105 [>5.8 mmol/L] versus ≥ 90-95 [≥ 5-5.3 mmol/L]) is associated with increased risk of macrosomia, and an increased risk of fetal death in the last trimester at times	Two-hour postprandial blood concentration ≥ 120 (6.7 mmol/L)	Two-hour postprandial plasma glucose > 130 (7.2 mmol/L)

According to Jovonovic (2006), dosing varies according to degree of obesity, ethnic characteristics, and other demographic criteria. Specific guidelines are as follows:

- 50 to 90 units are typically utilized to achieve glucose control (type of insulin used is calculated based upon blood glucose values)
- If fasting glucose is high, it is recommended to add an intermediate-acting insulin, with an initial dose of 0.2 U/kg body weight (such as NPH insulin) before bedtime
- If postprandial blood glucose concentrations are high, regular insulin or insulin lispro before meals at a dose calculated to be 1.5 U per 10 grams carbohydrate in the breakfast meal and 1 U per 10 grams carbohydrate in the lunch and dinner meals is recommended
- If both preprandial and postprandial blood glucose concentrations are high or postprandial glucose levels can only be blunted if starvation ketosis occurs, then
- Initiate a four injection per day regimen:
  - Consider administering a total dose of 0.7 U/kg up to week 18
  - 0.8 U/kg for weeks 18 to 26
  - 0.9 U/kg for weeks 26 to 36
  - 1.0 U/kg for weeks 36 to term

    - In a morbidly obese woman, the initial doses of insulin may need to be increased to 1.5 to 2.0 units/kg to overcome the combined insulin resistance of pregnancy and obesity
- Insulin is typically divided into the following schedule:
    - 45 percent as NPH insulin (30 percent before breakfast and 15 percent before bedtime) and
    - 55 percent as preprandial regular insulin
        - 22 percent before breakfast
        - 16.5 percent before lunch
        - 16.5 percent before dinner
- Four-times daily regimen improves glycemic control and perinatal outcome better than a twice-daily regimen
- Dosing is based on frequent self monitoring
- Four or more glucose measurements each day are recommended
- Twin gestations have an approximate doubling of the insulin requirements

Insulin Types

- Human insulin should be prescribed since it is the least immunogenic of the commercially available insulin preparations
- Insulin analogs like Lispro, Aspart, Glulysine are comparable in immunogenicity to human Regular insulin
- Only Lispro and Aspart have been investigated in pregnancy; studies denote acceptable safety profiles, lower risk for postprandial hypoglycemia, minimal transfer across the placenta, no evidence of teratogenesis
- Long-acting insulin analogs (Glargine, Detemir) have not been studied extensively in pregnancy; therefore, the use of human NPH insulin as part of a multiple injection regimen in pregnant women is recommended
- Lente insulins have too much variability in effect and therefore are not recommended (Jovonovic, 2006)

B. Treating Hypoglycemia (Jovonovic, 2006)

Remote from meal or snack time Hypoglycemia should be treated by:

- Administering 10 to 20 g of carbohydrate immediately
- Consider use of correction factor of one unit of rapid-acting insulin lowers blood glucose by 25 mg/dL

JOVONOVIC'S GUIDELINES	
If glucose <50 mg/dL	Subtract 2 units of regular insulin from the dose of insulin given before the meal
For glucose 50 to 75 mg/dL	Subtract one unit from the dose of insulin given before the meal
For glucose 75 to 100 mg/dL	It is not recommended to change insulin dose
For glucose 100 to 125 mg/dL	Add one unit regular insulin to the dose of insulin given before the meal
For glucose 100 to 150 mg/dL	Add two units regular insulin to the dose of insulin given before the meal.

Jovonovic (2006) does not recommend the use of insulin pumps (expensive and do not clearly provide a benefit in the setting of GDM).

C. Oral Anti-Hyperglycemic Agents

- The ADA and ACOG do not endorse the use of oral anti-hyperglycemic agents during pregnancy
- Oral anti-hyperglycemic agents have not approved by the Unites States Food and Drug Administration (ACOG, 2001, ADA, Suppl, 2004)
  - Tolbutamide and chlorpropamide are not to be used for pregnancy; the agents are known to cross the placenta and can cause fetal hyperinsulinemia, which often leads to other complications such as neonatal hypoglycemia and macrosomia (Garcia-Bournissen, et al., 2003; Zucker & Simon, 1968)
  - Glyburide has minimal transplacental passage; some neonatal hypoglycemia (Elliot, Langer, et al., 1991); the Fifth ACOG International Workshop cautioned its use until there is more research
  - Metformin should not be used in GDM; currently, there are no randomized trials evaluating its use in GDM; a trial in Australia may be completed in 2007 and may elucidate the safety and efficacy of Metformin in GDM; its use in GDM is not recommended
  - Acarbose is not recommended for use at this time; some of the drug may be absorbed systemically
  - Thiazolidinediones, glinides, GLP-1 not recommended during pregnancy; they are considered experimental

VI. Management During the Peripartum Period

- Hold insulin during labor and delivery
- Normal saline often achieves normoglycemia

- Avoid hyperglycemia during labor in order to prevent fetal hyperinsulinemia, neonatal hypoglycemia, hyperbilirubinemia, hypocalcemia, erythremia
- Keep maternal blood glucose concentration between 70 and 90 mg/dL

VII. Measures After Delivery

- Blood glucose should be measured on the day after delivery to assess for hyperglycemia; use criteria for diabetes diagnosis for nonpregnant individuals
- A regular diet can be considered for the GDM woman postpartum
- Patient should assess blood glucose at home for a few weeks post discharge (especially those that were diagnosed early in their gestation or who necessitated insulin therapy); remind patient to report any high values

VIII. Risk of Diabetes Postpartum

One third to two-thirds of women with GDM will have GDM in a subsequent pregnancy (Philipson & Super, 1989; Moses, 1996; Catalano, et al., 1991). They tend to be older, more parous, and have a greater increase in weight between their pregnancies than women without a recurrence. Higher infant birth weight in the index pregnancy and higher maternal prepregnancy weight have also been associated with recurrent GDM.

- Parity, habitus, large birth weight, and diabetes in a first-degree relative are less correlated with later diabetes.
- GDM is also a risk factor for the development of type 1 diabetes. Specific HLA alleles (DR3 or DR4) may predispose to the development of type 1 diabetes postpartum, as does the presence of islet-cell autoantibodies (Ferber, et al., 1999).
- Progestin-only (but not combined estrogen-progestin) oral contraceptives (OCs) have been associated with an increased risk of developing type 2 diabetes in women with recent GDM. In a study of Hispanic women with recent GDM who were breast feeding, the use of progestin-only OCs was associated with an increased risk of type 2 diabetes (Kjos, et al, 1998). Generalizability to other women is not yet clear.

XI. GDM Follow-Up

All women with known diagnosis of GDM should undergo

- An oral glucose tolerance test using a two-hour 75 gram oral glucose tolerance test
  - 6-12 weeks after delivery or after cessation of breast feeding.
  - Women who have an abnormal oral glucose tolerance test are therefore noted as having impaired glucose tolerance or a diagnosis of diabetes mellitus, based on ADA diagnostic criteria.
  - Those with impaired glucose tolerance should be counseled about their subsequent risk for developing overt diabetes. (See algorithm for Prevention and Delay of Type 2 Diabetes in Children and Adults with Impaired Fasting Glucose (IFG) and/or Impaired Glucose Tolerance.)

- Diabetes Education should be ordered to include meal planning to achieve ideal body weight along with other appropriate therapies as indicated on TDC algorithms for diabetes management.
- Education should include advice regarding contraception and future pregnancy plans.
- Education should include the risk towards the development of GDM in subsequent pregnancies as well as their risk for the development of type 2 diabetes in the future.
- Blood glucose measurement should be done at least at three year intervals; with hyperglycemia, more frequent testing is warranted.

REFERENCES

ACOG Practice Bulletin. Clinical management guidelines for obstetrician-gynecologists. Number 30, September 2001 (replaces Technical Bulletin Number 200, December 1994.) Gestational diabetes. *Obstet Gynecol.* 2001; 98:525.

Bevier, WC, Fischer, R, Jovanovic, L. Treatment of women with an abnormal glucose challenge test (but a normal oral glucose tolerance test) decreases the prevalence of macrosomia. *Am J Perinatol.* 1999; 16:269.

Brody, SC, Harris, R, Lohr, K (2003). Screening for gestational diabetes: a summary of the evidence for the U.S. Preventive Services Task Force. *Obstet Gynecol*, 101.

Carpenter, MW, Coustan, DR (1982). Criteria for screening tests for gestational diabetes, *American Journal of Obstet Gynecological*, 144.

Catalano, PM, Vargo, KM, Bernstein, IM, et al. Incidence and risk factors associated with abnormal postpartum glucose tolerance in women with gestational diabetes. *Am J Obstet Gynecol* 1991; 165:914.

Coustan, DR, Widness, JA, Carpenter, MW, et al., (1986). Should the fifty-gram, one-hour plasma glucose screening test for gestational diabetes be administered in the fasting or fed state? *Am Journal Obstet Gynecol,* 154.

Conway, DL, Gonzales, O, Skiver, D. Use of glyburide for the treatment of gestational diabetes: the San Antonio experience. *J Matern Fetal Neonatal Med.* 2004; 15:51.

Elliott, BD, Langer, O, Schenker, S, Johnson, RF. Insignificant transfer of glyburide occurs across the human placenta. *Am J Obstet Gynecol.* 1991; 165:807.

Ferber, KM, Keller, E, Albert, ED, Ziegler, AG. Predictive value of human leukocyte antigen class II typing for the development of islet autoantibodies and insulin-dependent diabetes postpartum in women with gestational diabetes. *J Clin Endoclinol Metab.* 1999; 84:2342.

Gestational diabetes mellitus. *Diabetes Care.* 2004; 27 Suppl 1:S88.

Jacobson, GF, Ramos, GA, Ching, JY, et al. Comparison of Glyburide and insulin for the management of gestational in a large managed care organization. *Am J Obstet Gynecol.* 2005; 193:118.

Jovonovic, L., Peterson, CM. (1985). Screening for gestational diabetes. Optimum timing and criteria for retesting. *Diabetes*, 34, Suppl, 2(21).

Kjos, SL, Peters, RK, Xiang, A, et al. Contraception and the risk of type 2 diabetes mellitus in Latina women with prior gestational diabetes mellitus. *JAMA.* 1998; 280:533.

Kjos, SL, Peters, RK, Xiang, A, et al. Predicting future diabetes in Latino women with gestational diabetes: Utility of early postpartum glucose tolerance testing. *Diabetes.* 1995; 44:586.

Laird MD, J, McFarland MD, FACE KF. Fasting blood glucose levels and initiation of insulin therapy in gestational diabetes. *Endocr Pract.* 1996; 2:330.

Langer, O, Conway, DL, Berkus, MD, et al. A comparison of Glyburide and insulin in women with gestational diabetes mellitus. *N Engl J Med.* 2000; 343:1134.

Langer, O, Yogev, Y, Xenakis, EM, Rosenn, B. Insulin and glyburide therapy: dosage, severity level of gestational diabetes, and pregnancy outcome. *Am J Obstet Gynecol.* 2005; 192:134.

Moses, RG. The recurrence rate of gestational diabetes in subsequent pregnancies. *Diabetes Care.* 1996; 19:13.

Parretti, E, Mecacci, F, Papini, M, et al. Third-trimester maternal glucose levels from diurnal profiles in non diabetic pregnancies: correlation with sonographic parameters of fetal growth. *Diabetes Care.* 2001; 24:1319.

Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. (2000). *Diabetes Care*; 23 Suppl.

Ricart, W, Lopez, J, Mozas, J, et al. (2005). Potential impact of American Diabetes Association (2000) criteria for diagnosis of gestational diabetes mellitus in Spain, *Diabetologia*, 48.

Schrader, HM, Jovanovic-Peterson, L, Bevier, W, Peterson, CM (1995). Fasting plasma glucose and glycosylated protein at 24-28 weeks of gestation predict macrosomia in the general obstetric population, *American Journal of Perinatology*, 12.

Scholl, TO, Sowers, M, Chen, X, Lenders, C. Maternal glucose concentration influences fetal growth, gestation, and pregnancy complications. *Am J Epidemiol.* 2001; 154:514.

Zucker, P, Simon, G. Prolonged symptomatic neonatal hypoglycemia associated with maternal chlorpropamide therapy. *Pediatrics.* 1968; 42:824.

Pregestational Diabetes Guidelines

Pregestational diabetes encompasses a diagnosis of type 1 or type 2 diabetes prior to gestation. It should be noted that undiagnosed pregestational diabetes is suspected in the presence of maternal hyperglycemia and fetal anomalies. The risk of fetal anomalies is therefore increased when fasting hyperglycemia is found at GDM diagnosis (Jovonovic, 2006; Sheffield, et al., 2002).

Suspect type 1 diabetes with the presence of the following (Jovonovic, 2006):

- Serum anti-insulin antibodies and anti-islet cell antibodies may be helpful for identifying type 1 diabetes in pregnant women
- GDM in lean women
- Diabetic ketoacidosis during pregnancy
- Severe hyperglycemia during pregnancy requiring large doses of insulin
- Postpartum hyperglycemia
- Type 2 diabetes and monogenic diabetes (e.g., maturity onset diabetes of the young and permanent neonatal diabetes) is difficult to distinguish from GDM
  - These pregnant women tend to be lean (while obesity is a risk factor for type 2 diabetes)
  - Should be followed for glucose status to evaluate for other disorders

Women should be directed to (Jovonovic, 2006):

- Continue self blood glucose monitoring postpartum to document persistent hyperglycemia
- Consider fasting blood glucose testing every 6 to 12 months for the next 5 to 10 years if their blood glucose is normal during this period

Pregestational Diabetes General Guidelines	Based on American College of Obstetricians & Gynecologists, 2006	
Recommendations Based on Limited or Inconsistent Scientific Evidence	Level B	
Patient Visits	Q 1–2 weeks during 1st two trimesters; weekly after 28–30 weeks of gestation	

Caloric Requirements	1. Nutrition consult warranted 2. 300 kcal higher than basal in patients with singleton fetus	Carbohydrate counting increase dietary flexibility to avoid excessive weight gain
	Normal Weight	30–35 kcal/kg/d
	< 90% desirable body weight	Increase to 30–40 kcal/kg/d
	> 120% of desirable body weight	Decrease calories to 24 kcal/kg/d
Caloric Composition	Complex, high–fiber carbohydrates	40–55%
	Protein	20%
	Unsaturated fats	30–40%
Caloric Distribution	1. 10–20%–Breakfast 2. 20–30%–Lunch 3. 30–40%–Supper 4. 30%–Snacks, prevent nocturnal hypoglycemia	Artificial sweeteners safe; patient log of food intake for several days /week to adjust insulin, exercise and correlate to glucose values
Insulin Therapy Needs		
	First trimester	0.7–0.8 u/kg/d
	Second trimester	0.8–1 u/kg/d
	Third trimester	0.9–1.2 u/kg/d
Maintain Glucose at Near Normal Levels	1. Fasting < 95 mg/dl or less 2. Premeal < 100 mg/dl or less 3. 1-hour postprandial < 140 or less 4. 2-hour postprandial < 120 mg/dl or less 5. HS, not to decrease < 60 mg/dl 6. Average maintained @ 100 mg/dl 7. A1c no higher than 6%	
Induction of Labor	Note recommended for suspected fetal macrosomia	Induction does not improve fetal outcomes

Monitoring	Antepartum fetal monitoring, nonstress test, biophysical profile, contraction stress test, fetal movement counting	Valuable testing
Maintain Glucose Control Near Physiologic Levels Before, During Pregnancy	Decreases spontaneous abortion, fetal malformation, fetal macrosomia, intrauterine fetal death, neonatal morbidity	
Counseling	Teach hypoglycemia & preconceptional counseling to patient and families	Cost effective, beneficial
Cesarean Delivery	For estimated fetal weight > 4500 g	To prevent traumatic injury
Insulin Therapy During Labor & Delivery	Prior to active labor	1. Hold AM Insulin 2. Start NS IV 3. Usual dose of intermediate-acting insulin at HS
	With active labor or blood glucose < 70 mg/dl	1. IV to D5% @ 100–150 cc/h (2.5 mg/kg/min) to keep glucose at 100 mg/dl 2. Check glucose hourly to adjust insulin or infusion rate 3. Short acting IV insulin at 1.25 u/h if glucose > 100 mg/dl
DKA during Pregnancy	Laboratory assessment Document acidosis	ABGs, glucose, ketones, electrolytes at 1–2 hour intervals

	Insulin therapy	Low-dose IV @ 0.2–0.4 u/kg, loading dose; 2–10 u/h, maintenance
	Fluid therapy	1. NS, 1 L in 1st hr 2. 500–1,000 ml/h for 2–4 hrs 3. 250 ml/h until 80% replaced 4. 4–6 L, total replacement in 12 hrs
	Glucose	Start D5% NS when glucose reaches 250 mg/dl
	Potassium	If normal or reduced, start infusion @ 15–20meq/h; If elevated, wait until normal levels, then add in IV in concentration of 20–30 meq/l
	Bicarbonate	44 mEq (one ampule) to L of .45NS if pH < 7.1

Self Monitoring Blood Glucose (SMBG)

Since diabetes is primarily a disease controlled by the patient, it is extremely important for the patient to monitor their diabetes on a day-to-day basis. The frequency of self monitoring blood glucose (SMBG) depends on the type of diabetes and the level of blood glucose control desired. One of the main purposes of blood glucose measurements is to assist in making adjustments in treatment, through either dietary intake, medications, activity levels or a combination of all 3 factors.

