DIABETES TOOL KIT

A PRACTITIONER'S REFERENCE

5th Edition

TEXAS DIABETES
COUNCIL

www.texasdiabetescouncil.org

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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? (Choose one)**
   - ☐ 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. **How long have you been using the Tool Kit?**
   - ☐ <1 year ☐ 1-3 years ☐ >3 years

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

4. **What sections/ topics in the Tool Kit do you use the most? (Choose all that apply)**
   - ☐ Minimum Practice Recommendations (flow sheet)
   - ☐ Treatment Algorithms / Guidelines
   - ☐ Pregnancy and Diabetes
   - ☐ Monitoring
   - ☐ Nutrition
   - ☐ Exercise
   - ☐ Medications
   - ☐ Acute Complications
   - ☐ Chronic Complications
   - ☐ Psychosocial Issues
   - ☐ Resource Lists
   - ☐ Patient Handouts

5. **What sections / topics of the Tool Kit do you use the least? (Choose all that apply)**
   - ☐ Minimum Practice Recommendations (flow sheet)
   - ☐ Treatment Algorithms / Guidelines
   - ☐ Pregnancy and Diabetes
   - ☐ Monitoring
   - ☐ Nutrition
   - ☐ Exercise
   - ☐ Medications
   - ☐ Acute Complications
   - ☐ Chronic Complications
   - ☐ Psychosocial Issues
   - ☐ Resource Lists
   - ☐ Patient Handouts

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

   _____

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

8. **Which group (s) represents your primary patient population (Choose all that apply)**
   - ☐ Asian ☐ Hispanic/Latino ☐ Black
   - ☐ White ☐ Native American ☐ Other (*please specify:* _____)

9. **Please indicate the type of healthcare provider you are:**
   - ☐ Physician assistant
   - ☐ Primary care physician
   - ☐ Registered Dietitian
   - ☐ Registered Nurse
   - ☐ Advanced Practice Nurse
   - ☐ Certified Diabetes Educator
   - ☐ Hospitalist
   - ☐ Specialist (*please indicate specialty:* _____)
   - ☐ Other (*please specify:* _____)

10. 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
- ☐ Medical Nutrition, IFG/Type 2 Diabetes Prevention & Therapy
- ☐ 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
- ☐ ICU Insulin Orders – IV Insulin Infusion Protocol
- ☐ Orders for Adults with DKA and Hyperglycemic Hyperosmolar State (HHS)
- ☐ Transition From I.V. to S.Q. Insulin for Patients with Diabetes or Hyperglycemia
- ☐ 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
- ☐ Recommendations for Treatment of Painful Peripheral Diabetic Neuropathy
- ☐ Care of the Elderly
  - ☐ Considerations for Elderly Persons with Diabetes
  - ☐ Guidelines for Management of the Elderly with Diabetes in Long-Term Care Facilities
  - ☐ Screening and Management of Hyperglycemia in the Geriatric Population

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

_____

_____

12. Please provide any additional feedback below:

_____

_____

_____

Please return this form to:

Diabetes Program
Attn: Nurse Consultant
Texas Diabetes Program, Mail Code 1965
Dept. of State Health Services
P.O. Box 149347
Austin, TX 78714-9347

Health Care Professional Education

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

Patient education materials 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 Minimum Standards of Care for Diabetes in Texas are 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 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 Tool Kit will be available on the Internet at www.texasdiabetescouncil.org.

Acknowledgements

The Texas Diabetes Council thanks the volunteers on the Medical Professionals Advisory Subcommittee 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 glucose 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 hypertension and hyperlipidemia.
- 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* (IFG)
  1. Fasting plasma glucose 100 mg/dL-125 mg/dL.
- Impaired Glucose Tolerance* (IGT)
  1. Two-hour plasma glucose 140 mg/dL-199 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. Advanced maternal age
     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 dietary 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 23.6 million adults (7.8%) in the United States, 6.2 million of whom do not yet know it.

C. Diabetes affects approximately 1.8 million Texans, and another 460,040 are at high risk of impaired glucose tolerance/insulin resistance.

D. Complications of diabetes in the United States:

- Diabetes is the leading cause of kidney failure.
- Diabetes is the leading cause of blindness among adults aged 20-74 years.
- Diabetes causes mild to severe forms of nervous system damage in 60-70 percent of persons with diabetes.
- Diabetes causes more than 60% of nontraumatic lower-limb amputations.
- Diabetes increases heart disease death rates among adults (2 to 4 times higher than adults without diabetes.
- Diabetes increases risk for stroke (2 to 4 times higher among people with diabetes)

E. Prevalence of diabetes by age groups:

1. Age 60 or older — 23.1%
2. Age 20 or older — 10.7%

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

1. Non-Hispanic whites — 9.8%
2. Non-Hispanic blacks — 14.7%
3. Hispanic/Latino — 10.4% (2004-2006)
4. American Indians and Alaska Natives — 16.5% (Indian Health Services) varies among tribes. Ranges from 6.0% (Alaska Natives) to 29.3% among American Indian adults in souther Arizona.
5. Asian American and Pacific Islanders — 7.5% (2004-2006).

G. Direct and indirect costs of diabetes in the United States (2007) were almost $174 billion, including:

1. $116 billion in direct costs (includes Medicaid and other state programs)
2. $58 billion in indirect costs (lost wages and early death)

Source: CDC National Diabetes Fact Sheet, 2007

Texas Diabetes Fact Sheet, 2008

Survey estimates of diabetes prevalence rose from 8% in 2006 to 10.3% in 2007. The 2007 BRFSS survey had a substantially larger sample size than previous years; therefore, it may have provided a more accurate estimate of prevalence which is steadily increasing in the state and nation.

Prevalence estimates are based on surveys in which individuals are asked if they have been diagnosed with diabetes. Efforts to increase diabetes screening and awareness lead to more people knowing they have diabetes and, consequently, being able to report that they have been diagnosed. This increase in awareness would also be reflected in the estimated prevalence rate.

I. 2007 DIABETES PREVALENCE

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

An estimated 1.8 million persons aged eighteen years and older in Texas (10.3% of this age group) have been diagnosed with diabetes. Nationwide, 18.3 million persons eighteen years of age and older have been diagnosed with diabetes (9.0% of this age group).

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

Another estimated 460,040 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 persons twenty years of age and older). The total for both diagnosed and undiagnosed diabetes is 2.2 million.

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

Male..... 853,751 (9.9%)

Female 942,698 (10.8%)

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

White, non-Hispanic 751,235 (8.5%)

Black, non-Hispanic..... 244,590 (12.9%)

Hispanic 721,779 (12.3%)

Other 88,524 (11.8%)

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	3.0%	3.7%	6.8%	3.8%
45-64	10.9%	17.6%	20.2%	21.1%
65+	17.5%	36.5%	34.4%	34.1%
Overall	8.5%	12.9%	12.3%	11.8%

**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 2.7%

30-44 Years 5.5%

45-64 Years 14.5%

65+ 23.2%

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

No High School Diploma 15.8%

High School Graduate 11.3%

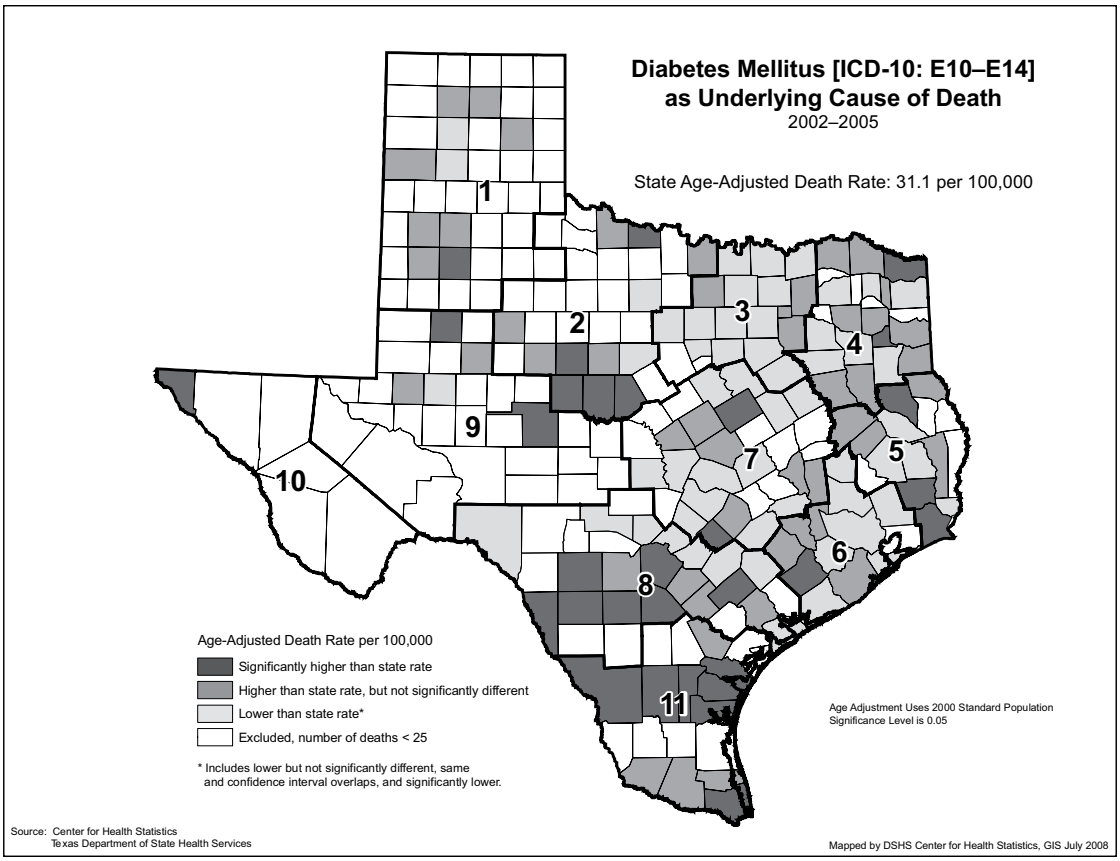
Some College 10.0%

College+ 6.9%

II. DIABETES MORTALITY[3]

Deaths Among Persons with Diabetes

Diabetes was the sixth leading cause of death in Texas 2002 through 2005. In 2005, 5,593 deaths were directly attributed to diabetes. Diabetes was also the sixth leading cause of death nationally 2002 through 2004, and seventh in 2005. 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 2002 through 2005, with diabetes as the underlying cause of death. The state rate for the four years is 31.1 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, 2005

The 2005 diabetes mortality rate for Texas was 30 deaths per 100,000 persons. Mortality rates for each race/ethnicity were applied to the 2005 population by race/ethnicity:

Of persons who have diabetes, in 2004:

- 21 per 100,000 whites (non-Hispanic)
- 52 per 100,000 Hispanics
- 55 per 100,000 blacks (non-Hispanic)
- 15 per 100,000 persons who fall in the "Other" category

The 2005 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:* 2007 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 2008 will be available in fall of 2009 (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: 09/01/08

Pre-diabetes

Definitions: Impaired glucose tolerance (IGT) and impaired fasting glucose (IFG) have been officially termed "pre-diabetes." 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 (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 IFG and 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 of hyperglycemia and a casual plasma glucose ≥ 200 mg/dL

or

C. 2-hour plasma glucose ≥ 200 mg/dL during an OGTT.

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 100-125 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 in children and nonpregnant adults, 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, Vol. 31, (Suppl 1), Jaunary 2008

Diabetes Management Goals of Therapy

GOALS FOR NON-PREGNANT DIABETIC PATIENTS	
Blood Sugar Before Meals	70-130 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
eGFR	≥ 60 **
Body Mass Index (BMI)	< 25 (Overweight 25-29.9; Obesity ≥ 30)

* American Diabetes Association: Clinical Practice Recommendations, 2008.