FREQUENCY OF TESTING

Type 1

- Ideally, test before and after meals and at bedtime. (Some school age children do not like to test at school.)
- For those patients on bedtime insulin, checking a 3:00 a.m. blood glucose is necessary at least 1x/week. If the patient is awakened during the night with signs and symptoms of hypoglycemia, if the fasting glucose continues to rise with increasing bedtime insulin or if the patient complains of restless sleep, a glucose check at 3:00 a.m. is required to better determine correct insulin dosage.
- Once stable, patients should alternate times to SMBG throughout the day.
- Test before, during, and after vigorous activity to avoid hypoglycemia.
- Increased testing is indicated if the patient has hypoglycemic or hyperglycemic symptoms and during periods of illness, injury, or stress.

Type 2

Recommended for those on insulin or oral medications and during periods of stress, such as infection or trauma.

- Depending on degree of control desired, test glucose before breakfast and before supper.
- Some patients may require testing before each meal and at bedtime.
- For those patients on bedtime insulin, checking blood sugar at 3:00 a.m. is necessary at least 1x/week. If the patient is awakened during the night with signs and symptoms of hypoglycemia, if the fasting glucose continues to rise with increasing bedtime insulin, or if the patient complains of restless sleep or awakening with a headache, a glucose check at 3:00 a.m. is required to better determine the correct insulin dosage.
- More frequent blood glucose measurements are indicated when changes are made in medication or insulin.
- If blood glucose levels are stable, test before breakfast and before supper, 2–3x/week.

Use of SMBG for those who are being treated only with a healthy eating plan is controversial. Many patients may benefit by measuring their responses to different foods and activities. The immediate feedback of SMBG can assist patients with making appropriate dietary modifications to improve future glucose results. They will want to SMBG more frequently during periods of stress or illness.

Glycemic Control Goals (nonpregnant adults)

TIME OF DAY	NORMAL VALUES NON-DIABETIC	ADA* GOALS	AACE** GOALS	ACTION SUGGESTED IF:
Fasting	< 100 mg/dL	90 – 130 mg/dL	< 110 mg/dL	< 80 or > 140 mg/dL
Preprandial (Before meals and snacks)	< 110 mg/dL	90 – 130 mg/dL	< 110 mg/dL	< 80 or > 140 mg/dL
After meals	70-140 mg/dL	< 180 mg/dL (peak)*	< 140 mg/dL (2 hrs. after meal)	Determined by clinician
Bedtime	< 110 mg/dL	110 – 150 mg/dL	unavailable	< 110 or > 160 mg/dL
A1c (also called glycosylated hemoglobin A1c, HbA1c or glycohemoglobin A1c)	< 6%	< 7% (a) or as close to normal (<6%) without significant hypoglycemia (b)	≤ 6.5%***	> 7%

* Diabetes Care. 2007 Jan; 30 Suppl 1: S9-10

** American Association of Clinical Endocrinologists (AACE), Medical Guidelines for the Management of Diabetes Mellitus: The AACE System of Intensive Diabetes Self-Management - 2002 Update.

*** AACE (2002) and the Texas Diabetes Council (2007).

a. For patients in general with diabetes b. For the individual with diabetes

• **See Glycemic Control Algorithm:**
Glycemic Control for Type 2 Diabetes in Children and Adults

A ten-year study showed that patients with type 1 who kept their blood glucose near these levels developed significantly fewer diabetes-related complications. Even if blood glucose levels were not in the desirable range, any lowering of blood glucose reduced the chances of developing complications.

In the following groups of people, glycemic control goals may be more relaxed

- In the elderly, infants and toddlers;
- In patients with hypoglycemic unawareness;

- In patients with advanced renal or cardiac disease;
- In patients experiencing difficulties with following their treatment plan.

To avoid symptoms of hyperglycemia in these groups, keeping blood glucose under 150 mg/dL is recommended.

Special considerations in SMBG

1. It is often helpful for patients to document their glucose results in a written log. This activity can assist patients in seeing glucose patterns during certain times of the day. It can also be helpful in making correlations between medications, dietary intake, activity and resulting glucose levels.
2. If available, patients can benefit from utilizing computer-downloading features of the meters. The glucose data can be grouped based on time of day, day of the week, weekends vs. weekdays, as well as providing markers of meals, activity and medication times. These computer programs are available for health care professionals' use in the office as well as being available to the patients to use at home.
3. Assess your patient's level of competence and select a glucose meter that best meets their needs. Not all patients will benefit from added features and the "extras" may just confuse the patient more.
4. Instruct the patient on the proper use of their particular glucose meter. Encourage the patient to read the instruction manual and know how to set the correct date and time, how to recall data, how to change the battery and how to trouble-shoot the meter for problems. Be sure the patient is aware that some meters may read the glucose results in mmol rather than mg/dL.
5. Instruct patients to check the expiration date and the proper means of storage and handling for their glucose monitoring strips
6. Instruct patients on interpreting the glucose results. It is not enough to just monitor the glucose. The patient needs to understand the correlation between the food they eat, the medications they take, their activity level and the resulting glucose level. The patient must be provided with guidelines on adjusting their insulin dosages for optimal glucose control.

Pregnancy in Preexisting Diabetes – Type 1 and Type 2

- Tight blood glucose control before conception and throughout pregnancy is critical for optimal outcomes.
- Testing before each meal, 1–2 hours after meals and at bedtime every day and 1–2x/week at 3:00 a.m. are optimal.
- Insulin treatment is recommended if the fasting glucose >105 mg/dL and/or 2 hour postprandial levels are >120 mg/dL

Gestational Diabetes

- A controversy exists regarding the best times to monitor. Fasting and 2-hour post-meal blood glucose testing are most commonly used. Studies have shown that fasting and 1 hour after meal testing resulted in improved glycemic control.
- Insulin treatment is recommended if fasting glucose >105 mg/dL and/or 2-hour postprandial levels are >120 mg/dL

Monitoring in the hospital setting

Managing hospitalized patients with diabetes should include capillary blood glucose measurements at the bedside. This should be part of the patients' "vital signs." Results can be obtained rapidly, and therapeutic decisions can be made that result in improved management and shortened hospital stays. Using capillary blood glucose tests instead of venipunctures enhances the patients' comfort and provides an opportunity for the patient to learn SMBG. Adequately trained personnel must perform bedside glucose tests. According to the American Diabetes Association in 2003, the "use of bedside blood glucose monitoring requires 1) clear administrative responsibility for the procedure, 2) a well-defined policy/procedure manual, 3) a training program for those personnel doing the testing, 4) quality control procedures, and 5) regularly scheduled equipment maintenance." Frequency of measurement should be individualized based on each patient's condition and health care provider recommendation.

Glucose monitoring systems cannot and should not replace laboratory glucose determinations, but they can greatly reduce their frequency and supplement expensive laboratory data.

A1c and self-monitoring of blood glucose (SMBG)

Another means of managing diabetes is with a hemoglobin A1c test, or often simply called an A1c. This test reflects the glucose (or blood sugar) control over the past 3 months. Testing the A1c level every 3 months is a good way to understand how well glucose levels are controlled over a long period and can help understand how SMBG frequency, timing, meal plans, and medications may need to be changed or adjusted.

Reasons to check blood glucose more frequently

- When diabetes medicine changes
- When initiating other kinds of medicines
- When making dietary changes
- When exercise routine or activity level changes
- When level of stress increases
- When the patient is sick. When ill, even without eating, glucose levels may run high, so testing is important!

Other reasons to check blood glucose

- When symptoms of low blood sugar (hypoglycemia) occur, which include dizziness, shaking, sweating, chills, and confusion
- When there are symptoms of high blood sugar (hyperglycemia), which include sleepiness, blurred vision, frequent urination, and excessive thirst
- To learn how meals, physical activity, and medicine affect blood glucose levels
- To document how well blood sugar is controlled
- When patients have a job in which poor control could cause safety problems
- To help a patient decide if it is safe to drive or perform other tasks that require concentration if taking insulin or have had hypoglycemia in the past

Sacks DB, Bruns DE, Goldstein DE, MacLaren NK, McDonald JM, Parrott M: Guidelines and recommendations for laboratory analysis in the diagnosis and management of diabetes mellitus. *Diabetes Care* 25:750–786, 2002

The National Committee for Clinical Laboratory Standards: Ancillary (Bedside) Blood Glucose Testing in Acute and Chronic Care Facilities: Approved Guideline. Villanova, PA, National Committee for Clinical Laboratory Standards, 1994

Hypoglycemia

BLOOD GLUCOSE LESS THAN 70 MG/DL

Onset:	Sudden	
Symptoms:	Shaky	Hungry
	Tired/sleepy	Headache
	Grouchy/irritable	Poor concentration
	Rapid heart beat	Numbness or tingling around mouth or tongue
	Sweaty	
Causes:	Delayed or missed meal	
	Too much exercise	
	Too much insulin/diabetes pill	
Treatment:	Eat a food containing 15 gm fast-acting carbohydrate (sugar) —	
	1/2 c. juice or regular soda	6–7 hard candies (not sugar free)
	5 sugar cubes	3 glucose tablets (5 grams glucose each)
	1 small box of raisins	8 oz. skim milk

Patients should always carry quick-acting carbohydrate (sugar). If they get symptoms, they should eat one of the foods listed above. They should feel better in 15 minutes. Recheck blood sugar. May repeat if needed. If the next meal is more than one hour away, most can eat one of the following: 1 peanut butter sandwich, cheese and crackers, or drink 1 cup skim milk.

If patient is unable to eat/drink but still conscious, a helper can quickly apply glucose gel or cake frosting to the gums and massage.

DO NOT GIVE FLUIDS IF UNCONSCIOUS/UNABLE TO SWALLOW. If unable to swallow, a family member/friend must inject 1 vial of glucagon subcutaneously. Instruct patient to notify their health care provider if they have three episodes of hypoglycemia within a one-week period or if one episode results in loss of consciousness.

PREVENTION:
Follow meal plan, don't skip
Take medication as prescribed
Monitor blood sugar regularly

OBTAIN DIABETES EDUCATION

Hyperglycemia

BLOOD GLUCOSE MORE THAN 240 MG/DL

Onset:	Can develop slowly, getting a little higher each day. Can develop quickly after a big meal or illness.	
Symptoms:	Thirstier than usual Urinary frequency Blurred vision Cuts/sores that heal slowly	Hungrier than usual More tired/sleepier than usual Dry, itchy skin
Causes:	Too much food Too little/no exercise	Not enough insulin/diabetes pill Infection/stress/illness
Treatment:	Take diabetes medication Identify possible causes	Drink more water Walk or mild physical activity unless glucose > 300 mg/dL or as health care provider advised

If blood sugar suddenly goes over 200 mg/dL, continue with treatment plan. Check sugars frequently to assure they are returning to normal level. Encourage more sugar-free fluids; for example, 8 oz. of water per hour. Notify health care provider if blood sugars are averaging over 200 mg/dl for a week or more.

PREVENTION:

Follow meal plan

Monitor blood sugar regularly

Regular exercise as advised by health care provider

Take medications as prescribed.

OBTAIN DIABETES EDUCATION

Vibrio vulnificus

What is *Vibrio vulnificus*?

Vibrio vulnificus is a bacterium in the same family as those that cause cholera. It normally lives in warm seawater and is part of a group of vibrios that are called "halophilic" because they require salt.

What type of illness does *V. vulnificus* cause?

V. vulnificus can cause disease in those who eat contaminated seafood or have an open wound that is exposed to seawater. Among healthy people, ingestion of *V. vulnificus* can cause vomiting, diarrhea, and abdominal pain. In immunocompromised persons, particularly those with chronic liver disease, *V. vulnificus* can infect the bloodstream, causing a severe and life-threatening illness characterized by fever and chills, decreased blood pressure (septic shock), and blistering skin lesions. *V. vulnificus* bloodstream infections are fatal about 50% of the time.

V. vulnificus can also cause an infection of the skin when open wounds are exposed to warm seawater; these infections may lead to skin breakdown and ulceration. Persons who are immunocompromised are at higher risk for invasion of the organism into the bloodstream and potentially fatal complications.

How common is *V. vulnificus* infection?

V. vulnificus is a rare cause of disease, but it is also underreported. Between 1988 and 1995, CDC received reports of over 300 *V. vulnificus* infections from the Gulf Coast states, where the majority of cases occur. There is no national surveillance system for *V. vulnificus*, but CDC collaborates with the states of Alabama, Florida, Louisiana, Texas, and Mississippi to monitor the number of cases of *V. vulnificus* infection in the Gulf Coast region.

How do persons get infected with *V. vulnificus*?

Persons who are immunocompromised, especially those with chronic liver disease, are at risk for *V. vulnificus* when they eat raw seafood, particularly oysters. A recent study showed that people with these pre-existing medical conditions were 80 times more likely to develop *V. vulnificus* bloodstream infections than were healthy people. The bacterium is frequently isolated from oysters and other shellfish in warm coastal waters during the summer months. Since it is naturally found in warm marine waters, people with open wounds can be exposed to *V. vulnificus* through direct contact with seawater. There is no evidence for person-to-person transmission of *V. vulnificus*.

How can *V. vulnificus* infection be diagnosed?

V. vulnificus infection is diagnosed by routine stool, wound, or blood cultures; the laboratory should be notified when this infection is suspected by the physician, since a special growth medium can be used to increase the diagnostic yield. Doctors should have a high suspicion for this organism when patients present with gastrointestinal illness, fever, or shock following the ingestion of raw seafood,

especially oysters, or with a wound infection after exposure to seawater.

How is *V. vulnificus* infection treated?

If *V. vulnificus* is suspected, treatment should be initiated immediately because antibiotics improve survival. Aggressive attention should be given to the wound site; amputation of the infected limb is sometimes necessary. Clinical trials for the management of *V. vulnificus* infection have not been conducted. The antibiotic recommendations below come from documents published by infectious disease experts; they are based on case reports and animal models.

- Culture of wound or hemorrhagic bullae is recommended, and all *V. vulnificus* isolates should be forwarded to a public health laboratory
- Blood cultures are recommended if the patient is febrile, has hemorrhagic bullae, or has any signs of sepsis

Antibiotic therapy:

- Doxycycline (100 mg p.o./IV twice a day for 7–14 days) and a third-generation cephalosporin (e.g., ceftazidime 1–2 g IV/IM every eight hours) is generally recommended
- A single agent regimen with a fluoroquinolone such as levofloxacin, ciprofloxacin or gatifloxacin, has been reported to be at least as effective in an animal model as combination drug regimens with doxycycline and a cephalosporin
- Children, in whom doxycycline and fluoroquinolones are contraindicated, can be treated with trimethoprim-sulfamethoxazole plus an aminoglycoside
- Necrotic tissue should be debrided; severe cases may require fasciotomy or limb amputation

Are there long-term consequences of *V. vulnificus* infection?

V. vulnificus infection is an acute illness, and those who recover should not expect any long-term consequences.

What can be done to improve the safety of oysters?

Although oysters can be harvested legally only from waters free from fecal contamination, even legally harvested oysters can be contaminated with *V. vulnificus* because the bacterium is naturally present in marine environments. *V. vulnificus* does not alter the appearance, taste, or odor of oysters. Timely, voluntary reporting of *V. vulnificus* infections to CDC and to regional offices of the Food and Drug Administration (FDA) will help collaborative efforts to improve investigation of these infections. Regional FDA specialists with expert knowledge about shellfish assist state officials with tracebacks of shellfish and, when notified rapidly about cases, are able to sample harvest waters to discover possible sources of infection and to close oyster beds when problems are identified. Ongoing research may help us to predict environmental or other factors that increase the chance that oysters carry pathogens.

How can I learn more about *V. vulnificus*?

You can discuss your medical concerns with your doctor or other health care provider. Your local city or county health department can provide information about this and other public health problems that are occurring in your area. Information about the potential dangers of raw oyster consumption is available 24 hours a day from the FDA's Seafood Hotline (telephone 1-800-332-4010); FDA public affairs specialists are available at this number between 12 and 4 p.m. Monday through Friday. Information is also available on the internet at: **http://vm.cfsan.fda.gov.**

Some tips for preventing *V. vulnificus* infections, particularly among immunocompromised patients, including those with underlying liver disease:

- Do not eat raw oysters or other raw shellfish.
- Cook shellfish (oysters, clams, mussels) thoroughly:
  - For shellfish in the shell, either a) boil until the shells open and continue boiling for 5 more minutes, or b) steam until the shells open and then continue cooking for 9 more minutes. Do not eat those shellfish that do not open during cooking. Boil shucked oysters at least 3 minutes, or fry them in oil at least 10 minutes at 375°F.
- Avoid cross-contamination of cooked seafood and other foods with raw seafood and juices from raw seafood.
- Eat shellfish promptly after cooking and refrigerate leftovers.
- Avoid exposure of open wounds or broken skin to warm salt or brackish water, or to raw shellfish harvested from such waters.
- Wear protective clothing (e.g., gloves) when handling raw shellfish.

Date: October 25, 2005
Content source: National Center for Infectious Diseases/Division of Bacterial and Mycotic Diseases

Chronic Complications of Diabetes

High levels of sugar (glucose) in the blood vessels over time lead to a variety of medical problems because too much sugar damages the lining of large and tiny blood vessels and other body tissues. Fortunately, early diagnosis and daily blood sugar control are possible with good nutrition, daily physical activity, weight control, taking prescribed medication and self-testing of blood sugar. Daily diabetes care means living a healthy lifestyle, often one that benefits the whole family.

Heart disease

- Heart disease is the most common reason that adults with diabetes die at an earlier age. Adults with diabetes are two to four times more likely to die from heart disease than people without diabetes.

Stroke

- The risk for stroke is also 2 to 4 times higher among people with diabetes. Having high blood pressure—higher than 130/80 mm Hg—or high blood fats (lipids) further increases the chances for persons with diabetes to have heart disease and/or stroke.

- **See Cardiovascular Risk Reduction Algorithm:** Hypertension for Diabetes in Adults
- **See Cardiovascular Risk Reduction Algorithm:** Lipid Treatment for Type 1 and Type 2 Diabetes in Adults
- **See Cardiovascular Risk Reduction Algorithm:** Macrovascular Risk Reduction: Antiplatelet Therapy

Blindness

- Diabetes is the leading cause of new blindness among adults because high sugar levels damage tiny blood vessels in the retina at the back of the eye.

Kidney disease

- Diabetes is the leading cause of kidney (renal) disease in the United States also because high sugar levels damage tiny blood vessels in the kidneys. Many people then require dialysis or kidney transplantation.

Nervous system disease

- About 60% to 70% of people with diabetes have mild to severe forms of nervous system damage. The results of such damage include loss of usual sensation or feeling pain in the feet

or hands, slowed digestion of food in the stomach, carpal tunnel syndrome, sexual impotence, and other nerve problems.

- Severe forms of diabetic nerve disease increase the risk of lower-limb (toe, foot, or leg) amputations.

Amputations

- More than half of nontraumatic lower-limb amputations in the United States occur among people with diabetes.
- Preventing amputations takes good blood sugar control, protective footwear (not walking around barefoot), daily inspections at home for cuts that a person might not feel, proper nail trimming, foot checks at every doctor visit, and a foot exam for sensation at least yearly.

- **See Foot Care Recommendations:** Foot Screening Mapping Examples
- **See Foot Care Recommendations:** Diabetic Foot Screen
- **See Foot Care Recommendations:** Diabetic Foot Exam
- **See Foot Care Recommendations:** Diabetic Foot Care/Referral
- **See Foot Care Algorithm:** High Risk Scenario & Ulcer Management
- **See Pain Management Recommendations:** Recommendations for Treatment of Painful Peripheral Diabetic Neuropathy

Dental disease

- Periodontal or gum diseases are more common among people with diabetes than among people without diabetes.
- Almost one third of people with diabetes have severe gum diseases in which the teeth get too loose.

Complications of pregnancy

- Poorly controlled diabetes before and during the first trimester of pregnancy can cause major birth defects in 5% to 10% of pregnancies and miscarriage in 15% to 20% of pregnancies.
- Poorly controlled diabetes during the second and third trimesters of pregnancy can result in excessively large babies, posing a risk to the mother and the child.

Other complications

- Uncontrolled diabetes often leads to imbalances that can threaten life, such as diabetic ketoacidosis and nonketotic coma.

- People with diabetes are more susceptible to infectious illnesses and, if they have these illnesses, are more seriously ill or die than people without diabetes. For example, they are more likely to be seriously ill with pneumonia or influenza than people who do not have diabetes.

Targets for Preventing Chronic Complications

- Monitor blood glucose.
- Control blood sugar (glucose) to near normal levels: blood sugars usually range from 70 to 100/110 mg/dL.
- Fill prescriptions and take medicines as prescribed; patient should tell doctor, pharmacist, or nurse about any problems related to getting or taking all the medicines.
- Get to and stay at a good body weight for height and build; a health care provider can measure body mass index (BMI) and help set an appropriate goal.
- Control blood pressure: goal is ≤ 130/80 mmHg.
- Control blood fats (lipids/cholesterol and triglycerides).
- Daily physical activity: 30 minutes a day of moderate to vigorous activity.
- Daily balanced eating habits; limit high fat foods.

Educating the Person with Diabetes

PRINCIPLES OF ADULT EDUCATION

Adults:

1. Are motivated to learn when they identify a need to learn or when social or professional pressures require new learning.
2. Are more likely to learn when content is organized in attractive learning packages.
3. Are self-directed and like to determine their specific learning experiences.
4. Enjoy small group interactions.
5. Draw their knowledge from years of experience and do not change readily.
6. Learn from others' experiences as well as from their own.
7. Want practical answers to current problems and enjoy problem solving.
8. Like physical comfort and a relaxing atmosphere.
9. Like tangible rewards.
10. Hate to have their time wasted.

STEPS TO AID RECALL

1. Present instructions in a clear, simple manner.
2. Make advice detailed and specific.
3. Repeat and stress areas of particular importance.
4. Break instructions down into categories.
5. Check for understanding by asking person to repeat instructions and/or return demonstrations.
6. Utilize a variety of teaching methods such as diagrams, models, videos, etc., to reinforce verbal instructions.
7. Positively reinforce accurate recall of information.

STRATEGIES TO INCREASE ADHERENCE

1. Involve person in establishing treatment goals.
2. Keep it simple.
3. Tailor treatment to fit the person's lifestyle.
4. Utilize reminders.
5. Seek and encourage family support.
6. Inform individual of desirable and undesirable effects of medications or treatments; let them know what to expect.
7. Monitor adherence.
8. Give feedback.

THE THREE DOMAINS OF LEARNING

1. **Cognitive** — learning that requires thinking
2. **Affective** — learning that requires a change in beliefs
3. **Psychomotor** — learning of skills and performance

THE EDUCATIONAL PROCESS

I. Assess

- A. Prior education and health beliefs
- B. Current routine and skills
  1. Medication(s)
  2. Monitoring
  3. Meal plan
  4. Exercise/activity level
- C. Physical limitations
  1. Altered vision
  2. Hearing loss
  3. Arthritis/tremors
  4. Memory deficits
  5. Concurrent illnesses
- D. Literacy and cognitive ability
- E. Psychosocial
  1. Support system
  2. Financial and transportation limitations
  3. Emotional status

II. Develop plan

- A. Goals and objectives
- B. Topics and content
- C. Activities
- D. Documentation
- E. References

III. Implement plan

- A. Keep in mind strategies that facilitate learning

IV. Evaluate

- A. Continued follow-up
- B. Referral to other agencies or health care providers

Teaching Strategies for Diverse Populations

An individualized education plan should be designed for every patient. The education plan should include basic skills and daily self-management practices.

Basic skills include:
Safe practices of medication administration
Meal planning
Hypoglycemia management
Self-blood glucose monitoring

Daily self-management practices include: Prevention and management of complications

Diabetes education is critical for proper disease management, but barriers to care often pose major obstacles towards achieving the implementation phase of AADE's Standards of Care. Communication barriers, financial/legal problems, and cultural barriers are known to hinder medical care.

Minimizing the language barrier would expedite the teaching-learning process. The following suggestions can be used by health care providers whose cultural background is different from the patient's.

1. Learn a few words, sentences or phrases in your target group's language to start a positive working relationship.
2. Use appropriate terms when addressing or referring to diverse groups (i.e., Hispanic/Latinos, Puerto Ricans, Mexicans, Cubans, instead of minorities).
3. Demonstrate respect, tolerance, and acceptance of different ideas.
4. Judge the merits of behavior rather than letting tone of voice, communication style or accent influence your behavior.
5. Ask questions. "If you don't ask, you won't know."
6. Observe; be aware of body language.
7. Establish relationships with several cultural groups to facilitate better understanding of the groups' values, beliefs, and communication style.
8. Be patient. Don't give up easily.
9. Develop culturally appropriate educational activities.
10. Identify appropriate communication channels for each ethnic group, i.e., church leaders or family.
11. Translate educational material appropriate for the ethnic group or subgroup. Spanish material may not be appropriate for various Hispanic cultures.
12. Identify culturally appropriate communication themes. Identify an adult translator preferably of the same gender.
13. Pamphlets and brochures should be well illustrated, geared to the appropriate reading level and in the preferred language.

14. Visit the patient's home.
15. Recommend US Dept. of Health and Human Services' *Diccionario de la Diabetes*, which is at a lower reading level for explanation of terminology in conjunction with frequently used terms by specific ethnic groups.
16. Recommend patient have an active support person who has an interest in learning and assisting the patient in every aspect of diabetes self-management.

STANDARDS AND REVIEW CRITERIA

National Standards for Diabetes Self-Management Education

CAROLÉ MENSING, RN, MA, CDE (TASK FORCE CHAIR)
JACKIE BOUCHER, MS, RD, LD, CDE
MARJORIE CYPRESS, MS, C-ANP, CDE
KATIE WEINGER, EDD, RN
KATHRYN MULCAHY, MSN, RN, CDE
PATRICIA BARTA, RN, MPH, CDE
GWEN HOSEY, MS, ARNP, CDE
WENDY KOPHER, RN, C, CDE, HTP
ANDREA LASICHAK, MS, RD, CDE
BETTY LAMB, RN, MSN
MAVOURNEEN MANGAN, RN, MS, ANP, C, CDE
JAN NORMAN, RD, CDE
JON TANJA, BS, MS, RPH
LINDA YAUK, MS, RD, LD, CDE
KIMBERLYDAWN WISDOM, MD, MS
CYNTHIA ADAMS, PHD

PROBLEM STATEMENT — Diabetes Self-Management Education (DSME) is the cornerstone of care for all individuals with diabetes who want to achieve successful health-related outcomes. The National Standards for DSME are designed to define quality diabetes self-management education that can be implemented in diverse settings and will facilitate improvement in health care outcomes. The dynamic health care process obligates the diabetes community to periodically review and revise these standards to reflect advances in scientific knowledge and health care.

Therefore, the Task Force to review the National Standards for DSME was convened to review the current standards for their appropriateness, relevancy, and scientific basis, and to be sure they are specific and achievable in multiple settings.

PROCEDURE FOR REVISION OF THE NATIONAL STANDARDS FOR DIABETES SELF-MANAGEMENT EDUCATION PROGRAMS

— The Task Force to Review and Revise the National Standards for Diabetes Self-Management Education Programs decided to do the following:

1. Critically review the current standards and prepare an evidence-based review of the literature.
2. Revise the National Standards for Diabetes Self-Management Education Programs as appropriate.

Establishing procedure

The Task Force began this task by outlining a process to be used for accomplishing its charge:

- Examine the adequacy of representation on the Task Force itself to ensure fair, relevant, and impartial revisions of the National Standards (the sponsoring organization for this revision of the National Standards is the American Diabetes Association).
- Perform an initial review of the current standards to identify areas that need to be addressed.
- Collect input from individuals and organizations who utilize the current standards.
- Set a timeline for accomplishing the charge.
- Critically review each standard and perform a review of the literature for each.
- Review new trends in diabetes education and care.
- Review the National Standards to ensure quality and consistency with the current American Diabetes Association Standards of Medical Care.
- Obtain critiques from secondary sources interested or involved in diabetes care.
- Perform a final review of the revised National Standards.
- Recommend the revised National Standards to the organizations represented on the Task Force for their review, endorsement, and implementation.
- Publish the new National Standards.

REPRESENTATION ON THE TASK FORCE

— Representation on the Task Force consisted of individuals from all major organizations and disciplines with significant interest in the provision of quality diabetes care and self-management education. It was decided that payers or purchasers of care would be used only as advisors and not as Task Force members. Thus, the following organizations, federal agencies, federally funded programs, and disciplines are represented on the Task Force:

Organizations, federal agencies, and federally funded programs

- American Diabetes Association
- American Association of Diabetes Educators
- American Dietetic Association
- Veteran's Health Administration
- Centers for Disease Control and Prevention
- Indian Health Service
- National Certification Board for Diabetes Educators
- Juvenile Diabetes Foundation International
- Diabetes Research and Training Centers

Disciplines

- Behaviorist (EdD)
- Pharmacist (RPh)
- Physician (MD)
- Registered dietitian (RD)
- Registered nurse (RN)

PROCESS — The goal for review, revision, and publication completion was 2 years. The committee first convened in October 1998 and reconvened in January, May, and October 1999. The technical review subgroup convened in July 1999 and then held weekly conference calls from July through October 1999. The entire group reconvened in October 1999 to finalize the proposed draft of the revised standards to share with the represented organizations. The represented organizations were sent the final draft December 1999. All represented organizations approved the revised standards. The final document was submitted for publication in spring 2000.

STANDARDS

Structure

Standard 1. *The DSME entity will have documentation of its organizational structure, mission statement, and goals, and will recognize and support quality DSME as an integral component of diabetes care.*

In the business literature, case studies and case report investigations on success-

ful management strategies emphasize the importance of clear goals and objectives, defined relationships and roles, and managerial support (1–4). This concept is relatively new in the health care industry. The business literature and health policy experts and organizations have emphasized written commitments, policies, support, and the importance of outcome variables in quality improvement efforts (1,5–16). The continuous quality improvement literature also stresses the importance of developing policies, procedures, and guidelines (1,5).

Documentation of the organizational structure, mission statement, and goals can lead to efficient and effective provision of education programs. Documentation of organizational structure delineates channels of communication, and organizational commitment to educational programs (17–20). According to the Joint Commission on Accreditation of Health Care Organizations (JCAHO) (5), this type of documentation is equally important for small and large health care organizations. Health care and business experts overwhelmingly agree that documentation of the process of providing services is a critical factor in clear communication and provides a solid basis on which to deliver quality diabetes education (1,5,12,14,15).

Standard 2. *The DSME entity will determine its target population, assess educational needs, and identify the resources necessary to meet the self-management educational needs of the target population(s).*

Clarifying the target population and determining self-management educational needs allow health care providers to focus resources and maximize health benefits (14,21–23). The assessment of the population should identify the educational needs of all individuals with diabetes, not just those who frequently attend medical appointments (21). DSME is a critical component of diabetes treatment (24), yet the majority of individuals with diabetes do not receive any formal diabetes education (25). Demographic variables, such as ethnic background, formal education level, reading ability, and barriers to participation in education, must be considered to maximize the effectiveness of self-management education (26–29).

Standard 3. *An established system (committee, governing board, advisory body) involving professional staff and other stakeholders will participate annually in a planning and review process that includes data analysis and outcome measurements, and addresses community concerns.*

An established system (e.g., committee, governing board, advisory body) provides a forum and mechanism essential for activities that serve to sustain the DSME entity (9,18,19,30,31). Consumer, professional, and community involvement in educational planning and evaluation of outcomes (1,5,12,14,15) can result in DSME that is more responsive to consumer-identified needs, more culturally relevant, and of greater personal interest to consumers (30,32–35).

Standard 4. *The DSME entity will designate a coordinator with academic and/or experiential preparation in program management and the care of individuals with chronic disease. The coordinator will oversee the planning, implementation, and evaluation of the DSME entity.*

The role of the coordinator is essential to ensure that quality diabetes education is delivered through a coordinated and systematic process. As new and creative methods to deliver education are explored, the coordinator plays a pivotal role in ensuring the accountability and continuity of the educational process (19, 36–38). The individual serving as the coordinator will be most effective if there is familiarity with the lifelong process of managing a chronic disease (i.e., diabetes).

Standard 5. *DSME will involve the interaction of the individual with diabetes with a multifaceted education instructional team, which may include a behaviorist, exercise physiologist, ophthalmologist, optometrist, pharmacist, physician, podiatrist, registered dietitian, registered nurse, other health care professionals, and paraprofessionals. DSME instructors are collectively qualified to teach the content areas. The instructional team must consist of at least a registered dietitian and a registered nurse. Instructional staff must be Certified Diabetes Educators (CDEs) or have recent didactic and experiential preparation in education and diabetes management.*

DSME has been shown to be most effective when delivered by a multidisciplinary team with a comprehensive plan of care (39–50). The multidisciplinary team utilized in DSME is one in which the different team members retain their individual disciplinary identity, work interdependently, consult with one another, and have shared goals (51). The team should have a collective combination of expertise in medical treatment, medical nutrition therapy, teaching skills, and behavioral psychology (8,51–56). It is essential in this collaborative and integrated team approach that individuals with diabetes assume an active role in their care (45).

Nurses have been utilized most often as instructors in the delivery of formal DSME (39,52,57–61). Since the emergence of medical nutrition therapy (40,62–65), registered dietitians have become an integral part of the diabetes education team. In recent years, the role of the diabetes educator has also expanded to other disciplines (8,40–42,51,65–69). Although there is no evidence demonstrating that one discipline is more effective than another, the literature review favors current practice that utilizes the registered nurse and registered dietitian as key members of the multidisciplinary team preparing and assisting in the delivery of DSME (43,44,55,66). In addition to the registered nurse and registered dietitian, a number of articles reflected the ever changing and evolving health care environment and included other health professionals (e.g., physicians, behaviorists, pharmacists, exercise physiologists, ophthalmologists, optometrists, and podiatrists) and paraprofessionals as members of the educational team (41,42,68–75). However, the literature reflects that additional research is needed to demonstrate that these professionals may play a major role on the diabetes education team.

Based on expert consensus, there is support that the primary instructors on the diabetes team require specialized diabetes and educational training beyond their basic academic preparation (57,76–81). Certification as a Diabetes Educator by the National Certification Board for Diabetes Educators (NCBDE) is one way that health care professionals can demonstrate mastery of a specific body of knowledge, and such certification has grown to be the community-accepted credential for DSME (82). According to the NCBDE, there are currently more than 10,000 CDEs in the U.S.

Standard 6. *The DSME instructors will obtain regular continuing education in the areas of diabetes management, behavioral interventions, teaching and learning skills, and counseling skills.*

Studies indicate that instructors without specialized training in diabetes (51, 83–89), behavioral interventions (74,76,79,90–92), teaching and learning skills (53,93–97), and counseling skills (78,98) may not focus on patient behavior change, and therefore, clinical outcomes

may not improve. Quality diabetes care and education require that professional staff have continuing education in diabetes educational strategies and behavioral interventions beyond their basic preparation (77,78,85,87,94,98,99). Behavior and lifestyle changes are the keys to successful self-management of diabetes (74,76). Selected studies of health care professionals have shown a need for increased knowledge and ability to utilize behavioral interventions with individuals living with diabetes and other chronic diseases (79,98–101). Therefore, the instructors delivering quality DSME must remain current in therapeutic modalities and medical nutrition therapy, as well as teaching skills and behavioral interventions.