** American Association of Clinical Endocrinologists (AACE), Medical Guidelines for Clinical Practice for the Management of Diabetes Mellitus. Endocrine Practice, Vol. 13 (Suppl 1), May/June 2007

*** AACE (2007) and the Texas Diabetes Council (2008).

Diabetes Minimum Practice Recommendations

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

Recommended Adult Immunization Schedule

UNITED STATES · 2009

Note: These recommendations *must* be read with the footnotes that follow containing number of doses, intervals between doses, and other important information.

Figure 1. Recommended adult immunization schedule, by vaccine and age group

VACCINE ▼ / AGE GROUP ▶	19–26 years	27–49 years	50–59 years	60–64 years	≥65 years
Tetanus, diphtheria, pertussis (Td/Tdap)[1,*]	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs				Td booster every 10 yrs
Human papillomavirus (HPV)[2,*]	3 doses (females)				
Varicella[3,*]	2 doses				
Zoster[4]				1 dose	
Measles, mumps, rubella (MMR)[5,*]	1 or 2 doses		1 dose		
Influenza[6,*]	1 dose annually				
Pneumococcal (polysaccharide)[7,8]	1 or 2 doses				1 dose
Hepatitis A[9,*]	2 doses				
Hepatitis B[10,*]	3 doses				
Meningococcal[11,*]	1 or more doses				

*Covered by the Vaccine Injury Compensation Program.

For all persons in this category who meet the age requirements and who lack evidence of immunity (e.g., lack documentation of vaccination or have no evidence of prior infection)

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

No recommendation

Report all clinically significant postvaccination reactions to the Vaccine Adverse Event Reporting System (VAERS). Reporting forms and instructions on filing a VAERS report are available at www.vaers.hhs.gov or by telephone, 800-822-7967.

Information on how to file a Vaccine Injury Compensation Program claim is available at www.hrsa.gov/vaccinecompensation or by telephone, 800-338-2382. To file a claim for vaccine injury, contact the U.S. Court of Federal Claims, 717 Madison Place, N.W., Washington, D.C. 20005; telephone, 202-357-6400.

Additional information about the vaccines in this schedule, extent of available data, and contraindications for vaccination is also available at www.cdc.gov/vaccines or from the CDC-INFO Contact Center at 800-CDC-INFO (800-232-4636) in English and Spanish, 24 hours a day, 7 days a week.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

Figure 2. Vaccines that might be indicated for adults based on medical and other indications

VACCINE ▼ / INDICATION ▶	Pregnancy	Immuno-compromising conditions (excluding human immunodeficiency virus [HIV])[13]	HIV infection[3,12,13] CD4+ T lymphocyte count <200 cells/µL	HIV infection[3,12,13] CD4+ T lymphocyte count ≥200 cells/µL	Diabetes, heart disease, chronic lung disease, chronic alcoholism	Asplenia[12] (including elective splenectomy and terminal complement component deficiencies)	Chronic liver disease	Kidney failure, end-stage renal disease, receipt of hemodialysis	Health-care personnel
Tetanus, diphtheria, pertussis (Td/Tdap)[1,*]	Td	Substitute 1-time dose of Tdap for Td booster; then boost with Td every 10 yrs							
Human papillomavirus (HPV)[2,*]		3 doses for females through age 26 yrs							
Varicella[3,*]	Contraindicated			2 doses					
Zoster[4]	Contraindicated				1 dose				
Measles, mumps, rubella (MMR)[5,*]	Contraindicated			1 or 2 doses					
Influenza[6,*]	1 dose TIV annually								1 dose TIV or LAIV annually
Pneumococcal (polysaccharide)[7,8]	1 or 2 doses								
Hepatitis A[9,*]	2 doses								
Hepatitis B[10,*]	3 doses								
Meningococcal[11,*]	1 or more doses								

*Covered by the Vaccine Injury Compensation Program.

For all persons in this category who meet the age requirements and who lack evidence of immunity (e.g., lack documentation of vaccination or have no evidence of prior infection)

Recommended if some other risk factor is present (e.g., on the basis of medical, occupational, lifestyle, or other indications)

No recommendation

These schedules indicate the recommended age groups and medical indications for which administration of currently licensed vaccines is commonly indicated for adults ages 19 years and older, as of January 1, 2009. Licensed combination vaccines may be used whenever any components of the combination are indicated and when the vaccine's other components are not contraindicated. For detailed recommendations on all vaccines, including those used primarily for travelers or that are issued during the year, consult the manufacturers' package inserts and the complete statements from the Advisory Committee on Immunization Practices (www.cdc.gov/vaccines/pubs/acip-list.htm).

CS 52465

The recommendations in this schedule were approved by the Centers for Disease Control and Prevention's (CDC) Advisory Committee on Immunization Practices (ACIP), the American Academy of Family Physicians (AAFP), the American College of Obstetricians and Gynecologists (ACOG), and the American College of Physicians (ACP).

Footnotes

Recommended Adult Immunization Schedule—UNITED STATES - 2009

For complete statements by the Advisory Committee on Immunization Practices (ACIP), visit www.cdc.gov/vaccines/pubs/ACIP-list.htm.

1. Tetanus, diphtheria, and acellular pertussis (Td/Tdap) vaccination

Tdap should replace a single dose of Td for adults aged 19 through 64 years who have not received a dose of Tdap previously.

Adults with uncertain or incomplete history of primary vaccination series with tetanus and diphtheria toxoid-containing vaccines should begin or complete a primary vaccination series. A primary series for adults is 3 doses of tetanus and diphtheria toxoid-containing vaccines; administer the first 2 doses at least 4 weeks apart and the third dose 6–12 months after the second. However, Tdap can substitute for any one of the doses of Td in the 3-dose primary series. The booster dose of tetanus and diphtheria toxoid-containing vaccine should be administered to adults who have completed a primary series and if the last vaccination was received 10 or more years previously. Tdap or Td vaccine may be used, as indicated.

If a woman is pregnant and received the last Td vaccination 10 or more years previously, administer Td during the second or third trimester. If the woman received the last Td vaccination less than 10 years previously, administer Tdap during the immediate postpartum period. A dose of Tdap is recommended for postpartum women, close contacts of infants aged less than 12 months, and all health-care personnel with direct patient contact if they have not previously received Tdap. An interval as short as 2 years from the last Td is suggested; shorter intervals can be used. Td may be deferred during pregnancy and Tdap substituted in the immediate postpartum period, or Tdap may be administered instead of Td to a pregnant woman after an informed discussion with the woman.

Consult the ACIP statement for recommendations for administering Td as prophylaxis in wound management.

2. Human papillomavirus (HPV) vaccination

HPV vaccination is recommended for all females aged 11 through 26 years (and may begin at 9 years) who have not completed the vaccine series. History of genital warts, abnormal Papanicolaou test, or positive HPV DNA test is not evidence of prior infection with all vaccine HPV types; HPV vaccination is recommended for persons with such histories.

Ideally, vaccine should be administered before potential exposure to HPV through sexual activity; however, females who are sexually active should still be vaccinated consistent with age-based recommendations. Sexually active females who have not been infected with any of the four HPV vaccine types receive the full benefit of the vaccination. Vaccination is less beneficial for females who have already been infected with one or more of the HPV vaccine types.

A complete series consists of 3 doses. The second dose should be administered 2 months after the first dose; the third dose should be administered 6 months after the first dose.

HPV vaccination is not specifically recommended for females with the medical indications described in Figure 2, "Vaccines that might be indicated for adults based on medical and other indications." Because HPV vaccine is not a live-virus vaccine, it may be administered to persons with the medical indications described in Figure 2. However, the immune response and vaccine efficacy might be less for persons with the medical indications described in Figure 2 than in persons who do not have the medical indications described or who are immunocompetent. Health-care personnel are not at increased risk because of occupational exposure, and should be vaccinated consistent with age-based recommendations.

3. Varicella vaccination

All adults without evidence of immunity to varicella should receive 2 doses of single-antigen varicella vaccine if not previously vaccinated or the second dose if they have received only one dose unless they have a medical contraindication. Special consideration should be given to those who 1) have close contact with persons at high risk for severe disease (e.g., health-care personnel and family contacts of persons with immunocompromising conditions) or 2) are at high risk for exposure or transmission (e.g., teachers; child care employees; residents and staff members of institutional settings, including correctional institutions; college students; military personnel; adolescents and adults living in households with children; nonpregnant women of childbearing age; and international travelers).

Evidence of immunity to varicella in adults includes any of the following: 1) documentation of 2 doses of varicella vaccine at least 4 weeks apart; 2) U.S.-born before 1980 (although for health-care personnel and pregnant women, birth before 1980 should not be considered evidence of immunity); 3) history of varicella based on diagnosis or verification of varicella by a health-care provider (for a patient reporting a history of or presenting with an atypical case, a mild case, or both, health-care providers should seek either an epidemiologic link with a typical varicella case or to a laboratory-confirmed case or evidence of laboratory confirmation, if it was performed at the time of acute disease); 4) history of herpes zoster based on health-care provider diagnosis or verification of herpes zoster by a health-care provider; or 5) laboratory evidence of immunity or laboratory confirmation of disease.

Pregnant women should be assessed for evidence of varicella immunity. Women who do not have evidence of immunity should receive the first dose of varicella vaccine upon completion or termination of pregnancy and before discharge from the health-care facility. The second dose should be administered 4–8 weeks after the first dose.

4. Herpes zoster vaccination

A single dose of zoster vaccine is recommended for adults aged 60 years and older regardless of whether they report a prior episode of herpes zoster. Persons with chronic medical conditions may be vaccinated unless their condition constitutes a contraindication.

5. Measles, mumps, rubella (MMR) vaccination

Measles component: Adults born before 1957 generally are considered immune to measles. Adults born during or after 1957 should receive 1 or more doses of MMR unless they have a medical contraindication, documentation of 1 or more doses, history of measles based on health-care provider diagnosis, or laboratory evidence of immunity.