Standard 7. *A written curriculum, with criteria for successful learning outcomes, shall be available. Assessed needs of the individual will determine which content areas listed below are delivered.*

- Describing the *diabetes disease process* and treatment options
- Incorporating appropriate *nutritional management*
- Incorporating *physical activity* into lifestyle
- Utilizing *medications* (if applicable) for therapeutic effectiveness
- *Monitoring* blood glucose, urine ketones (when appropriate), and using the results to improve control
- Preventing, detecting, and treating *acute complications*
- Preventing (through *risk reduction* behavior), detecting, and treating chronic complications
- *Goal setting* to promote health, and *problem solving* for daily living
- Integrating *psychosocial adjustment* to daily life
- Promoting *preconception care*, management during *pregnancy*, and *gestational diabetes management* (if applicable)

The literature supports a strong core group of topics in the design of the curriculum (24,79,80,102–115). The curriculum is defined as a coordinated set of courses and educational experiences to accomplish a set of outcomes (116). The individual with diabetes needs the knowledge and skills to make informed choices, to facilitate self-directed behavior change (24,117,118), and ultimately to reduce the risk of complications (40,44,112). The value of diabetes education is evident from research demonstrating that patients who never received diabetes education showed a striking fourfold increased risk of a major complication (119).

Table 1—*Diabetes education curricula*

American Diabetes Association: *Life With Diabetes: A Series of Teaching Outlines by the Michigan Diabetes Research and Training Center*, 1997
American Association of Diabetes Educators: *A Core Curriculum for Diabetes Education, Third Edition*, 1998

The content areas above provide instructors with an outline for developing this content. These content areas are presented in behavioral terms and thereby guide the instructor toward creative delivery methods that promote behavior change rather than simply acquisition of knowledge. The above-listed content areas are designed to be applicable in all settings. They represent topics that can be developed in basic, intermediate, and advanced levels (see Table 1 for examples of published diabetes education curricula). Research is needed to develop further a validated core curriculum.

Process

Standard 8. *An individualized assessment, development of an educational plan, and periodic reassessment between participant and instructor(s) will direct the selection of appropriate educational materials and interventions.*

Each participant or significant other living with diabetes brings unique life experiences and preferences to an encounter that help determine the intervention. The assessment includes relevant medical history, cultural influences, health beliefs and attitudes, diabetes knowledge, self-management skills and behaviors, readiness to learn, cognitive ability, physical limitations, family support, and financial status (26,27,54,120–122).

Multiple studies evaluating attitudes and beliefs toward diabetes indicate the importance of individualizing education plans based on the assessment (25,40,54, 117,120,123–134). The bulk of the literature supports the importance of attitudes and health beliefs in diabetes care outcomes (40,53,54,135–139).

Periodic individualized reassessment determines attainment of the educational objectives or the need for additional and creative interventions and future reassessment (80,128,140–142).

Standard 9. *There shall be documentation of the individual's assessment, education plan, intervention, evaluation, and follow-up in the permanent confidential education record. Documentation also will provide evidence of collaboration among instructional staff, providers, and referral sources.*

Documentation of patient encounters in the education record guides the educational and medical process, provides evidence of communication among instructional staff, providers, and referral sources, and may prevent duplication of services (143–147). It is only through documentation in the record that information on quality of diabetes care and adherence to practice guidelines can be reviewed (145,148). The use of evidence-based performance and outcome measures has been adopted by organizations and initiatives such as the Health Care Financing Administration (HCFA), the National Committee for Quality Assurance (NCQA), the Diabetes Quality Improvement Project (DQIP), the Health Plan Employer Data and Information Set (HEDIS), and JCAHO (149–151).

Research suggests that the development of standardized procedures for documentation, training of health professionals to document appropriately, and the use of structured standardized forms based on current practice guidelines can improve documentation and may ultimately improve quality of care (148,152,153).

Outcomes

Standard 10. *The DSME entity will utilize a continuous quality improvement process to evaluate the effectiveness of the education experience provided, and determine opportunities for improvement.*

Continuous quality improvement (CQI) is an effective methodology for the development, implementation, maintenance, and enhancement of quality DSME (3,11,154,155). The effectiveness of any systematic educational effort is dependent on clearly defining set organizational goals, collecting and analyzing data, and identifying and implementing process improvement measures (155). CQI involves continuing quantitative and qualitative analysis of processes (4), and health and satisfaction outcomes.

The CQI process relies on a demonstrated organizational commitment to provide quality DSME, and an ongoing effort by all organization and DSME team members to meet the needs and expectations of individuals with diabetes and other consumers (6,10–12,15,139,156).

Table 2—*Scope of practice guidelines*

American Association of Diabetes Educators and the American Nurses Association: Scope and standards of diabetes nursing, 1998
American Dietetic Association: American Dietetic Association Standards of professional practice for dietetics professionals, 1998

Quality improvement goals and objectives are consistent with the organizational goals and are based on an assessment of the DSME entity's target populations (14).

Evaluation is planned as an essential step in the provision of quality DSME to determine if DSME goals and objectives are met (157). Monitoring participant progress (medical and behavioral) and best practices are critical to the success of DSME and can be used as a basis for quality improvement (158–162). To measure outcomes effectively, data must be collected over time and data collection instruments administered on multiple occasions.

RECOMMENDATIONS FOR OVERSIGHT AND FUTURE REVIEWS

— DSME is an integral part of diabetes care and, like many aspects of health care, is an evolving process. The standards provide a benchmark for quality assessment of DSME. Standards for DSME must be based on a combination of the best scientific evidence and best practice where evidence is lacking (see Table 2 for Scope of Practice Guidelines). As new research emerges, the standards will need to be revised, and translation of the research incorporated into the practice of diabetes education. With this in mind, the Task Force recommends the following:

- The National Standards should be reviewed and revised every 5 years or sooner if research findings indicate a need for significant changes to support evidenced-based practice.
- Participating organizations would share responsibility for coordination of the review process on a voluntary and mutually agreeable rotation schedule.
- All represented organizations should be charged with collecting data on structure, process, and outcomes of diabetes education during the interim 5-year period.
- Our exhaustive review of the literature reveals that behavioral and educational research is increasing; however, more outcomes research is needed in the area of educational and behavioral interventions and provider characteristics to prove that diabetes educational efforts improve outcomes. We look forward to greater efforts in behavioral and educational research (163).
- Behavioral research funding must be given greater attention by the Federal government and agencies such as American Association of Diabetes Educators, American Diabetes Association, Centers for Disease Control and Prevention, Indian Health Service, National Institutes of Health, and others.

DEFINITION OF TERMS

— This list was developed by the Task Force to assist in the CQI process of revision of the standards and adapted several definitions from the Center for Health Promotion's Operational Terms & Definitions (164).

best practice–A strategy or process that has been demonstrated to solve a problem, improve results, and is replicable.
clients–All individuals affected by diabetes, including people with diabetes, family members, caregivers, and significant others.
community–The social, cultural, political, and geographic environment of the DSME and its target population.
continuous quality improvement (CQI)–A cyclic series of steps designed to enhance DSME processes leading to improved patient and program outcomes. Steps include the following: identify the opportunity for improvement, collect data, analyze data, choose an approach, develop the concepts and processes, implement, evaluate and improve.
criteria–A rule or test upon which a judgment or decision can be based.
diabetes self-management education (DSME)–An interactive, collaborative, ongoing process involving the person with diabetes and the educator(s). This process includes *1*) assessment of the individual's specific education needs; *2*) identification of the individual's specific diabetes self-management goals; *3*) education and behavioral intervention directed toward helping the individual achieve identified self-management goals; *4*) evaluation of the individual's attainment of identified self-management goals (revised from *Report of the Task Force on the Delivery of Diabetes Self-Management Education and Medical Nutrition Therapy*, Diabetes Spectrum, Vol. 12, No. 1, 1999).
educational intervention–An exchange of knowledge, tools, and practices that will address the client's assessed DSME needs.
evaluation–The act of examining DSME processes and outcomes to ascertain whether the desired goals and objectives were achieved.
evidence-based–Data or expert opinion which serves as proof or testimony.
expert opinion–Beliefs expressed by individual(s) who have mastered the content of a specific area.
health professional–An individual with a license/certification/registration in a health-related field, college degree.
instructional staff–Multidisciplinary and multifaceted, experienced, skilled health professionals who work with the client in the process of DSME.
medical nutrition therapy–See *J Am Diet Assoc* 94:838–839, 1994 (Identifying patients at risk: ADA's definition for screening and nutrition assessment).
multidisciplinary–More than one discipline.
paraprofessional–Community members who serve as connectors between health care consumers and providers to promote health among groups that have traditionally lacked access to adequate care.
participant–Person with diabetes and/or family and significant other.
services–Those systems, which are derived through clear objectives and goals, that arise from the definitions of function and mission. Accomplishments and performance deal systematically with priorities, measurements, feedback, organized audit of objectives, and results.
stakeholder–A person who has a vested interest (gains or losses) in what will be learned from an evaluation and how that knowledge will be utilized. Includes individuals in program operation; those served.
standard–A delineation of acceptable levels of practice consisting of qualitative or quantitative parameters utilized in evaluation.
target population(s)–A group of individuals who meet defined specifications (e.g., age, sex, race/ethnicity, income, type of diabetes, health status, geographic location, etc.) to whom DSME activities are offered.

Acknowledgments— We thank Carol Kennedy, RN, MA; Lynn Moseley, RD, MPH;

Marilyn Gerde, RN, BSN; and Theresa Barraclough of the American Diabetes Association Education Recognition Program for their assistance with the work of the National Standards Revision Task Force.

References

1. Deming WE: *Out of the Crisis.* Cambridge, MA, Massachusetts Institute of Technology, 1986
2. Drucker PF: The objectives of a business (Chapter 7); Managing service institutions for performance in management tasks, responsibilities, practices (Chapter 14). In *The Practice of Management.* New York, Harper & Row, 1954
3. Drucker PF: *Management: Tasks, Responsibilities, Practices.* New York, Harper & Row, 1984
4. Garvin DA: The processes of organization and management. *Sloan Manage Rev:* 30– 50, summer 1998
5. Joint Commission on Accreditation of Healthcare Organizations: *Framework for Improving Performance.* Oakbrook Terrace, IL, Joint Commission on Accreditation of Healthcare Organizations, 1994
6. Berwick DM: A primer on leading the improvement of systems. *BMJ* 312:619–622, 1996
7. Clemmer TP, Spuhler VJ, Berwick DM, Nolan TW: Cooperation: the foundation of improvement. *Ann Intern Med* 128:1004– 1009, 1998
8. Courtney L, Gordon M, Romer L: A clinical path for adult diabetes. *Diabetes Educ* 23:664–671, 1997
9. Dedgeling D, Salkeld G, Dowsett J, Fahey P: Patient education policy and practice in Australian hospitals. *Patient Educ Couns* 15:127–138, 1990
10. Laffel GL, Berwick DM: Quality in health care. *JAMA* 268:407–409, 1992
11. Laffel GL, Berwick DM: Quality health care. *JAMA* 270:254–255, 1993
12. Laffel G, Blumenthal D: The case for using industrial quality management science in health care organizations. *JAMA* 262: 2869–2873, 1989
13. Solberg LI, Reger LA, Pearson TL, Cherney LM, O'Connor PJ, Freeman SL, Lasch SL, Bishop DB: Using continuous quality improvement to improve diabetes care in populations: the IDEAL model. *J Qual Improv* 23:531–591, 1997
14. O'Connor PJ, Rush WA, Peterson J, Morben P, Cherney L, Keogh C, Lasch S: Continuous quality improvement can improve glycemic control for HMO patients with diabetes. *Arch Fam Med* 5:502–506, 1996
15. Garvin DA: Leveraging processes for strategic advantage. *Harvard Bus Rev:* Sept.-Oct. 1995
16. Von Korff M, Gruman J, Schaefer J, Curry SJ, Wagner EH: Collaborative management of chronic illness. *Ann Intern Med* 127:1097–1102, 1997
17. Fox CH, Mahoney MC: Improving diabetes preventative care in a family practice residency program: a case study in continuous quality improvement. *Fam Med* 30: 441–445, 1998
18. Giloth BE: Management of patient education in US hospitals: evolution of a concept. *Patient Educ Couns* 15:101–111, 1990
19. Heins JM, Nord WR, Cameron M: Establishing and sustaining state-of-the-art diabetes education programs: research and recommendations. *Diabetes Educ* 18: 501–508, 1992
20. Mangan M: Diabetes self-management education programs in the Veterans Health Administration. *Diabetes Educ* 23:687– 695, 1997
21. O'Connor PJ, Pronk NP: Integrating population health concepts, clinical guidelines, and ambulatory medical care systems to improve diabetes care. *J Ambulatory Care Manage* 21:67–73, 1998
22. Pronk NP, O'Connor PJ: Systems approach to population health improvement. *J Ambulatory Care Manage* 20:24–31, 1997
23. Barth R, Campbell LV, Allen S, Jupp JJ, Chisholm DJ: Intensive education improves knowledge, compliance, and foot problems in type 2 diabetes. *Diabet Med* 8:111–117, 1991
24. Padgett D, Mumford E, Hynes M, Carter R: Meta-analysis of the effects of educational and psychosocial interventions on the management of diabetes mellitus. *J Clin Epidemiol* 41:1007–1030, 1988
25. Coonrod BA, Betschart J, Harris MI: Frequency and determinants of diabetes patient education among adults in the U.S. population. *Diabetes Care* 17:852–858, 1994
26. Davis TC, Crouch MA, Wills G, Miller S, Abdehou DM: The gap between patient reading comprehension and the readability of patient education materials. *J Fam Pract* 31:533–538, 1990
27. Hosey GM, Freeman WL, Stracqualursi F, Gohdes D: Designing and evaluating diabetes education material for American Indians. *Diabetes Educ* 16:407–414, 1990
28. Glasgow RE, Toobert DJ, Hampson SE: Participation in outpatient diabetes education programs: how many take part and how representative are they? *Diabetes Educ* 17:376–380, 1991
29. Kumanyaka SK, Obarzanek E, Stevens VJ, Herbert PR, Whelton PK: Weight-loss experience of black and white participants in NHLBI-sponsored clinical trials. *Am J Clin Nutr* 53:1631S–1638S, 1991
30. Butterfoss D, Goodman RM, Wandersman A: Community coalitions for prevention and health promotion: factors predicting satisfaction, participation, and planning. *Health Educ Q* 23:65–79, 1996
31. Cochran LH, Phelps LA, Cochran LL: Advisory committee in action. *Perspectives on Advisory Committees*, no date cited
32. Braithwaite RL, Murphy F, Lythcott N, Blumenthal DS: Community organization and development for health promotion within an urban black community: a conceptual model. *Health Educ* 20:56–60, 1989
33. Goodman RM, Speers MA, McLeroy K, Fawcett S, Kegler M, Parker E, Smith SR, Sterling TD, Wallerstein N: Identifying and defining the dimensions of community capacity to provide a basis for measurement. *Health Educ Behav* 25:258–278, 1998
34. CDC/ATSDR Committee on Community Engagement: *Principles of Community Engagement*, no date cited
35. First World Health Assembly: Health promotion, May 1998
36. Johnson K, Schubring L: The evolution of a hospital-based decentralized case management model. *Nurs Econ* 17:29–48, 1999
37. Diabetes Control and Complications Trial Research Group: The Diabetes Control and Complications Trial: the trial coordinator perspective. *Diabetes Educ* 15:236– 241, 1989
38. Diabetes Control and Complications Trial Research Group: The impact of the trial coordinator in the Diabetes Control and Complications Trial (DCCT). *Diabetes Educ* 19:509–512, 1993
39. Aubert RE, Herman WH, Waters J, Moore W, Sutton D, Peterson BL, Bailey CM, Koplan JP: Nurse case management to improve glycemic control in diabetic patients in a health maintenance organization. *Ann Intern Med* 129:605–612, 1998
40. Glasgow RE, Toobert DJ, Hampson SE, Brown JE, Lewinsohn PM, Donnelly J: Improving self-care among older patients with type II diabetes: the "sixty-something. . ." study. *Patient Educ Couns* 19: 61–74, 1992
41. Pfizer Inc, Glaxo-Wellcome: The Asheville Project: a special report. *Pharm Times Suppl,* Romaine Pearson Publication, October 1998
42. Baran R, Crumlish K, Patterson H, Shaw J, Erwin G, Wylie J, Duong P: Improving outcomes of community-dwelling older patients with diabetes through pharmacist counseling. *Am J Health Syst Pharm* 56:1535–1539, 1999
43. Diabetes Control and Complications Trial Research Group: Implementation protocols in the Diabetes Control and Complications Trial. *Diabetes Care* 18: 361–376, 1995
44. Diabetes Control and Complications

Trial Research Group: The effect of intensive treatment of diabetes on the development of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 14:977–986, 1993
45. Schultz JF, Sheps SG: Management of patients with hypertension: a hypertension clinic model. *Mayo Clin Proc* 69: 997–999, 1994
46. Abourizk NN, O'Connor PJ, Crabtree BF, Schnatz JD: An outpatient model of integrated diabetes treatment and education: functional, metabolic, and knowledge out-comes. *Diabetes Educ* 20:416–421, 1994
47. Franz MJ, Splett PL, Monk A, Barry B, McLain K, Weaver T, Upham P, Bergenstal R, Mazze RS: Cost effectiveness of medical nutrition therapy provided by dietitians for persons with non-insulin-dependent diabetes mellitus. *J Am Diet Assoc* 95: 1018–1024, 1995
48. Etzweiler D: Chronic care: a need in search of a system. *Diabetes Educ* 23:569–573, 1997
49. Etzweiler D: Primary-care teams and a systems approach to diabetes management. *Clin Diabetes* 12:50–52, 1994
50. Hirsch IB: The status of the diabetes team. *Clin Diabetes* 16:145–146, 1998
51. Mazze R, Albin J, Friedman J, Hahn S, Murphy JA, Reese P, Rosen S, Scaggs C, Shamoon H, Vaccaro-Olko MJ: Diabetes education teams. *Professional Education in Diabetes: Proceedings of the DRTC Conference.* National Diabetes Information Clearinghouse and National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health, December 1980
52. Koproski J, Pretto Z, Poretsky L: Effects of an intervention by a diabetes team in hospitalized patients with diabetes. *Diabetes Care* 20:1553–1555, 1997
53. Assal JP, Jacquemet S, Morel Y: The added value of therapy in diabetes: the education of patients for self-management of their disease. *Metabolism* 46:61–64, 1997
54. Gilden JL, Hendryx M, Casia C, Singh SP: The effectiveness of diabetes education programs for older patients and their spouses. *J Am Geriatr Soc* 37:1023–1030, 1989
55. Levetan CS, Salas JR, Wilets IF, Zurnoff B: Impact of endocrine and diabetes team consultation on hospital length of stay for patients with diabetes. *Am J Med* 99: 22–28, 1995
56. Hendricks LE, Hendricks RT: Teaming up with a certified diabetes educator: how and why it's beneficial for the primary-care physician. *Pract Diabetology* 16:22–23, 1997
57. Davis ED: Role of the diabetes nurse educator in improving patient education. *Diabetes Educ* 16:36–43, 1990
58. Fedderson E, Lockwood DH: An in-patient diabetes educator's impact on length of hospital stay. *Diabetes Educ* 20: 125–128, 1994
59. Edelstein EL, Cesta TG: Nursing case management: an innovative model of care for hospitalized patients with diabetes. *Diabetes Educ* 19:517–521, 1993
60. Weinberger M, Kirkman MS, Samsa GP, Shortliffe EA, Landsman PB, Cowper PA, Simel DL, Feussner JR: A nurse-coordinated intervention for primary care patients with non-insulin dependent diabetes mellitus: impact on glycemic control and health-related quality of life. *J Gen Intern Med* 10:59–66, 1995
61. Spellbring AM: Nursing's role in health promotion. *Nurs Clin North Am* 26:805–814, 1991
62. Diabetes Control and Complications Trial Research Group: Expanded role of the dietitian in the Diabetes Control and Complications Trial: implications for practice. *J Am Diet Assoc* 93:758–767, 1993
63. Delahanty LM, Halford BH: The role of diet behaviors in achieving improved glycemic control in intensively treated patients in the Diabetes Control and Complications Trial. *Diabetes Care* 16: 1453– 1458, 1993
64. Franz MJ, Monk A, Barry B, McLain K, Weaver T, Cooper N, Upham P, Bergenstal R, Mazze R: Effectiveness of medical nutrition therapy provided by dietitians in the management of non-insulin-dependent diabetes mellitus: a randomized, controlled clinical trial. *J Am Diet Assoc* 95:1009–1017, 1995
65. Khakpour D, Thompson L: The nutrition specialist on the diabetes management team. *Clin Diabetes* 16:21–22, 1998
66. Franz MJ, Callahan T, Castle G: Changing roles: educators *and* clinicians. *Clin Diabetes* 12:53–54, 1994
67. Rubin RR, Peyrot M, Saudek CD: Effect of diabetes education on self-care, metabolic control, and emotional well-being. *Diabetes Care* 12:673–679, 1989
68. Coast-Senior EA, Kroner BA, Kelley CL, Trilli LE: Management of patients with type 2 diabetes by pharmacists in primary care clinics. *Ann Pharmacother* 32: 636– 641, 1998
69. Huff PS, Ives TJ, Almond SN, Griffin NW: Pharmacist-managed diabetes education service. *Am J Hosp Pharm* 40:991–993, 1983
70. Brownstein JN, Wiggins N, Rosenthal EL, Meister JS, Lacey Y, Muhammad A: Roles and competencies of urban and rural community health advisors: findings and implications for practice from the national community health advisor study. Centers for Disease Control and Prevention: The Community Health Worker (no year cited)
71. Corkery E, Palmer C, Foley ME, Schechter CB, Frisher L, Roman SH: Effect of a bicultural community health worker on completion of diabetes education in a Hispanic population. *Diabetes Care* 20:254–257, 1997
72. Gary TL, Batts ML, Bone L, Cummings Y, Hill M, Levine D, Maguire M, Saudek C, Brancati FL: Effect of behavioral interventions on body-mass index, diet, and physical activity in urban African Americans with type 2 diabetes. *Diabetes* 48 (Suppl. 1):A37, 1999
73. Van Veldhuizen-Scott MK, Widmer LB, Stacey SA, Popovich NG: Developing and implementing a pharmaceutical care model in an ambulatory care setting for patients with diabetes. *Diabetes Educ* 21: 117–123, 1995
74. Campbell EM, Redman S, Moffitt PS, Sanson-Fisher RW: The relative effectiveness of educational and behavioral instruction programs for patients with NIDDM: a randomized trial. *Diabetes Educ* 22:379–386, 1996
75. Rubin RR, Peyrot M, Saudek CD: The effect of a diabetes education program incorporating coping skills, training on emotional well-being, and diabetes self-efficacy. *Diabetes Educ* 19:210–214, 1993
76. Anderson RM, Donnelly MB, Gressard CP: The attitudes of nurses, dietitians, and physicians toward diabetes. *Diabetes Educ* 17:261–268, 1991
77. Lorenz RA, Bubb J, Davis D, Jacobson A, Jannasch K, Kramer J, Lipps J, Schlundt D: Changing behavior: practical lessons from the Diabetes Control and Complications Trial. *Diabetes Care* 19:648–652, 1996
78. Ockene JK, Ockene IS, Quirk ME, Hebert JR, Saperia GM, Luippold RS, Merriam PA, Ellis S: Physician training for patient-centered nutrition counseling in a lipid intervention trial. *Prev Med* 24: 563–570, 1995
79. Cypress M, Wylie-Rosett J, Engel SS, Stager TB: The scope of practice of diabetes educators in a metropolitan area. *Diabetes Educ* 18:111–114, 1992
80. Leggett-Frazier N, Swanson MS, Vincent PA, Pokorny ME, Engelke MK: Telephone communication between diabetes clients and nurse educators. *Diabetes Educ* 23: 287–293, 1997
81. Flavin K, White N: The intensive insulin therapy team. *Diabetes Educ* 15:249–252, 1989
82. American Association of Diabetes Educators: The scope of practice for diabetes educators and the standards of practice for diabetes educators. *Diabetes Educ* 26: 25–31, 2000
83. Boulton AJ: Why bother educating the multi-disciplinary team and the patient? The example of prevention of lower extremity amputation in diabetes. *Patient Educ Couns* 26:183–188, 1995
84. Drass JA, Muir-Nash J, Boykin P, Turek J, Baker K: Perceived and actual level of

knowledge of diabetes mellitus among nurses. *Diabetes Care* 12:351–356, 1989
85. Gossain VV, Bowman KA, Rovner DR: The actual and self-perceived knowledge of diabetes among staff nurses. *Diabetes Educ* 19:215–219, 1993
86. Litzelman DK, Slemenda CW, Langefeld CD, Hays LM, Welch MA, Bild DE, Ford ES, Vinicor ES: Reduction of lower extremity clinical abnormalities in patients with non-insulin-dependent diabetes mellitus: a randomized, controlled trial. *Ann Intern Med* 119:36–41, 1993
87. Ruby KL, Blainey CA, Hass LB, Patrick M: The knowledge and practices of registered nurse, certified diabetes educators: teaching elderly clients about exercise. *Diabetes Educ* 19:299–306, 1993
88. Scheiderich SD, Freibaum CN, Peterson LM: Registered nurses knowledge about diabetes mellitus. *Diabetes Care* 6:57–61, 1983
89. Woolridge J, Bergeron J, Thornton C: Preventing diabetic foot disease: lessons from the Medicare shoe demonstration. *Am J Public Health* 86:935–938, 1996
90. Grey M, Boland EA, Davidson M, Yu C, Tamborlane WV: Coping skills training for youths with diabetes on intensive therapy. *Appl Nurs Res* 12:3–12, 1999
91. Kaufman MW, All AC, Davis H: The scope and practice of diabetes educators in the state of Georgia. *Diabetes Educ* 25: 56–63, 1999
92. Stott NCH, Rees M, Rollnick S, Pill RM, Hackett P: Professional responses to innovation in clinical method: diabetes care and negotiating skills. *Patient Educ Couns* 29:67–73, 1996
93. Greene DS, Beaudin BP, Bryan JM: Addressing attitudes during diabetes education: suggestions from adult education. *Diabetes Educ* 17:470–473, 1991
94. Jayne RL, Rankin SH: Revisiting nurse knowledge about diabetes: an update and implications for practice. *Diabetes Educ* 19:497–502, 1993
95. Lorenz RA: Teaching skills of health professionals. *Diabetes Educ* 15:149–152, 1989
96. Maldonato A, Bloise D, Ceci M, Fraticelli E, Fallucca F: Diabetes mellitus: lessons from patient education (Abstract). *Patient Educ Couns* 26:57–66, 1995
97. Moriarty D, Stephens L: Factors that influence diabetes patient teaching performed by hospital staff nurses. *Diabetes Educ* 16:31–35, 1990
98. Stetson BA, Pichert JW, Roach RR, Lorenz RA, Boswell EJ, Schlundt DG: Registered dietitians' teaching and adherence promotion skills during routine patient education. *Patient Educ Couns* 19: 273–280, 1992
99. Anderson RM, Donnelly MB, Funnell MM, Johnson PD: The continuing education needs of diabetes nurse educators. *J Continuing Educ Nurs* 22:163–166, 1991
100. Brown SL, Pope JF, Hunt AE, Tolman NM: Motivational strategies used by dietitians to counsel individuals with diabetes. *Diabetes Educ* 24:313–318, 1998
101. Pill R, Stot NC, Rollnick SR, Rees M: A randomized controlled trial of an intervention designed to improve the care given in general practice to type II diabetic patients: patient outcomes and professional ability to change behavior. *Fam Pract* 15:229–235, 1998
102. Armstrong CL, Brown LP, York R, Robbins D, Swank A: From diagnosis to home management: nutritional considerations for women with gestational diabetes. *Diabetes Educ* 17:455–459, 1991
103. Baker SB, Vallbona C, Pavlik V, Fasser CE, Armbruster M, McCray R, Baker R: A diabetes control program in a public health care setting. *Public Health Rep* 108:595–605, 1993
104. Carlson A, Rosenqvist U: Diabetes care organization, process, and patient outcomes: effects of a diabetes control program. *Diabetes Educ* 17:42–48, 1991
105. Colagiuri R, Colaguiri S, de Blieck C, Naidu V: Quality assurance of individual diabetes patient education. *Diabetes Educ* 20:521–525, 1994
106. Dann Urban A, Andrews Rearson MA, Murphy K: The diabetes center home care nurse: an integral part of the diabetes team. *Diabetes Educ* 24:608–611, 1998
107. Funnell MM, Arnold MS, Fogler J, Merritt JH, Anderson LA: Participation in a diabetes education and care program: experience from the diabetes care for older adults project. *Diabetes Educ* 23: 163–167, 1997
108. Green Pastors J: Alternatives to the exchange system for teaching meal planning to persons with diabetes. *Diabetes Educ* 18:57–62, 1992
109. Hinson J, Riordan K, Hemphill D, Randolph C, Fonseca V: Hypertension education: an important and neglected part of the diabetes education curriculum? *Diabetes Educ* 23:166–170, 1997
110. Klepac M: Theory and practical applications of a wellness perspective in diabetes education. *Diabetes Educ* 22:225–229, 1996
111. Lowe DH, Hogue JK, Delcher HK: Evolution of a progressive self-directed diabetes education model. *Diabetes Educ* 20:199–202, 1994
112. Peyrot M, Rubin RR: Modeling the effect of diabetes education on glycemic control. *Diabetes Educ* 20:143–148, 1994
113. Ruggierio L: Provider guidelines for improving diabetes self-management. *Med Health Rhode Island* 31:355–357, 1998
114. Michael SR, Sabo CE: The challenge of conducting clinical research in diabetes care and education. *Diabetes Educ* 22: 23–27, 1996
115. Sidorov J, Harris R: The integrated approach to diabetes mellitus: the impact of clinical information systems, consumerism, and managed care. *Diabetes Spectrum* 9:158–163, 1996
116. Karni K, Duckett L, Garloff D, Larson T, Garrard J, Thawley D, Franks R: Key elements and processes needed in curriculum design. *Clin Lab Sci* 11:70–77, 1998
117. Brown SA: Effects of educational interventions in diabetes care: a meta-analysis of findings. *Nurs Res* 37:223–230, 1988
118. Brown SA: Studies of educational interventions and outcomes in diabetic adults: a meta-analysis revisited. *Patient Educ Couns* 16:189–215, 1990
119. Nicolucci A, Cavaliere D, Scorpiglione N, Carinci F, Capani F, Tognoni G, Benedetti MM: A comprehensive assessment of the avoidability of long-term complications of diabetes. *Diabetes Care* 19:927–933, 1996
120. Davis WK, Hull AL, Boutaugh ML: Factors affecting the educational diagnosis of diabetic patients. *Diabetes Care* 4:275–278, 1981
121. Carter JS, Gilliland SS, Perez GE, Levin S, Broussard BA, Valdez L, Cunningham-Sabo LD, Davis SM: Native American diabetes project: designing culturally relevant education materials. *Diabetes Educ* 23: 133–134, 1997
122. Thomson FJ, Masson EA: Can elderly patients co-operate with routine foot care? *Diabetes Spectrum* 8:218–219, 1995
123. Anderson RM, Fitzgerald JT, Oh M: The relationship between diabetes-related attitudes and patients' self-reported adherence. *Diabetes Educ* 19:287–292, 1993
124. Beeney LJ, Dunn SM: Knowledge improvement and metabolic control in diabetes education: approaching the limits? *Patient Educ Couns* 16:217–229, 1990
125. D'Eramo-Melkus GA, Wylie-Rosett J, Hagan JA: Metabolic impact of education in NIDDM. *Diabetes Care* 15:861–868, 1992
126. Dolan Mullen P, Green LW, Persinger GS: Clinical trials of patient education for chronic conditions: a comparative meta-analysis of intervention types. *Prev Med* 14:753–781, 1985
127. Duchin SP, Brown SA: Patients should participate in designing diabetes educational content. *Patient Educ Couns* 16: 255–267, 1990
128. Estey AL, Tan MH, Mann K: Follow-up intervention: its effect on compliance behavior to a diabetes regimen. *Diabetes Educ* 16:291–295, 1990
129. Glasgow RE: A practical model of diabetes management and education. *Diabetes Care* 18:117–126, 1995
130. Glasgow RE: Behavioral and psychoso-