A second dose of MMR is recommended for adults who 1) have been recently exposed to measles or are in an outbreak setting; 2) have been vaccinated previously with killed measles vaccine; 3) have been vaccinated with an unknown type of measles vaccine during 1963–1967; 4) are students in postsecondary educational institutions; 5) work in a health-care facility; or 6) plan to travel internationally.

Mumps component: Adults born before 1957 generally are considered immune to mumps. Adults born during or after 1957 should receive 1 dose of MMR unless they have a medical contraindication, history of mumps based on health-care provider diagnosis, or laboratory evidence of immunity.

A second dose of MMR is recommended for adults who 1) live in a community experiencing a mumps outbreak and are in an affected age group; 2) are students in postsecondary educational institutions; 3) work in a health-care facility; or 4) plan to travel internationally. For unvaccinated health-care personnel born before 1957 who do not have other evidence of mumps immunity, administering 1 dose on a routine basis should be considered and administering a second dose during an outbreak should be strongly considered.

Rubella component: 1 dose of MMR vaccine is recommended for women whose rubella vaccination history is unreliable or who lack laboratory evidence of immunity. For women of childbearing age, regardless of birth year, rubella immunity should be determined and women should be counseled regarding congenital rubella syndrome. Women who do not have evidence of immunity should receive MMR upon completion or termination of pregnancy and before discharge from the health-care facility.

6. Influenza vaccination

Medical indications: Chronic disorders of the cardiovascular or pulmonary systems, including asthma; chronic metabolic diseases, including diabetes mellitus, renal or hepatic dysfunction, hemoglobinopathies, or immunocompromising conditions (including immunocompromising conditions caused by medications or human immunodeficiency virus [HIV]); any condition that compromises respiratory function or the handling of respiratory secretions or that can increase the risk of aspiration (e.g., cognitive dysfunction, spinal cord injury, or seizure disorder or other neuromuscular disorder); and pregnancy during the influenza season. No data exist on the risk for severe or complicated influenza disease among persons with asplenia; however, influenza is a risk factor for secondary bacterial infections that can cause severe disease among persons with asplenia.

Occupational indications: All health-care personnel, including those employed by long-term care and assisted-living facilities, and caregivers of children less than 5 years old.

Other indications: Residents of nursing homes and other long-term care and assisted-living facilities; persons likely to transmit influenza to persons at high risk (e.g., in-home household contacts and caregivers of children aged less than 5 years old, persons 65 years old and older and persons of all ages with high-risk condition[s]); and anyone who would like to decrease their risk of getting influenza. Healthy, nonpregnant adults aged less than 50 years without high-risk medical conditions who are not contacts of severely immunocompromised persons in special care units can receive either intranasally administered live, attenuated influenza vaccine (FluMist®) or inactivated vaccine. Other persons should receive the inactivated vaccine.

7. Pneumococcal polysaccharide (PPSV) vaccination

Medical indications: Chronic lung disease (including asthma); chronic cardiovascular diseases; diabetes mellitus; chronic liver diseases, cirrhosis; chronic alcoholism, chronic renal failure or nephrotic syndrome; functional or anatomic asplenia (e.g., sickle cell disease or splenectomy [if elective splenectomy is planned, vaccinate at least 2 weeks before surgery]); immunocompromising conditions; and cochlear implants and cerebrospinal fluid leaks. Vaccinate as close to HIV diagnosis as possible.

Other indications: Residents of nursing homes or long-term care facilities and persons who smoke cigarettes. Routine use of PPSV is not recommended for Alaska Native or American Indian persons younger than 65 years unless they have underlying medical conditions that are PPSV indications. However public health authorities may consider recommending PPSV for Alaska Natives and American Indians aged 50 through 64 years who are living in areas in which the risk of invasive pneumococcal disease is increased.

8. Revaccination with PPSV

One-time revaccination after 5 years for persons with chronic renal failure or nephrotic syndrome; functional or anatomic asplenia (e.g., sickle cell disease or splenectomy); and for persons with immunocompromising conditions. For persons aged 65 years and older, one-time revaccination if they were vaccinated 5 or more years previously and were aged less than 65 years at the time of primary vaccination.

9. Hepatitis A vaccination

Medical indications: Persons with chronic liver disease and persons who receive clotting factor concentrates.

Behavioral indications: Men who have sex with men and persons who use illegal drugs.

Occupational indications: Persons working with hepatitis A virus (HAV)-infected primates or with HAV in a research laboratory setting.

Other indications: Persons traveling to or working in countries that have high or intermediate endemicity of hepatitis A (a list of countries is available at wwwn.cdc.gov/travel/contentdiseases.aspx) and any person seeking protection from HAV infection.

Single-antigen vaccine formulations should be administered in a 2-dose schedule at either 0 and 6–12 months (Havrix®), or 0 and 6–18 months (Vaqta®). If the combined hepatitis A and hepatitis B vaccine (Twinrix®) is used, administer 3 doses at 0, 1, and 6 months; alternatively, a 4-dose schedule, administered on days 0, 7 and 21 to 30 followed by a booster dose at month 12 may be used.

10. Hepatitis B vaccination

Medical indications: Persons with end-stage renal disease, including patients receiving hemodialysis; persons with HIV infection; and persons with chronic liver disease.

Occupational indications: Health-care personnel and public-safety workers who are exposed to blood or other potentially infectious body fluids.

Behavioral indications: Sexually active persons who are not in a long-term, mutually monogamous relationship (e.g., persons with more than 1 sex partner during the previous 6 months); persons seeking evaluation or treatment for a sexually transmitted disease; current or recent injection-drug users; and men who have sex with men.

Other indications: Household contacts and sex partners of persons with chronic hepatitis B virus (HBV) infection; clients and staff members of institutions for persons with developmental disabilities; international travelers to countries with high or intermediate prevalence of chronic HBV infection (a list of countries is available at wwwn.cdc.gov/travel/contentdiseases.aspx); and any adult seeking protection from HBV infection.

Hepatitis B vaccination is recommended for all adults in the following settings: STD treatment facilities; HIV testing and treatment facilities; facilities providing drug-abuse treatment and prevention services; health-care settings targeting services to injection-drug users or men who have sex with men; correctional facilities; end-stage renal disease programs and facilities for chronic hemodialysis patients; and institutions and nonresidential daycare facilities for persons with developmental disabilities.

If the combined hepatitis A and hepatitis B vaccine (Twinrix®) is used, administer 3 doses at 0, 1, and 6 months; alternatively, a 4-dose schedule, administered on days 0, 7 and 21 to 30 followed by a booster dose at month 12 may be used.

Special formulation indications: For adult patients receiving hemodialysis or with other immunocompromising conditions, 1 dose of 40 µg/mL (Recombivax HB®) administered on a 3-dose schedule or 2 doses of 20 µg/mL (Engerix-B®) administered simultaneously on a 4-dose schedule at 0, 1, 2 and 6 months.

11. Meningococcal vaccination

Medical indications: Adults with anatomic or functional asplenia, or terminal complement component deficiencies.

Other indications: First-year college students living in dormitories; microbiologists who are routinely exposed to isolates of *Neisseria meningitidis*; military recruits; and persons who travel to or live in countries in which meningococcal disease is hyperendemic or epidemic (e.g., the "meningitis belt" of sub-Saharan Africa during the dry season [December–June]), particularly if their contact with local populations will be prolonged. Vaccination is required by the government of Saudi Arabia for all travelers to Mecca during the annual Hajj.

Meningococcal conjugate (MCV) vaccine is preferred for adults with any of the preceding indications who are aged 55 years or younger, although meningococcal polysaccharide vaccine (MPSV) is an acceptable alternative. Revaccination with MCV after 5 years might be indicated for adults previously vaccinated with MPSV who remain at increased risk for infection (e.g., persons residing in areas in which disease is epidemic).

12. Selected conditions for which *Haemophilus influenzae* type b (Hib) vaccine may be used

Hib vaccine generally is not recommended for persons aged 5 years and older. No efficacy data are available on which to base a recommendation concerning use of Hib vaccine for older children and adults. However, studies suggest good immunogenicity in persons who have sickle cell disease, leukemia, or HIV infection or who have had a splenectomy; administering 1 dose of vaccine to these persons is not contraindicated.

13. Immunocompromising conditions

Inactivated vaccines generally are acceptable (e.g., pneumococcal, meningococcal, and influenza [trivalent inactivated influenza vaccine]), and live vaccines generally are avoided in persons with immune deficiencies or immunocompromising conditions. Information on specific conditions is available at www.cdc.gov/vaccines/pubs/acip-list.htm.

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	140 mg/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.
- 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	70 – 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. Vol. 31, (Suppl 1), January 2008

** American Association of Clinical Endocrinologists (AACE), Medical Guidelines for the Management of Diabetes Mellitus: The AACE System of Intensive Diabetes Self-Management – Vol. 13 (Suppl 1), May/June 2007.

*** 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 hypoglycemia occur, which include dizziness, shaking, sweating, chills, and confusion
- When symptoms of hyperglycemia occur, 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 glucose 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

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.

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 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 end stage renal disease (ESRD) in the United States also because high sugar levels damage tiny blood vessels in the kidneys. Many people then require dialysis or kidney transplantation.

Neuropahy

- 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

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Diabetes self-management education (DSME) is a critical element of care for all people with diabetes and is necessary in order to improve patient outcomes. The National Standards for DSME are designed to define quality diabetes self-management education and to assist diabetes educators in a variety of settings to provide evidence-based education. Because of the dynamic nature of health care and diabetes-related research, these Standards are reviewed and revised approximately every 5 years by key organizations and federal agencies within the diabetes education community.

A Task Force was jointly convened by the American Association of Diabetes Educators and the American Diabetes Association in the summer of 2006. Additional organizations that were represented included the American Dietetic Association, the Veteran's Health Administration, the Centers for Disease Control and Prevention, the Indian Health Service, and the American Pharmaceutical Association. Members of the Task Force included a person with diabetes; several health services researchers/behaviorists, registered nurses, and registered dietitians; and a pharmacist.

The Task Force was charged with reviewing the current DSME standards for their appropriateness, relevance, and scientific basis. The Standards were then reviewed and revised based on the available evidence and expert consensus. The committee convened on 31 March 2006 and 9 September 2006, and the Standards were approved 25 March 2007.

DEFINITION AND OBJECTIVES — Diabetes self-management education (DSME) is the ongoing process of facilitating the knowledge, skill, and ability necessary for diabetes self-care. This process incorporates the needs, goals, and life experiences of the person with diabetes and is guided by evidence-based standards. The overall objectives of DSME are to support informed decision-making, self-care behaviors, problem-solving and active collaboration with the health care team and to improve clinical outcomes, health status, and quality of life.

GUIDING PRINCIPLES — Before the review of the individual Standards, the Task Force identified overriding principles based on existing evidence that would be used to guide the review and revision of the DSME Standards. These are:

1. Diabetes education is effective for improving clinical outcomes and quality of life, at least in the short-term (1–7).
2. DSME has evolved from primarily didactic presentations to more theoretically based empowerment models (3,8).
3. There is no one "best" education program or approach; however, programs incorporating behavioral and psychosocial strategies demonstrate improved outcomes (9–11). Additional studies show that culturally and age-appropriate programs improve outcomes (12–16) and that group education is effective (4,6,7,17,18).
4. Ongoing support is critical to sustain progress made by participants during the DSME program (3,13,19,20).
5. Behavioral goal-setting is an effective strategy to support self-management behaviors (21).

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.*

Documentation of the DSME organizational structure, mission statement, and goals can lead to efficient and effective provision of services. In the business literature, case studies and case report investigations on successful management strategies emphasize the importance of clear goals and objectives, defined relationships and roles, and managerial support (22–25). While this concept is relatively new in health care, business and health policy experts and organizations have begun to emphasize written commitments, policies, support, and the importance of outcome variables in quality improvement efforts (22,26–37). The continuous quality improvement literature also stresses the importance of developing policies, procedures, and guidelines (22,26).

Documentation of the organizational structure, mission statement, and goals can lead to efficient and effective provision of DSME. Documentation of an organizational structure that delineates

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channels of communication and represents institutional commitment to the educational entity is critical for success (38–42). According to the Joint Commission on Accreditation of Health Care Organizations (JCAHO) (26), 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 from which to deliver quality diabetes education (22,26, 33,35–37). In 2005, JACHO published the *Joint Commission International Standards for Disease or Condition-Specific Care*, which outlines national standards and performance measurements for diabetes and addresses diabetes self-management education as one of seven critical elements (26).

Standard 2. *The DSME entity shall appoint an advisory group to promote quality. This group shall include representatives from the health professions, people with diabetes, the community, and other stakeholders.*

Established and new systems (e.g., committees, governing bodies, advisory groups) provide a forum and a mechanism for activities that serve to guide and sustain the DSME entity (30,39–41). Broad participation of organization(s) and community stakeholders, including health professionals, people with diabetes, consumers, and other community interest groups, at the earliest possible moment in the development, ongoing planning, and outcomes evaluation process (22,26,33,35,36,41) can increase knowledge and skills about the local community and enhance collaborations and joint decision-making. The result is a DSME program that is patient-centered, more responsive to consumer-identified needs and the needs to the community, more culturally relevant, and of greater personal interest to consumers (43–50).

Standard 3. *The DSME entity will determine the diabetes educational needs of the target population(s) and identify resources necessary to meet these needs.*

Clarifying the target population and determining its self-management educational needs serve to focus resources and maximize health benefits (51–53). The assessment process should identify the educational needs of all individuals with diabetes, not just those who frequently attend clinical appointments (51). DSME is a critical component of diabetes treatment (2,54,55), yet the majority of individuals with diabetes do not receive any formal diabetes education (56,57). Thus, identification of access issues is an essential part of the assessment process (58). Demographic variables, such as ethnic background, age, formal educational level, reading ability, and barriers to participation in education, must also be considered to maximize the effectiveness of DSME for the target population (13–19,43–47,59–61).

Standard 4. *A coordinator will be designated to oversee the planning, implementation, and evaluation of diabetes self-management education. The coordinator will have academic or experiential preparation in chronic disease care and education and in program management.*

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 accountability and continuity of the educational process (23,60–62). The individual serving as the coordinator will be most effective if there is familiarity with the lifelong process of managing a chronic disease (e.g., diabetes) and with program management.

Process

Standard 5. *DSME will be provided by one or more instructors. The instructors will have recent educational and experiential preparation in education and diabetes management or will be a certified diabetes educator. The instructor(s) will obtain regular continuing education in the field of diabetes management and education. At least one of the instructors will be a registered nurse, dietitian, or pharmacist. A mechanism must be in place to ensure that the participant's needs are met if those needs are outside the instructors' scope of practice and expertise.*

Diabetes education has traditionally been provided by nurses and dietitians. Nurses have been utilized most often as instructors in the delivery of formal DSME (2,3,5,63–67). With the emergence of medical nutrition therapy (66–70), registered dietitians became an integral part of the diabetes education team. In more recent years, the role of the diabetes educator has expanded to other disciplines, particularly pharmacists (73–79). Reviews comparing the effectiveness of different disciplines for education report mixed results (3,5,6). Generally, the literature favors current practice that utilizes the registered nurse, registered dietitian, and the registered pharmacist as the key primary instructors for diabetes education and members of the multidisciplinary team responsible for designing the curriculum and assisting in the delivery of DSME (1–7,77). In addition to registered nurses, registered dietitians, and pharmacists, a number of studies reflect the ever-changing and evolving health care environment and include other health professionals (e.g., a physician, behaviorist, exercise physiologist, ophthalmologist, optometrist, podiatrist) (48,80–84) and, more recently, lay health and community workers (85–91) and peers (92) to provide information, behavioral support, and links with the health care system as part of DSME.

Expert consensus supports the need for specialized diabetes and educational training beyond academic preparation for the primary instructors on the diabetes team (64,93–97). Certification as a diabetes educator by the National Certification Board for Diabetes Educators (NCBDE) is one way a health professional can demonstrate mastery of a specific body of knowledge, and this certification has become an accepted credential in the diabetes community (98). An additional credential that indicates specialized training beyond basic preparation is board certification in advanced Diabetes Management (BC-ADM) offered by the American Nurses Credentialing Center (ANCC), which is available for master's prepared nurses, dietitians, and pharmacists (48,84,99).

DSME has been shown to be most effective when delivered by a multidisciplinary team with a comprehensive plan of care (7,31,52,100–102). Within the multidisciplinary team, team members work interdependently, consult with one another, and have shared objectives (7,103,104). The team should have a collective combination of expertise in the clinical care of diabetes, medical nutrition therapy, educational methodologies, teaching strategies, and the psychosocial and behavioral aspects of diabetes self-management. A referral mechanism should be in place to ensure that the individual with diabetes receives education from those with appropriate training and credentials. It is essential in this collaborative and integrated team approach that individuals with diabetes are viewed as leaders of their team and assume an active role in designing their educational experience (7,20,31,100–102,104).

Standard 6. *A written curriculum reflecting current evidence and practice guidelines, with*

criteria for evaluating outcomes, will serve as the framework for the DSME entity. Assessed needs of the individual with pre-diabetes and diabetes will determine which of the content areas listed below are to be provided:

- Describing the *diabetes disease process* and *treatment options*
- Incorporating *nutritional management* into lifestyle
- Incorporating *physical activity* into lifestyle
- Using *medication(s)* safely and for maximum therapeutic effectiveness
- *Monitoring blood glucose* and other parameters and interpreting and using the results for self-management decision making
- Preventing, detecting, and treating *acute complications*
- Preventing detecting, and treating *chronic complications*
- Developing personal strategies to address psychosocial issues and concerns
- Developing personal strategies to promote health and behavior change

People with diabetes and their families and caregivers have a great deal to learn in order to become effective self-managers of their diabetes. A core group of topics are commonly part of the curriculum taught in comprehensive programs that have demonstrated successful outcomes (1,2,3,6,105–109). The curriculum, a coordinated set of courses and educational experiences, includes learning outcomes and effective teaching strategies (110–112). The curriculum is dynamic and needs to reflect current evidence and practice guidelines (112–117). Current educational research reflects the importance of emphasizing practical, problem-solving skills, collaborative care, psychosocial issues, behavior change, and strategies to sustain self-management efforts (31,39,42,48,98,118–122).

The content areas delineated above provide instructors with an outline for developing this curriculum. It is important that the content be tailored to match each individual's needs and adapted as necessary for age, type of diabetes (including pre-diabetes and pregnancy), cultural influences, health literacy, and other comorbidities (123,124). The content areas are designed to be applicable in all settings and represent topics that can be developed in basic, intermediate, and advanced levels. Approaches to education that are interactive and patient-centered have been shown to be effective (83,119,121,122,125–127).

These content areas are presented in behavioral terms and thereby exemplify the importance of action-oriented, behavioral goals and objectives (13,21,55,121–123,128,129). Creative, patient-centered experience-based delivery methods are effective for supporting informed decision-making and behavior change and go beyond the acquisition of knowledge.

Standard 7. *An individual assessment and education plan will be developed collaboratively by the participant and instructor(s) to direct the selection of appropriate educational interventions and self-management support strategies. This assessment and education plan and the intervention and outcomes will be documented in the education record.*

Multiple studies indicate the importance of individualizing education based on the assessment (1,56,68,131–135). The assessment includes information about the individual's relevant medical history, age, cultural influences, health beliefs and attitudes, diabetes knowledge, self-management skills and behaviors, readiness to learn, health literacy level, physical limitations, family support, and financial status (10–17,19,131,136–138). The majority of these studies support the importance of attitudes and health beliefs in diabetes care outcomes (1,68,134,135,138,139).

In addition, functional health literacy (FHL) level can affect patients' self-management, communication with clinicians, and diabetes outcomes (140,141). Simple tools exist for measuring FHL as part of an overall assessment process (142–144).

Many people with diabetes experience problems due to medication costs, and asking patients about their ability to afford treatment is important (144). Comorbid chronic illness (e.g., depression and chronic pain) as well as more general psychosocial problems can pose significant barriers to diabetes self-management (104,146–151); considering these issues in the assessment may lead to more effective planning (149–151).

Periodic reassessment determines attainment of the educational objectives or the need for additional and creative interventions and future reassessment (7,97,100,152). A variety of assessment modalities, including telephone follow-up and other information technologies (e.g., Web-based, automated phone calls), may augment face-to-face assessments (97,99).

While there is little direct evidence on the impact of documentation on patient outcomes, it is required to receive payment for services. In addition, documentation of patient encounters guides the educational process, provides evidence of communication among instructional staff, may prevent duplication of services, and provides information on adherence to guidelines (37,64,100,131,153). Providing information to other members of the patient's health care team through documentation of educational objectives and personal behavioral goals increases the likelihood that all of the members will address these issues with the patient (37,98,153).

The use of evidence-based performance and outcome measures has been adopted by organizations and initiatives such as the Centers for Medicare and Medicaid Services (CMS), the National Committee for Quality Assurance (NCQA), the Diabetes Quality Improvement Project (DQIP), the Health Plan Employer Data and Information Set (HEDIS), the Veterans Administration Health System, and JCAHO (26,154).

Research suggests that the development of standardized procedures for documentation, training 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 (100,153–155).

Standard 8. *A personalized follow-up plan for ongoing self management support will be developed collaboratively by the participant and instructor(s). The patient's outcomes and goals and the plan for ongoing self management support will be communicated to the referring provider.*

While DSME is necessary, it is not sufficient for patients to sustain a lifetime of diabetes self-care (55). Initial improvements in metabolic and other outcomes diminish after ~6 months (3). To sustain behavior at the level of self-management needed to effectively manage diabetes, most patients need ongoing diabetes self-management support (DSMS).