cial measures for diabetes care: what is important to assess? *Diabetes Spectrum* 10:12–17, 1997
131. Greenfield S, Kaplan SH, Ware JE Jr, Yano EM, Frank HJ: Patients' participation in medical care: effects on blood sugar control and quality of life in diabetes. *J Gen Intern Med* 3:448–457, 1988
132. Rosenstock IM, Strecher VJ, Becker MH: Social learning theory and the health belief model. *Health Educ Q* 15:175–183, 1988
133. Wise PH, Dowlatshahi DC, Farrant S, Fromson S, Meadows KA: Effect of computer-based learning on diabetes knowledge and control. *Diabetes Care* 9:504– 508, 1986
134. Wooldridge KL, Wallston KA, Graber AL, Brown AW, Davidson P: The relationship between health beliefs, adherence, and metabolic control of diabetes. *Diabetes Educ* 18:495–500, 1992
135. Dunn S: Rethinking the models and modes of diabetes education. *Patient Educ Couns* 16:281–286, 1990
136. Kurtz SMS: Adherence to diabetes regimens: empirical status and clinical applications. *Diabetes Educ* 16:50–56, 1990
137. Kvam SH, Lyons JS: Assessment of coping strategies, social support, and general health status in individuals with diabetes mellitus. *Psychol Rep* 68:623–632, 1991
138. Maiman LA, Becker MH, Kirscht JP, Haefner DP, Drachman RH: Scales for measuring health belief model dimensions: a test of predictive value, internal consistency, and relationships among beliefs. *Health Educ Monographs* 5:215–231, 1977
139. Young WB, Minnick AF, Marcantonio R: How wide is the gap in defining quality care? *J Nurs Adm* 26:15–20, 1996
140. Clement S: Diabetes self-management education (Technical Review). *Diabetes Care* 18:1204–1214, 1995
141. Funnell MM, Anderson RM: Patient education in the physician's office. *Pract Diabetology* 11:22–25, 1993
142. Mazzuca SA, Moorman NH, Wheeler ML, Norton JA, Fineberg NS, Vinicor F, Cohen SJ, Clark CM: The diabetes education study: a controlled trial of the effects of diabetes patient education. *Diabetes Care* 9:1–10, 1986
143. Claflin N, Hayden CT: Inderdisciplinary patient and family education. *J Health Q* 18:16–21, 1996
144. Covington DL, Maxwell JG, Clancy TV, Churchill P, Ahrens W: Poor hospital documentation of violence against women. *J Trauma Inj Infect Crit Care* 38: 412–416, 1995
145. Liesenfeld B, Heekeren H, Schade G, Hepp KD: Quality of documentation in medical reports of diabetic patients. *Int J Qual Health Care* 8:537–542, 1996
146. Ross RT, Hammen PF, Frantz EI, Paré LE, Boyd CR: Gunshot wounds: evaluating the adequacy of documentation at a level 1 trauma center. *J Trauma Inj Infect Crit Care* 45:151–152, 1998
147. South Dakota State Medical Association: Medical record documentation: is yours a help or a hindrance in a lawsuit? *J Med S Dakota State Med Assn* 51:51–52, 1998
148. Madlon-Kay DJ: Use of a structured encounter form to improve well-child documentation. *Arch Fam Med* 7:480–483, 1998
149. Daly A, Leontos C: Legislation for health care coverage for diabetes self-management training, equipment, and supplies: past, present, and future. *Diabetes Spectrum* 12:222–230, 1999
150. Lorber D: Letters, we get letters . . . *Pract Diabetology* 17:32–33, Dec 1999
151. Young-Hyman D: Provider impact in diabetes education. *Diabetes Educ* (Suppl.) 25:34–42, 1999
152. Grebe SKG, Smith RBW: Clinical audit and standardised follow up improve quality of documentation in diabetes care. *N Z Med J* 108:339–342, 1995
153. Schriger DL, Baraff LJ, Rogers WH, Cretin S: Implementation of clinical guidelines using a computer charting system: effect on the initial care of health care workers exposed to body fluids. *JAMA* 278:1585– 1590, 1997
154. Basa RP, McLeod B: Evaluation of a diabetes specialty center: structure, process, and outcome. *Patient Educ Couns* 25: 23–29, 1995
155. Gerber J: Implementing quality assurance programs in multigroup practices for treating hypercholesterolemia in patients with coronary artery disease. *Am J Cardiol* 80:57H–61H, 1997
156. Noel PH, Larme AC, Meyer J, Marsh G, Correa A, Pugh JA: Patient choice in diabetes education curriculum. *Diabetes Care* 21:896–901, 1998
157. Bartholomew LK, Parcel GS, Kok G: Intervention mapping: a process for developing theory- and evidence-based health education programs. *Health Educ Behav* 25:545– 563, 1998
158. Thompson A: Setting standards in diabetes education. *Nurs Standard* 14:25–28, 1993
159. Tildesley HD, Mair K, Sharpe J, Piaseczny M: Diabetes teaching: outcome analysis. *Patient Educ Couns* 19:59–65, 1996
160. Thacker SB, Koplan JP, Taylor WR, Hinman AR, Katz MF, Roper WL: Assessing prevention effectiveness using data to drive program decisions. *Public Health Rep* 109:187–194, 1994
161. Tilly KF, Belton AB, McLachlan JFC: Continuous monitoring of health status outcomes: experience with a diabetes education program. *Diabetes Educ* 21: 413–419, 1995
162. Beaudin CL: Outcomes measurement: application of performance standards and practice guidelines in managed behavioral healthcare. *J Nurs Care Qual* 13: 14–26, 1998
163. American Association of Diabetes Educators: Diabetes Educational and Behavioral Research Summit. *Diabetes Educ* (Suppl.) 25:1999
164. Center for Health Promotion Operational Terms & Definitions. Number 6. Health Partners, 1999

DIABETES MEDICATIONS SUPPLEMENT

WORKING TOGETHER TO MANAGE DIABETES

This medication supplement guide is to provide health care professional with at-a-glance information on medications commonly used for people with diabetes. For complete prescribing information, please consult the medications package insert or the Physicians' Desk Reference.

NDEP National Diabetes Education Program

Reviewers:

Pamela Allweiss, MD, MPH, Consultant, Centers for Disease Control and Prevention, Division of Diabetes Translation, Faculty: University of Kentucky

James Cleeman, MD, National Heart, Lung and Blood Institute, National Institutes of Health (review of sections B and C only)

Jeffrey Cutler, MD, National Heart, Lung and Blood Institute, National Institutes of Health (review of sections B and C only)

Saul Malozowski, MD, National Institute of Diabetes, Digestive and Kidney Diseases, National Institutes of Health

Amy Nicholas, Pharm D, CDE, University of Kentucky

Milissa Rock, RPh, CDE, CDM, The Diabetes Center, Old Saybrook, CT

Julio Rosenstock, MD, Dallas Diabetes and Endocrine Center, Dallas, TX (review of Table 5 Incretins and Amylins only)

Robert Vigersky, MD, Director, Diabetes Institute, Walter Reed Health Care System, Professor: Uniformed Service University of Health Science

Donald Zettervall, RPH, CDE, CDM, The Diabetes Center, Old Saybrook, CT

Credits and Acknowledgements

The NDEP thanks the following members of the NDEP Pharmacy, Podiatry, Optometry and Dental (PPOD) professionals work group for their contributions to the NDEP publication *Working Together to Manage Diabetes*, English and Spanish PPOD patient education posters and this Medications Supplement:

Barbara Aung, D.P.M.
W. Lee Ball, Jr. O.D.
Norma Bowyer, O.D., M.P.H., F.A.O.O.
Joseph M. Caporusso, DPM
Caswell Evans, D.D.S., M.P.H.
Deborah Faucette, R.Ph.
JoAnn Gurenlian, RDH, PhD
Stuart T. Haines, Pharm.D., FCCP, FASHP, BCPS
Lawrence Harkless, D.P.M.
Mimi Hartman, MA, RD, CDE
Cynthia Heard, OD
Cynthia Hodge, D.M.D.
Tom Murray, Pharm.D.
Milissa A. Rock, RPh, CDE
Ross Taubman, D.P.M.
George W. Taylor, III, DMD, DrPH
Jaime R. Torres, DPM, MS

In addition, the following NDEP staff at CDC and NIH contributed to the review and revision of these materials:

Sabrina Harper MS,
NDEP CDC Assistant Director

Joanne Gallivan, MS, RD
NDEP NIH Program Director

Jane Kelly, MD
NDEP CDC Program Director

Betsy Rodríguez, MSN, CDE
NDEP CDC

Rachel Weinstein, MEd
NDEP NIH Deputy Director

SECTION A Diabetes Medications

Table 1. Oral Agents to Treat Type 2 Diabetes

Agent	Class	Primary Action	Typical Dosage
Tolbutamide (Ornase™) Tolazamide (Tolinase™) Chlorpropamide (Diabenese™)	Sulfonylureas (1st generation)	Increases insulin production in the pancreas.	Tolbutamide: 0.25–2.0 g/day in divided doses; maximum, 3 g/day Tolazamide: 100–1,000 mg/day in divided doses; maximum, 1 g/day Chlorpropamide: 100–500 mg/day twice a day; maximum, 750 mg/day
Glyburide (Micronase™, Diabeta™, Glynase™) Glipizide (Glucotrol, Glucotrol XL™) Glimepiride (Amaryl™)	Sulfonylureas (2nd generation)	Increases insulin production in the pancreas.	Glyburide: 1.25–5 mg/once or twice a day; maximum, 20 mg/day Glynase: 0.75–12.0 mg/day; maximum 12 mg/day Glipizide: 2.5–20.0 mg/once or twice a day; maximum, 40 mg/day; or XL* 2.5–10.0 mg/once or twice a day; maximum, 20 mg/day Glimepiride: 1–8 mg/day; maximum, 8 mg/day
Repaglinide (Prandin™)	Meglitinide	Increases insulin release from pancreas.	New diagnosis or A1C <8%, 0.5 mg; A1C >8%, 1–2 mg, 15–30 min before each meal; increase weekly until results are obtained; maximum, 16 mg/day
Nateglinide (Starlix™)	Phenylalanine derivative	Increases insulin release from pancreas.	60–120 mg before each meal
Metformin (Fortamet™, Glumetza™, Glucophage™)	Biguanide	Primarily decreases hepatic glucose production. Minor increase in muscle glucose uptake which may improve insulin resistance.	500 mg/day twice a day with meals, increase by 500 mg every 1–3 wk, twice or three times a day; usually most effective at 2,000 mg/day; maximum, 2,550 mg/day Long acting form Glucophage XR™: 500mg once/day, max dose 2000mg once/day
Rosiglitazone (Avandia™)	Thiazolidinedione	Decreases insulin resistance, increasing glucose uptake, fat redistribution; minor decrease in hepatic glucose output; preserves β-cell function; decreases vascular inflammation.	Initially 4 mg/day in single or divided doses. Increase to 8 mg/day in 12 wk, if needed; maximum, 8 mg/day with or without food
Pioglitazone (Actos™)	Thiazolidinedione	Decreases insulin resistance, increasing glucose uptake, fat redistribution; minor decrease in hepatic glucose output; preserves β-cell function; decreases vascular inflammation.	Initially 15 or 30 mg/day; maximum with or without food 45 mg for monotherapy, 30 mg for combination therapy
Acarbose (Precose™) Miglitol (Glyset™)	Alpha-glucosidase inhibitor	Slows absorption of complex carbohydrate from GI tract.	25 mg/day; increase by 25 mg/day every 4–6 wk; maximum, split dose before meals (with first bite of food) 300 mg/day(150 mg/day for weight <60 kg)
Combinations			
Glucovance™ (Glyburide and Metformin)	Sulfonylureas and Biguanide	Decreases hepatic glucose production and increases insulin secretion.	Ratios of glyburide and metformin (in mg):1.25/250, 2.5/500, 5/500. Initial: 1.25/250 once or twice a day, increased every 2 weeks. 2nd line: 2.5–5/500 twice a day, increased every1–2 weeks. Average dose 7.5/1,500. Maximum dose should not exceed 20 mg glyburide/2,000 mg metformin daily.
Metaglip™ (Glipizide and Metformin)	Sulfonylureas and Biguanide	Decreases hepatic glucose production and increases insulin secretion.	Ratios of glipizide and metformin (in mg): 2.5/250, 2.5/500, 5/500. Initial: 2.5/250 once or twice a day, increased every 2 weeks. 2nd line: 2.5–5/500 twice a day, increased every 1– 2 weeks. Maximum doseshould not exceed 20 mg glipizide/2,000 mg metformin daily.
Avandamet™ (Rosiglitazone and Metformin)	Thiazolidinedione and Biguanide	Decreases hepatic glucose production, increases glucose uptake, decreases insulin resistance, and preserves β-cell function.	Ratios of rosiglitazone and metformin: 1 mg/500 mg, 2 mg/500 mg, 4 mg/500 mg, 2 mg/1,000 mg, 4 mg/1,000 mg twice a day; dosage individualized based on current therapy. Maximum, 8 mg/2,000 mg per day.
Actoplus Met™ (Pioglitazone and Metformin)	Thiazolidinedione and Biguanide	Decreases hepatic glucose production, increases glucose uptake, decreases insulin.	Ratios of pioglitazone and metformin: 15 mg/500 mg, 15 mg/850 mg
Avandaryl™ (Rosiglitazone and Glimepiride)	Thiazolidinedione and Sulfonylurea	Decreases insulin resistance and increases insulin secretion.	Ratios of rosiglitazone and glimepiride: 4 mg/1 mg, 4 mg/1 mg

Adapted from © 2006 The Diabetes Center, Old Saybrook, CT. Used with permission.
A1C = glycated hemoglobin ALT = alanine aminotransferase CHF = congestive heart failure
FPG = fasting plasma glucose GI = gastrointestinal XL = TZD= thiozolidinedione, CYP 450= cytochrome P 450

Side Effects	Precautions	Critical Tests	Comments
Hypoglycemia, weight gain, hyperinsulinemia Disulfiram reaction with alcohol	Chlorpropamide remains active for up to 60 hours. Use extreme caution with elderly patients or patients with hepatic or renal dysfunction.	All are metabolized in liver. Periodic evaluation of liver function is suggested.	Use of these agents is not recommended unless the patient has a well-established history of taking them. Second-generation sulfonylureas provide more predictable results with fewer side effects and more convenient dosing.
Hypoglycemia, weight gain, hyperinsulinemia	Clearance may be diminished in patients with hepatic or renal impairment.		Glipizide is preferred with renal impairment. Doses >15 mg should be divided. Glimepiride indicated for use with insulin. Shown to have some insulin-sensitizing effect.
Hypoglycemia, weight gain, hyperinsulinemia	Use with caution on patient with hepatic or renal impairment.		Patients should be instructed to take medication no more than 30 minutes prior to a meal. If meals are skipped or added, the medication should be skipped or added as well. Approved for use as monotherapy or in combinatin with TZD or metformin.
Minimal risk of hypoglycemia	Currently no contraindications available. Use with caution with moderate to severe hepatic disease.	Periodic evaluation of liver function tests.	Approved as monotherapy or in combination with metformin or TZD. Has only a 2-hour duration of action. If meals are skipped or added, the medication should be skipped or added as well.
Nausea, diarrhea, metallic taste, possible lactic acidosis	Due to increased risk of lactic acidosis, should not use if suspect frequent alcohol use, liver or kidney disease, or CHF.	Contraindicated if serum creatinine is: >1.5 mg/dL in men or >1.4 mg/dL women. Do not use if creatinine clearance is abnormal. Monitor hematological and renal function annually.	Especially beneficial in obese patients due to potential for weight loss, improved lipid profile, and lack of potential for hypoglycemia requiring supplemental carbohydrate intake. Discontinue for 48 hr after contrast dye procedures.
Minor weight increase of 3–6 lbs., edema	Should not be used in patients with CHF or hepatic disease. Can cause mild-to-moderate edema.	Avoid initiation if ALT >2.5X upper limit of normal. Measure ALT periodically. Discontinue if ALT >3X upper limit of normal.	Approved for use as monotherapy and in combination with metformin, sulfonylureas, or insulin. Less interactions associated with CYP-450.
Minor weight increase of 3–6 lbs., edema	Should not be used in patients with CHF or hepatic disease. Can cause mild-to-moderate edema.	Avoid initiation if ALT >2.5X upper limit of normal. Measure ALT periodically. Discontinue if ALT >3X upper limit of normal.	Avoid initiation if ALT >2.5X upper limit of normal. Measure ALT periodically. Discontinue if ALT >3X upper limit of normal.
Gas and bloating, sometimes diarrhea for both drugs	Should not be used if GI disorders are concurrent.	Avoid if serum creatinine is >2.0 mg/dL. Monitor serum transaminase every 3 months for 1st year of therapy.	Approved for use as monotherapy and in combination with metformin, sulfonylureas, or insulin. If used with hypoglycemic agents, such as sulfonylureas or insulin, must treat hypoglycemia with glucose not sucrose.
Hypoglycemia, weight gain, lactic acidosis	Should not be used if suspect frequent alcohol use, liver or kidney disease, or CHF.	Same caveats as individual components.	Patients may frequently use 2 different dose tablets to attain desired daily dosage and results. Discontinue for 48 hr after procedure using contrast dye.
Hypoglycemia, weight gain, lactic acidosis	Should not be used if suspect frequent alcohol use, liver or kidney disease, or CHF.	Same caveats as individual components.	Patients may frequently use 2 different dose tablets to attain desired daily dosage and results. Discontinue for 48 hr after procedure using contrast dye.
Edema, possible lactic acidosis	Should not be used if suspect frequent alcohol use, liver or kidney disease, or CHF.	Same caveats as individual components.	Less expensive than using agents separately. Reported decrease in GI upset associated with metformin and weight increase associated with rosiglitazone. Discontinue for 48 hr after procedure using contrast dye.
Same caveats as individual components.	Same caveats as individual components.	Same caveats as individual components.	Same caveats as individual components.
Same caveats as individual components.	Same caveats as individual components.	Same caveats as individual components.	Same caveats as individual components.

** Agents in a class of medicines share mechanisms of action, require similar precautions, and generally have similar side effects. For proper usage, please read label. Agents should not be used in patients with type 1 diabetes.*

Diabetes Medications

Table 2. Glucose-Lowering Activity—Oral Diabetes Agent

Medication	Blood Glucose Most Affected	Greatest Risk for Hypoglycemia
Sulfonylureas	Fasting and postprandial	Nocturnal, fasting, 4–6 hr after meals
Meglitinide or phenylalanine derivative	Postprandial	2–3 hr after meals
Biguanide	Fasting and postprandial	After exercise if prolonged and strenuous
Alpha-glucosidase inhibitor	Postprandial	None
Thiazolidinedione	Fasting and postprandial	None
Glucovance™	Fasting and postprandial	Nocturnal, fasting, 4–6 hr after meals
Metaglip™	Fasting	Nocturnal, fasting 4–6 hr after meals
Avandamet™	Fasting and postprandial	After exercise if prolonged and strenuous
Actoplus Met™	Fasting and postprandial	After exercise if prolonged and strenuous
Avandryl™	Fasting and postprandial	Nocturnal, fasting, 4–6 hr after meals

Adapted from © 2006 The Diabetes Center, Old Saybrook, CT. Used with permission.
Testing frequency and times may vary based on individual assessment.