DSMS is defined as activities to assist the individual with diabetes to implement and sustain the ongoing behaviors needed to manage their illness. The type of support provided can include behavioral, educational, psychosocial, or clinical (13,121–123).

A variety of strategies are available for

providing DSMS both within and outside the DSME entity. Some patients benefit from working with a nurse case manager (7,20,98,157). Case management for DSMS can include reminders about needed follow-up care and tests, medication management, education, behavioral goal-setting, and psychosocial support/connection to community resources.

The effectiveness of providing DSMS through disease-management programs, trained peers and health community workers, community-based programs, use of technology, ongoing education and support groups, and medical nutrition therapy has also been established (7,13,89–92,101,121–123,158–159).

While the primary responsibility for diabetes education belongs to the DSME entity, patients benefit by receiving reinforcement of content and behavioral goals from their entire health care team (100). Additionally, many patients receive DSMS through their provider. Thus, communication is essential to ensure that patients receive the support they need.

Outcomes

Standard 9. *The DSME entity will measure attainment of patient-defined goals and patient outcomes at regular intervals using appropriate measurement techniques to evaluate the effectiveness of the educational intervention.*

In addition to program-defined goals and objectives (e.g., learning goals, metabolic, and other health outcomes), the DSME entity needs to assess each patient's personal self-management goals and his/her progress toward those personal goals. The AADE7 self-care behaviors provide a useful framework for assessment and documentation. Diabetes self-management behaviors include physical activity, healthy eating, medication taking, monitoring blood glucose, diabetes self-care related problem solving, reducing risks of acute and chronic complications, and psychosocial aspects of living with diabetes (112,160). Assessments of patient outcomes should occur at appropriate intervals. The interval depends on the outcome itself and the timeframe provided within the selected goals. For some areas, the indicators, measures, and timeframes may be based on guidelines from professional organizations or government agencies. In addition to assessing progress toward personal behavioral goals, a plan needs to be in place to communicate personal goals and progress to other team members.

The AADE Outcome Standards for Diabetes Education specify self-management behavior as the key outcome (112,160). Knowledge is an outcome to the degree that it is actionable (i.e., knowledge that can be translated into self-management behavior). In turn, effective self-management is one (but not the only) contributor to longer-term, higher-order outcomes such as clinical status (e.g., control of glycemia, blood pressure, and cholesterol), health status (e.g., avoidance of complications), and subjective quality of life. Thus, patient self-management behaviors are at the core of the outcomes evaluation.

Standard 10. *The DSME entity will measure the effectiveness of the education process and determine opportunities for improvement using a written continuous quality improvement plan that describes and documents a systematic review of the entities' process and outcome data.*

Diabetes education must be responsive to advances in knowledge, treatment strategies, educational strategies, psychosocial interventions, and the changing health care environment. Continuous quality improvement (CQI) is an iterative, planned process (161) that leads to improvement in the delivery of patient education (162). The CQI plan should define quality based on and consistent with the organization's mission, vision, and strategic plan and include identifying and prioritizing improvement opportunities (163). Once improvement projects are identified and selected, the plan should incorporate timelines and important milestones including data collection, analysis, and presentation of results (163). Outcome measures indicate the result of a process (i.e., whether changes are actually leading to improvement), while process measures provide information about what caused those results (163–164). Process measures are often targeted to those processes that typically impact the most important outcomes. Measuring both process and outcomes helps to ensure that change is successful without causing additional problems in the system (164).

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References

1. Brown SA: Interventions to promote diabetes self-management: state of the science. *Diabetes Educ* 25 (6 Suppl.):52–61, 1999
2. Norris SL, Engelgau MM, Naranyan KMV: Effectiveness of self-management training in type 2 diabetes: a systematic review of randomized controlled trials. *Diabetes Care* 24:561–587, 2001
3. Norris SL, Lau J, Smith SJ, Schmid CH, Engelgau MM: Self-management education for adults with type 2 diabetes: a meta-analysis on the effect on glycemic control. *Diabetes Care* 25:1159–1171, 2002
4. Norris SL: Self-management education in type 2 diabetes. *Practical Diabetology* 22:713, 2003
5. Gary TL, Genkinger JM, Guallar E, Peyrot M, Brancati FL: Meta-analysis of randomized educational and behavioral interventions in type 2 diabetes. *Diabetes Educ* 29:488–501, 2003
6. Deakin T, McShane CE, Cade JE, et al. Review: group based education in self-management strategies improves outcomes in type 2 diabetes mellitus. *Cochrane Database Syst Rev* (2): CD003417, 2005
7. Renders CM, Valk GD, Griffin SJ, Wagner EH, Eijk van JThM, Assendelft WJJ: Interventions to improve the management of diabetes in primary care, outpatient, and community settings: a systematic review. *Diabetes Care* 24: 1821–1833, 2001
8. Funnell MM, Anderson RM: Patient empowerment: a look back, a look ahead. *Diabetes Educ* 29:454–464, 2003
9. Roter DL, Hall JA, Merisca R, Nordstrom B, Cretin D, Svarstad B: Effectiveness of

interventions to improve patient compliance: a meta-analysis. *Medical Care* 36: 1138–1161, 1998
10. Barlow J, Wright C, Sheasby J, et al: Self-management approaches for people with chronic conditions: a review. *Patient Education and Counseling* 48: 177–187, 2002
11. Skinner TC, Cradock S, Arundel F, Graham W: Lifestyle and behavior: four theories and a philosophy: self-management education for individuals newly diagnosed with type 2 diabetes. *Diabetes Spectrum* 16: 75–80, 2003
12. Brown SA, Hanis CL: Culturally competent diabetes education for Mexican Americans: the Starr County Study. *Diabetes Educ* 25:226–236, 1999
13. Anderson RM, Funnell MM, Nowankwo R, et al: Evaluating a problem based empowerment program for African Americans with diabetes: results of a randomized controlled trial. *Ethnicity and Disease* 15: 671–678, 2005
14. Sarkisian CA, Brown AF, Norris CK, Wintz RL, Mangione CM: A systematic review of diabetes self-care interventions for older, African American or Latino adults. *Diabetes Educ* 28:467–47915, 2003
15. Chodosh J, Morton SC, Mojica W, Maglione M, Suttorp MJ, Hilton L, Rhodes S, Shekelle P: Meta-analysis: chronic disease self-management programs for older adults. *Ann Intern Med* 143:427–438, 2005
16. Anderson-Loftin W, Barnett S, Bunn P, et al: A. Soul food light: culturally competent diabetes education. *Diabetes Educ* 31:555–563, 2005
17. Mensing CR, Norris SL: Group education in diabetes: effectiveness and implementation. *Diabetes Spectrum* 16:96–103, 2003
18. Rickheim PL, Weaver TK, Flader JL, Kendall DM: Assessment of group versus individual education: a randomized study. *Diabetes Care* 25:269–274, 2002
19. Brown SA, Blozis SA, Kouzekanani K, Garcia AA, Winchell M, Hanis CL: Dosage effects of diabetes self-management education for Mexican Americans. *Diabetes Care* 28:527–532, 2005
20. Polonsky WH, Earles J, Smith S, Pease DJ, Macmillan M, Christensen R, Taylor T, Dickert J, Jackson RA: Integrating medical management with diabetes self-management training: a randomized control trial of the Diabetes Outpatient Intensive Treatment Program. *Diabetes Care* 26:3094–3053, 2003
21. Bodenheimer T, MacGregor K, Sharifi C: *Helping Patients Manage Their Chronic Conditions*. Oakland, CA, California Healthcare Foundation, 2005
22. Deming WE: *Out of the Crisis*. Cambridge, MA, Massachusetts Institute of Technology, 2000
23. 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, 1993
24. Drucker PF: *Management: Tasks, Responsibilities, Practices*. New York, Harperbusiness, 1993
25. Garvin DA: The processes of organization and management. *Sloan Manage Rev* (summer):30–50, 1998
26. Joint Commission on Accreditation of Healthcare Organizations: *Joint Commission International Standards for Disease or Condition-Specific Care*. 1st ed. Oakbrook Terrace. IL, Joint Accreditation on Healthcare Organizations, 2005
27. Berwick DM: A primer on leading the improvement of systems. *BMJ* 312:619–622, 1996
28. Clemmer TP, Spuhler VJ, Berwick DM, Nolan TW: Cooperation: the foundation of improvement. *Annals Internal Medicine* 128:1004–1009, 1998
29. Courtney L, Gordon M, Romer L: A clinical path for adult diabetes. *The Diabetes Educator* 23:664–671, 1997
30. Glasgow RE, Hiss RG, Anderson RM, Friedman NM, Hayward RA, Marrero DG, Taylor CB, Vinicor F: Report of the Health Care Delivery Work Group. *Diabetes Care* 24:124–130, 2001
31. Wagner EH, Austin BT, Von Korff M: Organizing care for patients with chronic illness. *Milllbank Quarterly* 74: 511–544, 1996
32. Community Health Improvement Partners: From the board room to the community room: a health improvement collaboration that's working. *Journal of Quality Improvement* 24:549–564, 1998
33. Kiefe CI, Allison JJ, Willais OD, Person SD, Weaver MT, Weissman NW: Improving quality improvement using achievable benchmarks for physician feedback. *JAMA* 285:2871–2879, 2001
34. 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
35. 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. *Archives Family Medicine* 5:502–506, 1996
36. Wagner EH, Davis C, Schaefer J, Von Korff M, Austin B: A survey of leading chronic disease management programs: are they consistent with the literature? *Journal of Nursing Care Quality* 16:67–80, 2002
37. Von Korff M, Gruman J, Schaefer J, Curry SJ, Wagner EH: Collaborative management of chronic illness. *Ann Intern Med* 127:1097–1102, 1997
38. Fox CH, Mahoney MC: Improving diabetes preventative care in a family practice residency program: a case study in continuous quality improvement. *Family Medicine* 30:441–445, 1998
39. Siminerio L, Piatt G, Emerson S, Ruppert K, Saul M, Solano F, Stewart A, Zgibor J: Deploying the chronic care model to implement and sustain diabetes self-management training programs. *Diabetes Educ* 32:1–8, 2006
40. Siminerio LM, Zgibor JC, Solano FX: Implementing the chronic care model for improvements in diabetes practice and outcomes in primary care: The University of Pittsburgh Medical Center Experience. *Clinical Diabetes* 22:54–58, 2003
41. Heins JM, Nord Wr, Cameron M: Establishing and sustaining state-of-the-art diabetes education programs: research and recommendations. *Diabetes Educ* 18:501–598, 1992
42. Mangan M: Diabetes self-management education programs in the Veterans Health Administration. *Diabetes Educ* 23:687–695, 1997
43. Griffin JA, Gilliland Ss, Perez G, Helitzer D, Carter JS.: Participants satisfaction with culturally appropriate diabetes education program: the Native American diabetes education program in a northwest Indian tribe. *Diabetes Educ* 25:351–363, 1999
44. Hiss RG: Barriers to care in non-insulin-dependent diabetes mellitus: the Michigan experience. *Ann Intern Med* 124: 146–148, 1996
45. Simmons D, Voyle J, Swinburn B, O'Dea K: Community-based approaches for the primary prevention of non-insulin-dependent diabetes mellitus. *Diabet Med* 14:519–526, 1997
46. Gamm LD: Advancing community health through community health partnerships. *J Healthcare Management* 43: 51–67, 1998
47. Snoek FJ: Quality of life: a closer look at measuring patients' well-being. *Diabetes Spectrum* 13:24–28, 2000
48. Piatt G, Brooks MM, Orchard TJ, Kortykowski M, Emerson S, Siminerio L, Simmons D, Ahmad U, Soner TJ, Zgibor JC: Translating the chronic care model into the community. *Diabetes Care* 29: 811–816, 2006
49. Harris SB, Zinman B: Primary prevention of type 2 diabetes in high-risk populations. *Diabetes Care* 23:87–881, 2000
50. Rothman J: Approaches to community intervention. In *Strategies of Community Intervention*. 5th ed. Itasca, IL, F. Peacock, 2001, p. 26–63
51. O'Connor PJ, Pronk NP: Integrating population health concepts, clinical guidelines, and ambulatory medical care systems to improve diabetes care. *J Am-*

bulatory Care Manager 21:67–73, 1998
52. Wagner EH: The role of patient care teams in chronic disease management. *Br Med J* 320:569–572, 2000
53. Hiss RG, Gillard ML, Armbruster BA, McClure LA: Comprehensive evaluation of community-based diabetic patients. *Diabetes Care* 24:690–694, 2001
54. Jack L: Diabetes Self-Management Education Research: An international review of intervention methods, theories, community partners and outcomes. *Disease Management and Health Outcomes* 11:415–428, 2003
55. Piette JD, Glasgow R: Strategies for improving behavioral health outcomes among patients with diabetes: self-management, education. In *Evidence-Based Diabetes Care*. Gerstein HC, Haynes RB, Eds. Ontario, Canada, BC Decker Publishers 2001, p. 207–251
56. 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
57. Pearson J, Mensing C, Anderson R: Medicare reimbursement and diabetes self-management training: national survey results. *Diabetes Educ* 30:914–927, 2004
58. Siminerio L, Piatt G, Zgibor J: Implementing the chronic care model in a rural practice. *Diabetes Educ* 31:225–234, 2005
59. Anderson RM, Goddard CE, Garcia R, Guzman JR, Vazquez F: Using focus groups to identify diabetes care and education issues for Latinos with diabetes. *Diabetes Educ* 24:618–625, 1998
60. Zgibor JC, Simmons D: Barriers to blood glucose monitoring in a multiethnic community. *Diabetes Care* 25:1772–1777, 2002
61. Johnson K, Schubring L: The evolution of a hospital-based decentralized case management model. *Nursing Economics* 17:29–48, 1999
62. 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
63. 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
64. Davis ED: Role of the diabetes nurse educator in improving patient education. *Diabetes Educ* 16:36–43, 1990
65. Fedderson E, Lockwood DH: An inpatient diabetes educator's impact on length of hospital stay. *Diabetes Educ* 20: 125–128, 1994
66. 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
67. Spellbring AM: Nursing's role in health promotion. *Nurs Clin North Am* 26:805–814, 1991
68. 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
69. 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
70. 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
71. 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
72. Khakpour D, Thompson L: The nutrition specialist on the diabetes management team. *Clin Diabetes* 16:21–22, 1998
73. 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
74. 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
75. Huff PS, Ives TJ, Almond SN, Griffin NW: Pharmacist-managed diabetes education service. *Am J Hosp Pharm* 40:991–993, 1983
76. Canter CL: The Asheville Project: Long term-clinical and economic outcomes of a community pharmacy diabetes care program. *J Am Pharm Assoc (Wash)* 43: 173–184, 2003
77. 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
78. Garrentt DG, Blumi BM: Patient self-management program for diabetes: first-year clinical, humanistic, and economic outcomes. *J Am Pharm Assoc* 45:130–137, 2005
79. Shane-McWhorter L, Fermo JD, Bultemeir NC, Oderda GM: National survey of pharmacist certified diabetes educators. *Pharmacotherapy* 22:1579–1593, 2002
80. Franz MJ, Callahan T, Castle G: Changing roles: educators and clinicians. *Clin Diabetes* 12:53–54, 1994
81. 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
82. 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
83. 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
84. Emerson S: Implementing diabetes self-management education in primary care. *Diabetes Spectrum* 19:79–83, 2006
85. Satterfield D, Burd, C Valdez L, Hosey G, Eagle Shield J: The "In-Between People": participation of community health representatives and lay health workers in diabetes prevention and care in American Indian and Alaska Native communities. *Health Promotion Practice* 3:66–175, 2002
86. American Association of Diabetes Educators: American Association of Diabetes Educators Position Statement: diabetes community health workers. *Diabetes Educ* 29:818–823, 2003
87. American Public Health Association (APHA) Policy Statement No. 2001–15. Recognition and support for community health workers' contributions to meeting our nation's health care needs. Policy Statements Adopted by the Governing Council of the American Public Health Association, October 24, 2001. *Am J Public Health* 92:451–483, 2002
88. Norris SL, Chowdhury FE, VanLet K, Horsley T, Brownstein JN, Zhang X, Jack L Jr, Satterfield DW: Effectiveness of community health workers in the care of persons with diabetes. *Diabet Med* 23: 544–556, 2006
89. Lewin SA, Dick J, Pond P, Zwarenstein M, Aja G, van Wyk B, Bosch-Copblanch Z, Patrick M: Lay health workers in primary and community health care. *Cochrane Database Syst Rev* 1:2005
90. Norris SL, Nichols PJ, Caspersen CJ, et al: Increasing diabetes self-management education in community settings. a systematic review. *Am J Prev Med* 22:39–43, 2002
91. Lorig KR, Ritter P, Stewart AL, et al: Chronic disease self-management programs. *Medical Care* 39:1217–1221, 2001

92. Heisler M: Building peer support programs to manage chronic disease: seven models for success. Oakland, CA, California Health Care Foundation, 2006
93. Anderson RM, Donnelly MB, Gressard CP: The attitudes of nurses, dietitians, and physicians toward diabetes. *Diabetes Educ* 17:261–268, 1991
94. 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
95. 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
96. 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
97. 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
98. 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
99. Valentine V, Kulkarni K, Hinnen D: Evolving roles: from diabetes educators to advanced diabetes managers. *Diabetes Spectrum* 16:27–31, 2004
100. Glasgow RE, Funnell MM, Bonomi AE, Davis CL, Beckham V, Wagner EH: Self-management aspects of the Improving Chronic Illness Care Breakthrough series: design and implementation with diabetes and heart failure teams. *Ann Behav Med* 24:80–87, 2002
101. Ofman JJ, Badamgarav E, Henning JM, Knight K, Gano AD Jr, Levan RK, Gur-Arie S, Richards MS, Hasselblad V, Weingarten SR: Does disease management improve clinical and economic outcomes in patients with chronic diseases? A systematic review. *Am J Med* 117:182–192, 2004
102. Wensing M, Wollersheim H, Grol R: Organizational interventions to implement improvements in patient care: a structured review of reviews. *Implementation Sci* 1:2, 2006
103. 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
104. Skovlund SE, Peyrot M, on behalf of the DAWN International Advisory Panel: The Diabetes Attitudes, Wishes, and Needs (DAWN) program: a new approach to improving outcomes of diabetes care. *Diabetes Spectrum* 18:136–142, 2005
105. Norris SL, Nichols PJ, Caspersen CJ, Glasgow RE, Emgelgau MM, Jack J, Snyder SR, Carande-Kulis VG, Isham G, Garfield S, Briss P, McCulloch D, and the Task Force on Community Preventive Services. Increasing diabetes self-management education in community settings: a systematic review. *Am J Prev Med* 22:33–66, 2002
106. Norris SL, Zhang X, Avenell A, Gregg E, Bowman B, Serdula M, Brown TJ, Schmid CH, Lau J: Long term effectiveness of lifestyle and behavioral weight loss interventions in adults with type 2 diabetes: a meta-analysis. *Am J Med* 117: 762–74, 2004
107. Ellis SE, Speroff T, Dittus RS, Brown A, Pichert JW, Elasy TA: Diabetes patient education: a meta-analysis and meta-regression. *Patient Educ Counsel* 52:97–105, 2004
108. Brown SA: Studies of educational interventions in diabetes care: a meta-analysis revisited. *Patient Educ Counsel* 16: 189–215, 1990
109. Armour TA, Norris SL, Jack L Jr, Zhang X, Fisher L: The effectiveness of family interventions in people with diabetes mellitus: a systematic review. *Diabet Med* 10:1295–1305, 2005
110. Redman BK: *The Practice of Patient Education*. 10th ed. St. Louis, MO, Mosby, 2007
111. Wikipedia. Curriculum definition. Available at http://en.wikipedia.org/wiki/Curriculum. Accessed 7 January 2007
112. Mulcahy K, Maryniuk M, Peeples M, Peyrot M, Tomky D, Weaver T, Yarborough P: Diabetes self-management education core outcome measures. *Diabetes Educ* 29:768–803, 2003
113. American Association of Diabetes Educators: The scope of practice, standards of practice, and standards of professional performance for diabetes educators. *Diabetes Educ* 31:487–513, 2005
114. American Diabetes Association: Standards of medical care in diabetes—2009. *Diabetes Care* 32 (Suppl. 1):S13–S61, 2009
115. American Diabetes Association: Nutrition recommendations and interventions for diabetes: a position statement of the American Diabetes Association (Position Statement). *Diabetes Care* 30 (Suppl. 1):S48–S65, 2007
116. Reader D, Splett P, Gunderson EP: Impact of gestational diabetes mellitus nutrition practice guidelines implemented by registered dietitians on pregnancy outcomes. *J Am Dietetic Association* 9: 1426–1433, 2006
117. Kulkarni K, Boucher JL, Daly A, Shwide-Slavin C, Silvers BT, O-Sullivan-Maillet J, Pritchett E, American Dietetic Association, Diabetes Care and Education Practice Group, American Dietetic Association: Standards of practice and standards of professional performance for registered dietitians (generalist, specialty, and advanced) in diabetes care. *J Am Dietetic Association* 105:819–824, 2005
118. Blanchard MA, Rose LE, Taylor J, McEntee MA, Latchaw L: Using a focus group to design a diabetes program for an African American population. *Diabetes Educ* 25:917–923, 1999
119. Sarkadi A, Rosenqvist U: Study circles at the pharmacy – a new model for diabetes education in groups. *Patient Ed and Counselling* 37:89–96, 1999
120. Norris SL: Health related quality of life among adults with diabetes. *Curr Diab Reports* 5:124–30, 2005
121. Tang TS, Gillard ML, Funnell MM, et al: Developing a new generation of ongoing diabetes self-management support interventions (DSMS): a preliminary report. *Diabetes Educ* 31:91–97, 2005
122. Funnell MM, Nwankwo R, Gillard ML, Anderson RM, Tang TS: Implementing an empowerment-based diabetes self-management education program. *Diabetes Educ* 31:53–61, 2005
123. Glazier RH, Bajcar J, Kennie NR, Willson K: A systematic review of interventions to improve diabetes care in socially disadvantaged populations. *Diabetes Care* 26:1675–88, 2006
124. Samuel-Hodge CD, Keyserling TC, France R, Ingram AF, Johnston LF, Pullen Davis L, Davis G, Cole AS: A church based diabetes self-management education program for African Americans with type 2 diabetes. *Prev Chronic Dis* 3:A93, 2006
125. Trento M, Passera P, Borgo E, Tomalino M, Bajardi M, Cavallo F, Porta M: A 5-year randomized controlled study of learning, problem solving ability, and quality of life modifications in people with type 2 diabetes managed by group care. *Diabetes Care* 27:670–675, 2004
126. Izquierdo RE, Knudson PE, Meyer S, Kearns J, Ploutz-Snyder R, Weinstock R: A comparison of diabetes education administered through telemedicine versus in person. *Diabetes Care* 26:1002–1007, 2003
127. Garrett N, Hageman CM, Sibley SD, Davern M, Berger M, Brunzell C, Malecha K, Richards SW: The effectiveness of an interactive small group diabetes intervention in improving knowledge, feeling of control and behavior. *Health Promot Pract* 6:320–328, 2005
128. Hayes JT, Boucher JL, Pronk NP, Gehlin