Table 3. Important Insulin Information*

Insulin	Onset	Peak	Effective Duration	Maximal Duration	Comments
Human insulins					
Rapid Acting					
Lispro (Humalog™)	< 15 min	1–2 hr	2–4 hr	3–5 hr	Should be taken just prior to or just after eating.
Aspart (Novalog™)	< 15 min	1–3 hr	3–5 hr	4–6 hr	Should be taken just prior to or just after eating.
Glulisine (Apidra™)	< 15 min	0.5–1 hr	3 hr	3 hr	Should be taken just prior to or just after eating.
Short Acting					
Regular (Novolin R™, Humulin R™)	0.5–1 hr	2–4 hr	3–5 hr	8 hr	Best if taken 30 min before a meal.
Intermediate Acting					
Lente (Novolin™, Humulin L™)	3–4 hr	4–12 hr	12–18 hr	16–20 hr	Limited supplies.
NPH (Novolin N™, Humulin N™)	2–4 hr	4–10 hr	10–16 hr	14–18 hr	Bedtime dosing minimizes nocturnal hypoglycemia.
Long Acting					Characterized by a "flat" or "peakless" concentration profile.
Insulin glargine (Lantus™) analog	4–6 hr	None	24 hr	24 hr	Cannot be mixed with any other insulin. Stress site rotation and not to use same syringe used with other insulins. Not recommended for pre-filling syringes.
Detemir (Levemir™)	3–4 hr	50% in 3–4 hr, lasting up to 14 hr	5.7–23.2 hr	Dose dependent-5.7–23.2 hr	Cannot be mixed in same syringe with other insulins. Duration of action is dose dependent: 6 hrs (0.1U/kg), 12hrs (0.2U/kg), 20 hrs (0.4U/kg), 23 hrs (0.8U/kg and 1.6U/kg).
Ultralente	6–10 hr	Minimal	18–20 hr	20–30 hr	Limited supplies.
Pre-mixed Human					
Humalog™ 75/25 Novolog Mix™ 70/30	<15 min	1–2 hr	10–16 hr	14–18 hr	75% NPL, 25% Lispro 70% NPH, 30% Aspart Should be taken just prior to or just after eating because of rapid onset. Caution because of name confusion with Humalog and Novolog.
Humulin™ 70/30 Novolin™ 70/30	0.5–1 hr	2–10 hr	10–16 hr	14–18 hr	Humalin and Novolin are 70% NPH and 30% regular insulin.
Animal Source					
Regular	0.5–2 hr	3–4 hr	4–6 hr	6–8 hr	Conversion to human insulin recommended. Dose changes required (usually a 10% reduction in dose when switching to human).
NPH	4–6 hr	8–14 hr	16–20 hr	20–24 hr	
Lente	4–6 hr	8–14 hr	16–20 hr	20–24 hr	
Inhaled Insulin					
Exubera™	10–20 min	30–90 min	2–6 hr	6 hr	Dosed in MG of powder, Available in 1 mg and 3 mg blisters. 1mg approx=3 IU insulin, 3mg approx=8 IU (Inhalation of 1 mg +1 mg +1 mg does not equal 3mg)

Adapted from © 2006 The Diabetes Center, Old Saybrook, CT. Used with permission.
*Site rotation for injections is necessary for all types of insulin.

Table 4. Recommended Insulin Storage

Insulin Type	Refrigerated (36° F–46° F)		Room Temperature (59° F– 86° F)	
Vial	Opened	Unopened	Opened	Unopened
Humalog™, Novolog™, Humulin™, Novolin™, Apidra™	28 days	Until expiration date	28 days	28 days
Lantus™ (10 mL)	28 days	Until expiration date	28 days	28 days
Detemir (Levemir™)	42 days	Until expiration date	42 days	42 days
Pens/Cartridges	Not in use		In use	
Humalog™	Until expiration date		28 days	
Humulin R™ (available in cartridge only)	Until expiration date		28 days	
Humulin N™	Until expiration date		14 days	
Humulin 70/30™	Until expiration date		10 days	
Humalog Mix 75/25™	Until expiration date		10 days	
Novolog™	Until expiration date		28 days	
Novolog Mix 70/30™	Until expiration date		14 days	
Novolin R™ (prefilled and 1.5-mL cartridge)	Until expiration date		30 days	
Novolin R™ (3-mL cartridge)	Until expiration date		28 days	
Novolin N™ (prefilled and 1.5-mL cartridge)	Until expiration date		7 days	
Novolin N™ (3-mL cartridge)	Until expiration date		14 days	
Novolin 70/30™ (prefilled and 1.5-mL cartridge)	Until expiration date		7 days	
Novolin 70/30™ (3-mL cartridge)	Until expiration date		10 days	
Detemir (Levemir™)	Until expiration date		42 days	
Apidra™	Until expiration date		28 days	
Lantus™	Until expiration date		28 days	
Self-filled syringes (Note: not recommended for glargine)	14 days*		7 days	
Inhaled Insulin	Not in use (unopened overwrap)		In use (unopened overwrap)	
Exubera™ (insulin blisters)	Room Temperature (59° F– 86° F) Until expiration date		Room Temperature (59° F– 86° F) 90days	
Release Unit	Do not refrigerate		Replace every 14 days	
Inhaler & Chamber	ReplaceYearly (Wash Weekly)			

Adapted from © 2006 The Diabetes Center, Old Saybrook, CT. Used with permission. *Suggested, not clinically established

Table 5. Incretins and Amylins

Agent	Primary Action	How Supplied/Storage	Typical Dosage	Duration Action	Side Effects	Precautions	Comments
Exenatide (Byetta™)	Decreases post-meal glucagon production Delays gastric emptying Increases satiety, leading to decreased caloric intake. Degree of response depends on plasma glucose levels	250 mcg/ml: - 5 mcg/dose prefilled pen -10 mcg/dose prefilled pen If not in use: refrigerate until expiration date. If in use: stable at room temperature Discard after 30 days.	5 mcg BID subcutaneous for first 1 month, then 10 mcg BID, injected within 60 minutes before morning and evening meal	Peak effects in approx 2 hours with maximal duration of 10 hours.	Nausea and hypoglycemia most common; occasional vomiting, diarrhea, jitters, dizziness, headache.	Not for use in patients with Type 1 diabetes, severe renal disease or ESRD*, or severe GI disease.	Consider lowering dose of sulfonylurea to avoid hypoglycemia when starting. May reduce the rate of absorption of oral medication. Medications requiring threshold concentrations should be taken 1 hour prior to injection. Approved for use with sulfonylureas and/or metformin or in combination with a TZD* alone or with metformin.
Pramlintide (Symlin™)	Decreases post-meal glucagon production Delays gastric emptying, Increases satiety, leading to decreased caloric intake. Degree of response depends on plasma glucose levels	5 ml vials containing 0.6 mg/ml. Requires U-100 insulin syringe for injection If not in use: refrigerate until expiration date. If in use: room temperature Discard after 28 days.	Type 1 diabetes: 15–60 mcg starting with 15 mcg subcutaneously before meals of 30gm or more carbohydrate. Type 2 diabetes: 60–120 mcg starting with 60 mcg subcutaneous before meals. Titrate as directed by prescriber.	Maximum effect in 20 minutes with rapid elimination. Maximum duration of 4 hours	Nausea and hypoglycemia most common. Doses are adjusted based on presentation of these side effects. Occasional vomiting, stomach pain, dizziness, indigestion.	Indicated for insulin treated type 2 diabetes or for type 1 diabetes. Contraindicated in patients with hypoglycemia unawareness, gastroparesis. Or poor adherence Should never be mixed with insulin and should be injected separately. Reduce insulin dose by 50% when starting.	Requires patient testing of blood sugars before and after meals, frequent physician follow up, and thorough understanding of how to adjust doses of insulin and pramlintide. May reduce the rate of absorption of orally administered medication. Medications requiring threshold concentrations should be taken 1 hour prior to injection.
Sitagliptin (Januvia™)	DPP-4 inhibitor* Inhibits the DPP-4 enzyme that degrades GLP-1 and GIP resulting in 2-3 fold increased levels of these incretins. Increases insulin secretion in presence of elevated plasma glucose. Reduces post-meal glucagon secretion .	25mg, 50mg, 100mg tablets	100 mg po qD Moderate renal insufficiency (CrCl>30 to <50mL/min): 50mg/day Severe renal insufficiency (CrCl <30mL/min): 25mg/day	Approximately 24 hours	Low incidence of side effects including hypoglycemia or gastrointestinal symptoms Headache, upper respiratory tract infection, nasopharyngitis	Not for use in type 1 diabetes Assessment of renal function is recommended prior to initiation and periodically thereafter.	May be used as monotherapy or in combination with metformin or TZDs. Not associated with weight loss

Adapted from © 2006 The Diabetes Center, Old Saybrook, CT. Used with permission. *DPP-4-dipeptidyl peptidase -4 GIP- glucose dependent insulinotropic polypeptide GLP-glucose like polypeptide ESRD-End Stage Renal Disease TZD-Thiazolidinedione

Table 6. Hypoglycemia Treatment

Agent	Primary Action	How Supplied/Storage	Typical Dosage	Duration Action	Side Effects	Precautions	Comments
Glucagon	Converts liver glycogen to glucose	1 mg vial with diluent; emergency kit, 1 mg vial with prefilled syringe of diluent. Before reconstitution, room temperature until expiration date. After reconstitution, may be stored for up to 48 hours under refrigeration.	0.5–2 mg subcutaneous	15 min, should be followed by carbohydrate snack.	Occasional nausea and vomiting	Must be reconstituted prior to injection. Should be followed by carbohydrate snack and blood glucose testing every 15 minutes until glucose level returns to acceptable levels.	Patient should be instructed to teach colleagues, family, etc. how to give injection. Only use if patient isunconscious or unable to eat or drink. All people taking insulin should receive a prescription for glucagon kit for emergency use.

Adapted from © 2006 The Diabetes Center, Old Saybrook, CT. Used with permission.

Table 7. Recommended Control Measures

Biochemical Index	Preprandial	Peak postprandial	A1C (ADA)*	Blood pressure	LDL	TG	HDL
Goal	90–130 mg/dL	<180 mg/dL	<7%	<130/80	<100	<150	>40

Adapted from © 2006 The Diabetes Center, Old Saybrook, CT. Used with permission. LDL=low density lipoprotein TG=triclycerides HDL=high density lipoprotein *ADA—American Diabetes Association

SECTION B

Medications to Lower High Blood Pressure*

Category	Generic Name	Brand Name™	Minimum Daily Dose	Maximum Daily Dose	Special Considerations for class of drugs
Angiotensin-converting enzyme (ACE) inhibitors	benazepril	Lotensin™	10 mg QD	40 mg QD or divided	May cause cough. May increase potassium concentrations. Do not use potassium or salt substitutes without consulting physician. Do not use if pregnant or if trying to conceive. Caution if creatinine >1.5.
	captopril	Capoten™	25 mg divided dose	100 mg divided dose	
	enalapril	Vasotec™	5 mg QD	40 mg QD or divided	
	fosinopril	Monopril™	10 mg QD	40 mg QD or divided	
	lisinopril	Prinivil, Zestril™	10 mg QD	40 mg QD	
	moexipril	Univasc™	7.5 mg QD	30 mg QD or divided	
	perindopril	Aceon™	4 mg QD	8 mg QD	
	quinapril	Accupril™	10 mg QD	80 mg QD or divided	
	ramipril	Altace™	2.5 mg QD	20 mg QD or divided	
Angiotensin II receptor blockers	trandolapril	Mavik™	1 mg QD	4 mg QD	May cause dizziness and upset stomach. Do not use potassium or salt substitutes without consulting physician. Do not use if pregnant or if trying to conceive. Caution if creatinine >1.5.
	candesartan	Atacand™	8 mg QD	32 mg QD or divided	
	eprosartan	Teveten™	400 mg QD	800 mg QD or divided	
	irbesartan	Avapro™	150 mg QD	300 mg QD	
	losartan	Cozaar™	25 mg QD	100 mg QD or divided	
	olmesartan	Benicar™	20 mg QD	40 mg QD	
	telmisartan	Micardis™	20 mg QD	80 mg QD	
	valsartan	Diovan™	80 mg QD	320 mg QD	
Calcium channel blockers	amlodipine	Norvasc™	2.5 mg QD	10 mg QD	May cause constipation, dizziness, upset stomach, and flushing. Call physician for shortness of breath, unusual heartbeat, or swelling of feet or hands.
	diltiazem	Cardizem LA™	120 mg QD	540 mg QD	
	diltiazem	Cardizem CD™	180 mg QD	420 mg QD	
	diltiazem	Dilacor XR™*	180 mg QD	420 mg QD	
	diltiazem	Tiazac™	180 mg QD	420 mg QD	
	felodipine	Plendil™*	2.5 mg QD	20 mg QD	
	isradipine	DynaCircCR™*	2.5 mg QD	10 mg QD	
	nicardipine	Cardene SR™*	60mg in divided dose	120 mg divided dose	
	nifedipine	Adalat CC™*	30 mg QD	60 mg QD	
	nifedipine	Procardia XL™*	30 mg QD	60 mg QD	
	nisoldipine	Sular™*	10 mg QD	40 mg QD	
	verapamil	Calan™	80 mg QD in divided dose	320 mg divided dose	
	verapamil	Calan SR ™	120 mg QD	480 mg divided dose	
	verapamil	Covera HS™*	120 mg QD	360 mg QD	
	verapamil	Isoptin™	80 mg QD in divided dose	320 mg divided dose	
	verapamil	Isoptin SR™*	120 mg QD	480 mg QD or divided	
	verapamil	Verelan™	80 mg QD in divided dose	320 mg divided dose	
	verapamil	Verelan PM™	120 mg QD	360 mg QD	
Thiazides and related diuretics	bedroflumethiazide	Naturetin™	2.5 mg QD	20 mg QD	May increase blood glucose concentrations. Take in morning to minimize diuretic effect at night. May cause low potassium, need to monitor level.
	chlorothiazide	Diuril™	125 mg QD	500 mg QD or divided	
	chlorthalidone	Hygroton™	12.5 mg QD	25 mg QD	
	hydrochlorothiazide	HydroDIURIL™	12.5 mg QD	50 mg QD or divided	
	hydrochlorothiazide	Microzide™	12.5 mg QD	50 mg QD or divided	
	indapamide	Lozol™	1.25 mg QD	2.5 mg QD	
	methyclothiazide	Enduron™	2.5 mg QD	5 mg QD	
	metolazone	Mykrox™	0.5 mg QD	1.0 mg QD	
	metolazone	Zaroxolyn™	2.5 mg QD	5 mg QD	

* *Agents in a class of medicines share mechanisms of action, require similar precautions and generally have similar side effects.*
CC= extended release XL=extended release SR=sustained release CR=controlled release CD=extended release XR=extended release
PM=extended release, controlled onset HS=extended release, controlled onset Dosages based on JNC7 usual dose range.

Medications to Lower High Blood Pressure* (continued)

Category	Generic Name	Brand Name™	Minimum Daily Dose	Maximum Daily Dose	Special Considerations for class of drugs
Loop diuretics	bumetanide	Bumex™	0.5 mg QD	2 mg QD or divided	May cause low potassium. Need blood test to monitor level. (Parenteral drug available) May cause photosensitivity:sunscreen recommended.
	ethacrynic acid	Edecrin™	25 mg QD	200 mg divided dose	
	furosemide	Lasix™	20 mg QD	80 mg QD or divided	
	torsemide	Demadex™	2.5 mg QD	10 mg QD	
Potassium-sparing diuretics	amiloride	Midamor™	5 mg QD	10 mg QD	Do not use potassium or salt substitutes without consulting physician. Need to monitor potassium level.
	triamterene	Dyrenium™	50 mg QD or divided	100 mg divided dose	
Aldosterone receptor blockers	eplerenone	Inspra™	50 mg QD	100 mg divided dose	
	spironolactone	Aldactone™	25 mg QD	50 mg divided dose	
β-blockers	acebutolol	Sectral™	200 mg QD	800 mg divided dose	Intrinsic sympathomimetic activity. May alter blood glucose, may mask signs of low blood. Call physician for slow heart rate (<60), confusion, or swelling of feet or legs. Can cause claudication. Do not discontinue abruptly.
	atenolol	Tenormin™	25 mg QD	100 mg QD	
	betaxolol	Kerlone™	5 mg QD	20 mg QD	
	bisoprolol	Zebeta™	2.5 mg QD	10 mg QD	
	carteolol	Cartol™	2.5 mg QD	10 mg QD	
	metoprolol	Lopressor™	50 mg QD	100 mg QD or divided	
	metoprolol	Toprol XL™*	50 mg QD	100 mg QD	
	nadolol	Corgard™	40 mg QD	120 mg QD	
	penbutolol	Levatol™	10 mg QD	40 mg QD	
	pindolol	Visken™	10 mg in divided dose	40 mg divided dose	
	propranolol	Inderal™	40 mg divided dose	160 mg divided dose	
	propranolol	Inderal LA™*	60 mg QD	180 mg QD	
	timolol	Blocadren™	20 mg divided dose	40 mg divided dose	
α-blockers	doxazosin	Cardura™	1 mg QD	16 mg QD	To prevent dizziness, avoid standing up suddenly, especially with the first few doses.
	prazosin	Minipress™	2 mg in divided dose	20 mg divided dose	
	terazosin	Hytrin™	1 mg QD	20 mg QD	
Combined α- and β-blockers	carvedilol	Coreg™	12.5 mg divided dose	50 mg divided dose	May mask signs of low blood glucose levels. Take with food to avoid stomach upset.
	labetalol	Normodyne™	200 mg divided dose	800 mg divided dose	
	labetalol	Trandate™	200 mg divided dose	800 mg divided dose	
Direct vasodilators	hydralazine	Apresoline™	25 mg QD	100 mg divided dose	May cause headaches, fluid retention, or fast heart rate.
	midoxidil	Loniten™	2.5 mg QD	80 mg divided dose	
Central α-agonists	clonidine	Catapres™	0.1 mg QD	0.8 mg divided dose	Do not discontinue drug suddenly without consulting physician.
	clonidine	Catapres TTS™* (patch)	0.1 mg Q week	0.3 mg Q week	
	methyldopa	Aldomet™	250 mg divided dose	1,000 mg divided dose	
	guanfacine	Tenex™	0.5 mg QD	2 mg QD	
Peripheral Anti-adrenergics	guanadrel	Hylorel™	10 mg in divided dose	75 mg divided dose	May cause dizziness, nasal congestion, and depression.
	guanethidine	Ismelin™	10 mg QD	50 mg QD	
	resperine		0.1 mg divided dose	0.25 mg divided dose	

* *Agents in a class of medicines share mechanisms of action, require similar precautions and generally have similar side effects.*
XL = extended release LA = long acting

Note: There are many combination medications for the control of blood pressure. The indications and caveats are the same for each individual component.