E, Spencet M, Waslaski J: The role of the certified diabetes educator in telephone counseling. *Diabetes Educ* 27:377–386, 2001
129. Carlson A, Rosenqvist U: Diabetes care organization, process and patient outcomes: effects of a diabetes control program. *Diabetes Educ* 17:42–48, 1991
130. Handley M, MacGregor K, Schillinger D, Scharifi C, Wong S, Bodenheimer T: Using action plans to help primary care patients adopt healthy behaviors: A descriptive study. *J Am Board Fam Med* 19:224–231, 2006
131. 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
132. Brown SA: Effects of educational interventions in diabetes care: a meta-analysis of findings. *Nurs Res* 37:223–230, 1988
133. Davis WK, Hull AL, Boutaugh ML: Factors affecting the educational diagnosis of diabetic patients. *Diabetes Care* 4: 275–278, 1981
134. Anderson RM, Fitzgerald JT, Oh M: The relationship between diabetes-related attitudes and patients' self-reported adherence. *Diabetes Educ* 19:287–292, 1993
135. Funnell MM, Anderson RM: AADE Position Statement: individualization of diabetes self-management education. *Diabetes Educ* 33:45–49, 2007
136. 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
137. Hosey GM, Freeman WL, Stracqualursi F, Gohdes D: Designing and evaluating diabetes education material for American Indians. *Diabetes Educ* 16:407–414, 1990
138. Thomson FJ, Masson EA: Can elderly patients co-operate with routine foot care? *Diabetes Spectrum* 8:218–219, 1995
139. 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
140. Ad Hoc Committee on Health Literacy for the Council on Scientific Affairs, American Medical Association: Health literacy: report of the Council on Scientific Affairs. *JAMA* 281:552–557, 1999
141. Schillinger D, Grumbach K, Piette J, Wang F, Osmond D, Daher C, Palacios J, Diaz Sullivan G, Bindman AB: Association of health literacy with diabetes outcomes. *JAMA* 288:475–482, 2002
142. Nurss JR, Parker R, Williams M, Baker D: *STOFHLA Teaching Edition*. Snow Camp, NC, Peppercorn Books, 2003
143. Chew LD, Bradley KA, Boyko EJ: Brief questions to identify patients with inadequate health literacy. *Family Medicine* 36:588–594, 2006
144. Shillinger D, Piette J, Grumbach K, Wang F, Wilson C, Daher C, et al.: Closing the loop: physician communication with diabetic patients who have low health literacy. *Arch Intern Med* 163:83–90, 2003
145. Piette JD, Heisler M, Wagner TH: Problems paying out of pocket medication costs among older adults with diabetes. *Diabetes Care* 27:384–391, 2004
146. Peyrot M, Rubin RR, Lauritzen T, Snoek FJ, Matthews DR, Skovlund SE: Psychosocial problems and barriers to improved diabetes management: results of the cross-national Diabetes Attitudes, Wishes, and Needs study. *Diabet Med* 22:1379–1385, 2005
147. Peyrot M, Rubin RR, Siminerio L, on behalf of the International DAWN Advisory Panel: Physician and nurse use of psychosocial strategies in diabetes care: results of the cross-national Diabetes Attitudes, Wishes, and Needs study. *Diabetes Care* 29:1256–1262, 2006
148. Rubin RR, Peyrot M, Siminerio L, on behalf of the International DAWN Advisory Panel: Health care and patient-reported outcomes: results of the cross-national Diabetes Attitudes, Wishes, and Needs study. *Diabetes Care* 29:1249–1255, 2006
149. McKellar JD, Humphreys K, Piette JD: Depression increases diabetes symptoms by complicating patients' self-care adherence. *Diabetes Educ* 30:485–492, 2004
150. Krein SL, Heisler M, Piette JD, Makki F, Kerr EA: The effect of chronic pain on diabetes patients' self-management. *Diabetes Care* 28:65–70, 2005
151. Piette JD, Kerr E: The role of comorbid chronic conditions on diabetes care. *Diabetes Care* 29:239–253, 2006
152. Estey AL, Tan MH, Mann K: Follow-up intervention: its effect on compliance behavior to a diabetes regimen. *Diabetes Educ* 16:291–295, 1990
153. Glasgow RE, Davis CL, Funnell MM, et al: Implementing practical interventions to support chronic illness self-management. *Joint Commission Journal on Quality and Safety* 29:563–574, 2003
154. 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
155. Grebe SKG, Smith RBW Clinical audit and standardized follow-up improve quality of documentation in diabetes care. *N Z Med J* 108:339–342, 1995
156. 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
157. 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: a randomized, controlled trial. *Ann Intern Med* 129 605–612, 1998
158. Knight K, Badamgarav E, Henning JM, Hasselblad V, Gano AD Jr, Ofman JJ, Weingarten SR: A systematic review of diabetes disease management programs. *Am J Managed Care* 11:242–50, 2005
159. Two Feathers J, Kieffer EC, Palmisano G, et al: Racial and ethnic approaches to community health (REACH) Detroit partnership: improving diabetes-related outcomes among African American and Latino adults. *Am J Public Health* 95: 1552–1560, 2005
160. Mulcahy K, Maryniuk M, Peeple M, Peyrot M, Tomky D, Weaver T, Yarborough P: AADE Position Statement: standards for outcomes measurement of diabetes self-management education. *Diabetes Educ* 29:804–816, 2003
161. Institute of Healthcare Improvement: How to improve: improvement methods. Available at http://www.ihi.org/IHI/Topics/Improvement/improvementmethods\. Accessed 24 April 2006
162. Bardsley J, Bronzini B, Harriman K, Lumber T: *CQI: A Step by Step Guide for Quality Improvement in Diabetes Education*. Chicago, IL, American Association of Diabetes Educators, 2005
163. Joint Commission Resources: *Cost-Effective Performance Improvement in Ambulatory Care*. Oakbrook Terrace, IL, Joint Commission on Accreditation of Healthcare Organizations, 2003
164. Institute of Healthcare Improvement: Measures: diabetes. Available at http://www.ihi.org/IHI/Topics/ChronicConditions/Diabetes/Measures. Accessed 24 April 2006

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.

DEPARTMENT OF HEALTH & HUMAN SERVICES · USA

NDEP
National Diabetes Education Program

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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

See Table 1 continuation on next page.

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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.

See Table 1 continuation at right.

** 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.*

TEXAS DIABETES COUNCIL
2009 Update to Diabetes Medications Supplement

Table 1 Continuation: Oral Agents to Treat Type 2 Diabetes

Agent	Class	Primary Action	Typical Dose	Side Effects	Cautions	Critical Tests	Comments
Colesevelam (Welchol)	Bile acid sequestrant	Slow complex carbohydrate absorption/lower fat flux through liver	625mg tablet, 6 tablets daily or 3 tablets BID	Constipation Dyspepsia Nausea	Bowel obstruction Triglyceride >500mg/dL History of Pancreatitis	Lipid profile	May reduce absorption of: Phenytoin, warfarin, levothyroxine Other medicines should be moved 1 hour before colesevelam
Sitagliptin/metformin Janumet	DPP-4 inhibitor Biguanide	Reduce hepatic glucose production and lower post-prandial glucagon levels	Sitagliptin/metformin 50mg/500mg or 50mg/1000mg dosed BID Max: see individual components	See individual components	See individual components	See individual components	See individual components (Sitagliptin on table 5)
Pioglitazone/ glimepiride Duetact	Thiazolidinedione Sulfonylurea	Improve insulin resistance/increase pancreatic insulin secretion	Pioglitazone/ glimepiride 30mg/2mg or 30mg/4mg Daily Max: 30mg/4mg Daily	See individual components	See individual components	See individual components	See individual components

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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

TEXAS DIABETES COUNCIL
2009 Additions to Diabetes Medications Supplement

Table 2 Continuation: Glucose-Lowering Activity-Oral Diabetes Agent

Medication	Blood Glucose Most Effected	Greatest Risk of Hypoglycemia
Sitagliptin	Post-prandial	None
Colesevelam	Post-prandial	None
Sitagliptin/metformin	Fasting and post-prandial	None
Pioglitazone/glimepiride	Fasting and Post-prandial	Nocturnal, fasting, post-prandial

June 2009

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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).
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.

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2009 Additions to Diabetes Medications Supplement

Table 3 Continuation: Important Insulin Information*

Insulin	Onset	Peak (hours)	Effective Duration	Maximum Duration	Comments
Humulin Mix 50/50	<15 minutes	1 ½ to 2 ½	10-16 hours	16-20 hours	

Discontinued Insulins: All animal source insulins, Lente insulin, Ultralente insulin, Exubera inhaled

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*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	

TEXAS DIABETES COUNCIL
2009 Additions to Diabetes Medications Supplement

Table 4 Continuation: Recommended Insulin Storage

Insulin Type	Refrigerated (36˚F - 46˚F)		Room Temperature (59˚F - 86˚F)	
	Opened	Unopened	Opened	Unopened
Humalog Mix 50/50 Vial	28 days	Until expiration date	28 days	28 days
Humalog Mix 50/50 Pen device/cartridge	**Do not refrigerate once opened.**	Until expiration date	10 days **Do not refrigerate once opened.**	10 days

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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

WORKING TOGETHER TO MANAGE DIABETES

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

WORKING TOGETHER TO MANAGE DIABETES

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

Note: *Resources for Individuals with Diabetes* is updated routinely. The most recent version can be accessed on the Texas Diabetes Council web site at www.texasdiabetescouncil.org.

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
www.chipmedicaid.org

Comprehensive health insurance for children (newborn through age 18) in families that earn too much to quality for Medicaid but likely cannot afford to buy health insurance.

Medicaid

Texas Department of Human Services
Statewide: 1-800-252-8263
www.hhsc.state.tx.us/medicaid/index.html

Eligibility is based on financial income.

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 Prevention & Control Program/Council

Texas Department of State Health Services
P.O. Box 149347, Mail Code 1965
Austin, Texas 78714-9347
(512) 458-7490, 1-888-963-7111 ext. 7490
www.texasdiabetescouncil.org

The Texas Diabetes Council was established by the Texas Legislature in 1983 and works with private and public organizations to promote diabetes prevention and awareness of quality care. The Council develops, implements and monitors a state plan for diabetes prevention and control. **FREE** educational materials are available to order online.

Texas Department of State Health Services Audiovisual Library

P.O. Box 149347, Mail Code 1975
Austin, TX 78714-9347
1-888-963-7111 ext. 7260
TDD: 512-458-7708
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.

National Organizations

American Association of Diabetes Educators

200 W. Madison Street, Suite 800
Chicago, Illinois 60606
1-800-338-3633 (general inquires)
1-800-832-6874 or www.mydiabetespartner.org for diabetes educators in your area
www.diabeteseducator.org
email: aade@aadenet.org

American Diabetes Association

1660 Duke Street
Alexandria, Virginia 22314
1-800-806-7801 (membership)
1-800-342-2383
1-800-232-6733 to order publications
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 available) for a list of registered dietitians in your area

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
1-770-488-5000/Fax: 1-770-488-5966
TTY: 1-888-232-6348
1-877-CDC-DIAB (232-3422)
www.cdc.gov/diabetes

Joslin Diabetes Center

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

Juvenile Diabetes Research Foundation International (JDRF)

120 Wall St., 19th Floor
New York, New York 10005-4001
1-800-533-2873 (JDF-CURE)
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
www.medicalert.org

Diabetes Research and Wellness Foundation

5151 Wisconsin Ave., NW
Suite 420
Washington, D.C. 20016
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
www.niddk.nih.gov

National Diabetes Education Program

One Diabetes Way
Bethesda, MD 20814-9692
1-800-438-5383
Five web addresses:
www.cdc.gov/diabetes/ndep home page
www.ndep.nih.gov for publications, audiovisual resources & publications
www.diabetesatwork.org for business and managed care organizations
www.betterdiabetescare.nih.gov for changes in health systems
www.cdc.gov/podcasts for podcast viewing

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.

Patient Magazines/Print

Diabetes Digest

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

Diabetes Forecast

www.forecast.diabetes.org

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 and www.dlife.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

Medical Alert Jewelry

Diabetes Research & Wellness Foundation

FREE diabetes ID necklaces
www.diabeteswellness.net/

Medication Assistance & Information

Abbot Diabetes Patient Assistance Program

866-224-8887
www.abbottdiabetescare.com

Access Diabetic Supply

1901 Green Road, Suite A
Deerfield Beach, FL 33064
1-800-715-5031 (Tel)
1-800-276-0252 (Fax)
www.diabeticsupply.com

American Diabetes Supply, Inc.

1-800-453-9033, ext. 611
www.americandiabetessupply.com

American Diabetes Wholesale

1121 S Military Trail
Suite 355
Deerfield Beach, FL 33442
Ph. (Toll Free) – (877) 241-9002
Fax (Toll Free) – (866) 995-4820
www.americandiabeteswholesale.com

B-Scientific Diabetes Centre

800-544-5969
877-505-5545 (fax)
www.bscientific.com
Serves Medicaid, CHIP, CSHCN, & commercial enrollees

Better Living Now, Inc.

500 Wheeler Road
Hauppauge, New York 11788
1-800-854-5729 – Customer Service
1-800-654-7515 – Customer Service Fax Line
1-800-756-8775 – Sales
www.betterlivingnow.com

CCS Medical

14255 49th Street North, Suite 301
Clearwater, FL 33762
1-800-726-9811
www.ccsmed.com/english/patient/index.asp

Care Entrée

972-522-2000
www.careentree.com

Edgepark Medical Supplies Shop

1-800-321-0591
www.edgepark.com/

Focus Express Mail Pharmacy Inc.

1250 Easton Road
Suite S-101
Horsham, PA 19044
1-866-403-6287
www.focuspharmacy.com

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

Liberty Medical Supply Pharmacy

10400 S. Federal Hwy., Suite 200
Port St. Lucie, FL 34952
www.libertymedical.com

Current or Future Patients

Diabetes Products and Services 1-800-376-1599
To Reorder Diabetes Supplies 1-888-537-7726
To Reorder Insulin and Syringes 1-800-599-9680
HbA1c Test Kits 1-877-891-7765
Prescription Medication Mailing Service
1-800-597-8635

Healthcare Professionals

Diabetes Products and Services 1-866-836-9935
HbA1c Test Kits 1-800-545-0916
Prescription Medication Mailing Service
1-866-238-9469

Medicare Prescription Drug Plans

800-633-4227
www.medicare.gov/MPDPF/Shared/Static/Resources.asp

The Medicine Program

866-694-3893
www.themedicineprogram.com

Medicool, Inc.

20460 Gramercy Pl
Torrance, California 90501
1-800-433-2469
www.medicool.com/diabetes

Mini Pharmacy & Medical Supplies

1-888-545-6464
www.minipharmacy.net/index.php

National Diabetes Information Clearinghouse

1-800-860-8747
1 Information Way
Bethesda, MD 20892-3560
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

Pharmacy Distributor Services, Inc.

112 Intracoastal Pointe Drive
Jupiter, FL 33477
Tel: 1-800-440-2417
Fax: 1-800-590-3441
www.pharmacydistributorservices.com

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

Western Diabetic Supplies

1140 36th St - Suite 140
Ogden, Utah 84403
Ph: 877-937-8342
Fax: 866-808-3418
www.westerndiabeticsupplies.com

Pharmaceutical Companies Assistance Programs

Amylin Pharmaceuticals, Inc.

Amylin Patient Assistance Program
Phone – 1-800-330-7647

AztraZeneca Pharmaceuticals, LP

AstraZeneca Foundation Patient Assistance Program
Phone – 1-800-292-6363

Aventis Pharmaceuticals Inc.

Sanofi-Aventis Patient Assistance Program
Phone – 1-800-221-4025

Bayer Pharmaceuticals Corporation

Bayer Patient Assistance Program
Phone – 1-800-998-9180

Bristol-Myers Squibb Company

Bristol-Myers Squibb Patient Assistance Foundation, Inc.
Phone – 1-800-736-0003

Eli Lilly and Company

Lilly Cares
Phone – 1-800-545-6962

GlaxoSmithKline

Bridges to Access
Phone – 1-866-728-4368

Johnson & Johnson

Health Care Systems Patient Assistance Program
Phone – 1-800-652-6227

Merck Patient Assistance Program

Phone - 1-800-994-2111

Merck/Scherling-Plough Pharmaceuticals

Merck/Sherling-Plough Patient Assistance Program
Phone – 1-800-347-7503

Novartis Pharmaceuticals Corporation

Novartis Pharmaceuticals Corporation Patient Assistance Program
Phone – 1-800-277-2254

Novo Nordisk Inc.

Novo Nordisk Diabetes Patient Assistance Program
Phone – 1-866-310-7549

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

Roche Laboratories Inc.

Roche Laboratories Patient Assistance Program
Phone – 1-877-757-6243

Sanofi-Aventis

Sanofi-Aventis Patient Assistance Program
Phone – 1-800-221-4025

Scherling-Plough Corporation

SP-Cares Patient Assistance Program
Phone – 1-800-656-9485

Takeda Pharmaceuticals North America, Inc.

Takeda Patient Assistance Program
Phone – 1-800-830-9159 or 1-877-582-5332

Eye Care Assistance

American Foundation for the Blind

11 Penn Plaza, Suite 300
New York, New York 10001
1-800-232-5463
212-502-7600
afbinfor@afb.net
www.afb.org

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
www.dars.state.tx.us/dbs/best/
DBSinfo@dars.state.tx.us

Lighthouse International

111 East 59th Street
New York, New York 10022-1202
1-800-334-5497
1-800-829-0500
212-821-9200
212-821-9713 (TDD)
info@lighthouse.org
www.lighthouse.org

National Association for Visually Handicapped (NAVH)

22 West 21st Street, 6th Floor
New York, New York 10010-6493
212-889-3141
www.navh.org

National Eye Institute

National Institutes of Health
2020 Vision Place
Bethesda, MD 20892-3655
301-496-5248
2020@nei.nih.gov
www.nei.nih.gov

National Federation of the Blind

1800 Johnson Street
Baltimore, MD 21230
Phones: 1-888-581-4741, 410-659-9314
Fax: 410-685-5653
www.nfb.org

Prevent Blindness America

500 East Remington Road
Schaumburg, IL 60173-4557
1-800-331-2020
847-843-2020
info@preventblindness.org
www.preventblindness.org

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

Children with Diabetes

www.childrenwithdiabetes.com

Marathon Kids

www.marathonkids.org

Shriners Hospitals

800-237-5055

Texas Children's Hospital

832-822-3670
www.texaschildrenshospital.org/CareCenter/Diabetes

Camps

ADA Diabetes Camps

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.

Camp Bluebonnet

Sponsor: Children's Diabetes Camp of Central Texas
Contact: Amy Wallquist
P.O. Box 12885
Austin, TX 78711-2885
Email: camp_bluebonnet@yahoo.com
www.childrensdiabetescamp.org

Day camp for children with diabetes, ages 4-17

Camp Sweeney

P. O. Box 918
Gainesville, TX 76273
940-665-2011/Fax: 940-665-9467
www.campsweeney.org/

Summer camping sessions from 10 days to 3 weeks for children ages 5-19 with type 1 diabetes. Family weekend camp and winter session offered. Camperships available.

Texas Lions Camp

P.O. Box 247
Kerrville, Texas 78029-0247
1-830- 896-8500/ Fax: 830-896-3666
www.lionscamp.com/Diabetes.htm

Two **FREE** summer camping sessions exclusively for children ages 8-15 that use insulin. Sponsored by Texas Districts of Lions Clubs International.

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

National Diabetes Education Program

www.ndep.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

IPump.org, Inc.

program-director@ipump.org
www.ipump.org/

IPump.org provides temporary financial assistance and **FREE** supplies to people of all ages with diabetes in need throughout the U.S.

Animas:	Animas Pump Company	1-877-937-7867
MiniMed:	Medtronics	1-800-999-9859
Cosmo:	Smiths Medical	1-800-544-4734
Omnipod:	Insulet Corporation	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)

ask.hrsa.gov/pc/

Support Services

Family Support Network

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