For all anti-hypertensives:
- *Ask pharmacist before using OTC products.*
- *Monitor blood pressure regularly.*
- *To prevent dizziness, advise patient to stand up slowly. If dizziness persists, refer to health care provider.*

Information about high blood pressure can be found at the following Web sites:
Health care professionals: http://www.nhlbi.nih.gov/health/prof/heart/index.htm
Information for people with diabetes: http://www.nhlbi.nih.gov/hbp
Drugs used to treat high blood pressure: http://www.nhlbi.nih.gov/guidelines/hypertension/express.pdf

SECTION C

Medications for the Treatment of Dyslipidemia

Category	Generic Name	Brand Name	Minimum Daily Dose	Maximum Daily Dose	Special Considerations for class of drugs
HMG-CoA reductase inhibitors (statins)	atorvastatin	Lipitor™	10 mg QD	80 mg in divided doses	Main action: Lowers LDL ("bad") cholesterol. Also lowers TG and modestly raises HDL. Have blood tests for liver enzyme concentrations. Notify physician if muscle aches or weakness develops. Use caution if combined with fibric acid derivatives due to the increased risk of rhabdomyolysis.
	fluvastatin	Lescol™	20 mg QD	80 mg in divided doses	
	fluvastatin	Lescol XL™	80 mg QD	80 mg in divided doses	
	lovastatin	Mevacor™	10 mg QD	80 mg in divided doses	
	lovastatin (extended-release)	Altocor™	20 mg QD	60 mg QD	
	pravastatin	Pravachol™	10 mg QD	80 mg QD	
	rosuvastatin	Crestor™	5 mg QD	40 mg QD	
	simvastatin	Zocor™	5 mg QD	80 mg in divided doses	
Cholesterol absorption inhibitors	ezetimibe	Zetia™	10 mg QD	10 mg QD	Main action: Lowers LDL cholesterol; inhibits absorption of cholesterol. If used with a statin, take together. If used with bile acid sequestrant, ezetimibe should be taken 2 hr before or 4 hr after bile acid sequestrant.
Nicotinic acid (niacin)	nicotinic acid (extended release)	Niaspan™	50–100 mg QD	2,000 mg QD	Main action: Lowers LDL cholesterol increases HDL ("good") cholesterol, lowers triglycerides. Take with food. May cause flushing. May increase blood glucose levels. Have blood tests for liver enzyme concentrations. Long-acting forms may be more likely to cause liver malfunction.
	nicotinic acid		250 mg/day QD	Titrated up to 1500mg therapeutic dose in 3 divided doses. Maximum dose= 3000mg	
Lipid combinations	lovastatin-niacin	Advicor™	20 mg/500 mg QD	40 mg/2,000 mg QD	Main Action: Reduces LDL, TC , and TG and increases HDL due to the individual actions of niacin and lovastatin.
	simvastatin-ezetimibe	Vytorin™	10 mg/10 mg QD	80 mg/10 mg QD	Main Action: Reduces LDL cholesterol.
	Amlodipine+atorvastatin	Caduet™	2.5mg/10mg QD	10 mg/80 mg QD	Blood Pressure medication (Calcium channel blocker (see Blood pressure med chart)+lipid (statin) medication. Same comments as individual
Fibric acid derivatives	fenofibrate	Tricor™	48 mg QD	145 mg QD	Main action: Lowers triglycerides, increases HDL cholesterol. Perform blood tests for liver enzyme concentrations. Adjust dose based on age and renal impairment. Notify physician if muscle aches or weakness develops.
	fenofibrate	Lofibra™	67 mg QD	200 mg QD	
	fenofibrate	Triglide™	50 mg QD	160 mg QD	
	fenofibrate	Antara™	43 mg QD	130 mg QD	
	gemfibrozil	Lopid™	1,200 mg BID	1,200 mg BID	
Bile acid sequestrants	cholestyramine	LoCHOLEST™	4 g QD	24 g in divided doses	Main action: Lowers LDL cholesterol. May cause constipation and stomach upset. May need to be taken at a different time than other medications to avoid drug interactions. May increase triglycerides blood concentrations. Can be combined with other agents such as statins.
	cholestyramine light	LoCHOLEST light™	4 g QD	24 g in divided doses	
	cholestyramine	Questran™	4 g QD	24 g in divided doses	
	cholestyramine light	Questran light™	4 g QD	24 g in divided doses	
	cholestyramine	Prevalite™	4 g QD	24 g in divided doses	
	cholestipol	Colestid™	2g QD or BID	6g QD or BID	
	colesevelam	Welchol™	1,875 mg (3 tablets) QD	4,375 mg (7 tabs) QD or BID	

HMG-Coa = 3-hydroxy-3-methylglutaryl coenzyme A LDL = low-density lipoprotein HDL = high-density lipoprotein TC = total cholesterol
TG = plasma triglycerides generic = generic drug manufacturers

The U. S. Department of Health and Human Services' National Diabetes Education Program (NDEP) is jointly sponsored by the National Institutes of Health and the Centers for Disease Control and Prevention with the support of more than 200 partner organizations.

www.ndep.nih.gov
1-800-438-5383
revised 3/07 NDEP – 54 – S
CS109012

Resources for Individuals with Diabetes

Statewide Organizations

Children's Health Insurance Program in Texas (CHIP)/Children's Medicaid

1-800-647-6558, 1-877-543-7669
fax: 1-877-542-5951
http://www.chipmedicaid.org

Families can apply for CHIP using a toll-free phone number or a mail application.

Medicaid
Texas Department of Human Services

Statewide: 1-800-252-8263
http://www:hhsc.state.tx.us/medicaid/index.html

Information on Medicaid eligibility and coverage.

Children with Special Health Care Needs (CSHCN, formerly CIDC)

Phones: 1-800-252-8023, or 1-800-422-2956 (Family Health Services)
Fax: 512-458-7417
www.dshs.state.tx.us/cshcn

Children with Special Health Care Needs (formerly CIDC) provides state-funded assistance for children with type 1 and type 2 diabetes for services not covered by Medicaid, CHIP, private insurance or third party payors.

Texas Diabetes Program/Council

Texas Department of State Health Services
1100 West 49th Street
Austin, Texas 78756
(512) 458-7490, 1-888-963-7111 ext. 7490
http://www.texasdiabetescouncil.org

The Texas Diabetes Council was established by the Texas Legislature in 1983. The Council works with private and public organizations to promote diabetes prevention and awareness of quality care. They develop, implement and monitor a state plan for diabetes control. Free educational materials are available.

Texas Department of State Health Services Audiovisual Library

1100 West 49th Street, Mail Code 1975
Austin, TX 78756-3199
1-888-963-7111 ext. 7260
TDD: 512-458-7708
http://www.dshs.state.tx.us/avlib/default.shtm

Offers free loan of audiovisual materials to Texas residents on a number of health and safety topics.

HHSC (Health and Human Services Commission) Office of the Ombudsman

1-877-787-8999
Fax: 512-491-1067
TDD Hotline 888-425-6889 or 512-438-3087 (not toll free)

The Office of the Ombudsman was created to assist the public with health and human services-related complaints or issues.

Camps

ADA (American Diabetes Association) Youth Camps

http://www.diabetes.org/communityprograms-and-localevents/diabetescamps.jsp

Each summer, there are day camps and 1- to 3-week camping sessions for children with type 1 diabetes. Tuition assistance is available based on financial need.

Texas Children's Hospital Diabetes Summer Camp

Corpus Christi, TX
Contact: Patsy Reyes at 1-361-694-5434

Texas Lions Camp

P.O. Box 247
Kerrville, Texas 78029-0247
(830) 896-8500

Camp serves children, ages 7-17, who use insulin.

National Organizations

American Association of Diabetes Educators

100 West Monroe, 4th Floor
Chicago, Illinois 60603
1-800-338-3633
1-800-832-6874 for diabetes educators in your area
http://www.aadenet.org

American Diabetes Association

1660 Duke Street
Alexandria, Virginia 22314
1-800-342-2383 (DIABETES)
1-800-232-6733 (ADA ORDER) to order publications
http://www.diabetes.org

American Dietetic Association

120 South Riverside Plaza, Suite 2000
Chicago, Illinois 60606-6995
1-800-877-1600

Consumer Nutrition Hotline:
1-800-366-1655 (Spanish speaker available); has a list of registered dietitian in your area
http://www.eatright.org

Centers for Disease Control and Prevention Division of Diabetes Translation

4770 Buford Highway, NE, Mailstop K-10
Atlanta, Georgia 30341-3717
1-800-232-4636
TTY: 1-888-232-6348
1-877-CDC-DIAB (232-3422)
http://www.cdc.gov/diabetes

Joslin Diabetes Center

One Joslin Place
Boston, MA 02215
617-732-2400
www.joslin.org

Juvenile Diabetes Research Foundation International

120 Wall St., 19th Floor
New York, New York 10005-4001
1-800-533-2873 (JDF-CURE)
http://www.jdf.org
email: info@jdrf.org

Medic Alert Foundation International

2323 Colorado Avenue
Turlock, California 95382
1-800-ID-ALERT (432-5378), or 1-888-633-4298
http://www.medicalert.org

For medical information jewelry and national registry service.

Diabetes Research and Wellness Foundation

5151 Wisconsin Ave., NW
Suite 420
Washington, D.C. 20016
http://www.diabeteswellness.net

National Diabetes Information Clearinghouse

1 Information Way
Bethesda, Maryland 20892-3560
(301) 654-3327
1-800-860-8747
ndic@info.niddk.nih.gov
http://www.niddk.nih.gov

National Diabetes Education Program

One Diabetes Way
Bethesda, MD 20814-9692
1-800-438-5383
http://www.ndep.nih.gov

Publications and Audiovisual Resources

American Diabetes Association, American Dietetic Association, and the other organizations listed above have educational publications and audiovisual materials available, some at no cost. The list of other materials is only a sampling of diabetes education materials. The public library, local health department, local hospital and heart association are also sources for information.

Books and Brochures

Texas Diabetes Program/Council Texas Department of State Health Services

1100 West 49th Street
Austin, Texas 78756
(512)458-7490

Offers more than 20 free publications, English and Spanish, in easy-to-read formats. For example, "Food for Life: Living Well with Diabetes" is a booklet describing healthy eating habits and dietary choices.

www.texasdiabetescouncil.org

United States Department of Agriculture Food and Nutrition Information Center

http://www.nal.usda.gov/fnic
1-800-687-2258

Food Guide Pyramid – Copyright free materials that can be downloaded from Internet

Weight-control Information Network

National Institute for Diabetes & Digestive & Kidney Disease (NIDDK)

1 WIN Way
Bethesda, Maryland 20892-3665
1-800-WIN-8098; (301) 984-7378
email: win@info.niddk.nih.gov

Patient Magazines/Print

Diabetes Digest

5 South Myrtle Ave.
Spring Valley, NY 10977
845-426-7612
fax: 845-426-7512

Diabetes Forecast

http://www.diabetes.org/diabetes-forecast.jsp

Diabetes Health

6 School St.
Suite 160
Fairfax, CA 94930
1-800-234-1218
fax: 415-258-2822
www.diabeteshealth.com

Diabetes Interview (monthly)

P.O. Box 668
Fairfax, CA 94978-0668
1-800-488-8468
Fax 1-800-559-0031

Diabetes Self-Management

P.O. Box 51125
Boulder, CO 80323-1125

Diabetes Wellness Letter

DRWF, P.O. 231
Shrub Oak, NY 10588

Practical Diabetology

150 22nd Street
New York, NY 10011

Voice of the Diabetic

Free upon Request
811 Cherry Street, Ste. 309
Columbia, MO 65201-4892

Patient Magazines/Online

Children with Diabetes

www.childrenwithdiabetes.com

Helps kids with diabetes and their families learn about diabetes, meet people with diabetes, and help others with diabetes.

Diabetic Gourmet

www.diabeticgourmet.com

Online magazine dedicated to healthy eating, diabetes, and diabetes-related health issues, with news, recipes, articles, forums, tools, and more.

Diabetic Lifestyle Online Magazine

www.diabetic-lifestyle.com

Includes recipes, menus, medical updates, and practical information on managing diabetes on a daily basis.

Online Resources/Chat Rooms

Diabetic-Lifestyle Just for Kids

www.diabetic-lifestyle.com/forkids.htm

Children with DIABETES

www.childrenwithdiabetes.com

Diabetes Chat

www.diabetesCHAT.net

Must be 18 years old to participate

Medication Assistance & Information

Abbot Diabetes Patient Assistance Program

866-224-8887
www.abbottdiabetescare.com

American Diabetes Supply, Inc.

1-800-453-9033, ext. 611

www.americandiabetessupply.com

B-Scientific Diabetes Centre

800-544-5969
877-505-5545 (fax)
www.bscientific.com

Serves Medicaid, CHIP, CSHCN, & commercial enrollees

Care Entrée

972-522-2000
www.careentree.com

Cost Containment Research Institute

202-318-0770
4200 Wisconsin Ave NW, Suite 106-222
Washington, DC 20016
www.institutedc.org

Free Drug Card
www.freedrugcard.us

Free Medicine Foundation
573-996-3333
www.freemedicinefoundation.com/index.html

Free Medicine Program
800-921-0072
www.freemedicineprogram.com

FREEDOMED
1-888-722-7556
www.freedomed.com

The Health and Wellness Education Center
205-652-6557
tydebra3@aol.com

HealthCove
800-796-5558
www.healthcove.com

Medicare Prescription Drug Plans
800-633-4227
www.medicare.gov/MPDPF/Shared/Static/Resources.asp

The Medicine Program
866-694-3893
www.themedicineprogram.com

National Diabetes Information Clearinghouse
www.diabetes.niddk.nih.gov/dm/pubs/financialhelp/index.htm

National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)
800-860-8747
Publication: "Financial Help for Diabetes Care"

NeedyMeds
www.needymeds.com

Partnership for Prescription Assistance (PPA)
1-888-477-2669
www.pparx.org

Pfizer
866-776-3700
www.pfizerhelpfulanswers.com

2 programs:Connection to Care, &Pfizer Pfriends—not age-mandated
Note: Cannot have insurance to quality for this program

RxAssist
www.rxassist.org

State Pharmaceutical Assistance Programs
www.ncsl.org/programs/health/drugaid.htm

Together RX
1-800-865-7211

www.Together-RX.com

Veterans Prescription Service
877-222-8387
www.va.gov/healtheligibility

Eye Care Assistance

Eye Care America
655 Beach St.
San Francisco, CA 94109-1336
1-800-222-3937
www.eyecareamerica.org

Note: Also provides assistance with medications

Blindness Education, Screening, and Treatment (BEST) Program

Division for Blind Services
Texas Department of Assistive and Rehabilitative Services (DARS)
1-800-628-5115
http://www.dars.state.tx.us/dbs/best/
DBSinfo@dars.state.tx.us

Advocacy

Advocacy, Inc.

7800 Shoal Creek Blvd., #171-E
Austin, TX 78757-1024
1-800-252-9108

Patient Advocate Foundation

800-532-5274
www.patientadvocate.org

Children's Resources

Marathon Kids

www.marathonkids/com/site/

Shriners Hospitals

800-237-5055

Texas Children's Hospital

832-822-3670

www.texaschildrenshospital.org/CareCenter/Diabetes

Camps

ADA Diabetes Camps

http://www.diabetes.org/communityprograms-and-localevents/diabetescamps.jsp

Each summer, there are day camps and 1- to 3-week camping sessions for children with type 1 diabetes. Tuition assistance is available based on financial need.

Texas Lions Camp

P.O. Box 247
Kerrville, Texas 78029-0247
1-830- 896-8500

Camp serves children, ages 7-17, who use insulin.

Texas Children's Hospital Diabetes Summer Camp
Corpus Christi, TX
Contact: Patsy Reyes at 1-361-694-5434

Government Resources

Centers for Disease Control
Division of Diabetes Translation

www.cdc.gov

National Institutes of Health

www.nih.gov

National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK)

www.niddk.nih.gov

General Information

Maternal and Child Health Library

www.mchlibrary.info/KnowledgePaths/kp_diabetes.html

Language Translation

CDC's "Take Charge of Your Diabetes" is available in 9 languages. For translations, access the following link:

http://www.hawaii.gov/health/family-child-health/chronic-disease/diabetes/resourcesandtools.html

Pump Training

Animas:	Animas Pump Co.	1-877-937-7867
MiniMed:	Medtronics	1-800-999-9859
Cosmo Pump:	Deltec	1-800-544-4734

Primary Care Service Sites

Texas Association of Community Health Centers

www.tachc.org

U.S. Department of Health and Human Services (DHHS) Health Resources and Services Administration (HRSA)

http://ask.hrsa.gove/pc/

Support Services

Family Support Network

http://www.childrenwithdiabetes.com/fsn/

Insurance Information

Health Insurance Consumer Guides

www.heatlhinsuranceinfo.net

Insure Kids Now!

877-543-7669
www.insurekidsnow.gov

Medicaid

1-877-267-2323

State Children's Health Insurance Program

1-877-543-7669
www.cms.hhs.gov/home/schip.asp

The Texas Department of Insurance

333 Guadalupe
Austin 78701

or

P.O. Box 149104
Austin 78714-9104
800-578-4677 (in Texas) ,512-463-6169

Consumer Helpline
1-800-252-3439, 463-6515 in Austin
www.tdi.state.tx.us