

# DIABETES TOOL KIT

PROFESSIONAL & PATIENT EDUCATION MATERIALS



TEXAS DIABETES  
COUNCIL

[www.texasdiabetescouncil.org](http://www.texasdiabetescouncil.org)

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## *Introduction*

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The Texas Diabetes Council (TDC) “Diabetes Tool Kit” was prepared by an interdisciplinary team of volunteer certified diabetes educators (CDEs) and professional staff of the Texas Department of Health, Diabetes Control Program to be of service to Texas practitioners, 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, registered nurses, dietitians, pharmacists, and professionals on the Medical Professionals Advisory to the Texas Diabetes Council.

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

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

### **Standards of Care**

The Council’s adopted Minimum Standards of Care for Diabetes in Texas is accompanied by decision support tools, i.e. a minimum practice recommendations flow sheet, treatment algorithms designed for primary care settings, and information intended for use in professional preparation and continuing education of licensed health care professionals and the medical leadership and case/disease management staff of health plans. The Kit promotes delivery of quality care and quality improvement efforts focused on provider practices and clinic or office systems. Charts and algorithms can be reproduced or integrated into the office’s computerized or paper tracking methods to remind the providers of critical preventive services and therapeutic targets and to set the base for feedback on treatment strategies. Algorithms are updated and available on the TDC website: [www.texasdiabetescouncil.org](http://www.texasdiabetescouncil.org).

### **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 the 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 or Indian Health Services are located in metropolitan areas. Many patients receive information from various members of the diabetes care team: primary physicians, nurses, pharmacists, dietitians, and specialists such as dentists, foot specialists (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 Tool Kit will be available on the Internet at [www.texasdiabetescouncil.org](http://www.texasdiabetescouncil.org).

## Acknowledgements

The Texas Diabetes Council thanks the volunteers on the Health Care Professionals Advisory Committee who developed the first edition of the 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 handy reference.

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## *Types of Diabetes*

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### A. Type 1 – Previously called IDDM or Juvenile Diabetes

1. Accounts for less than 10% of diabetes.
2. Must take injected insulin. New insulin delivery and cell transplants are under study.
3. Absolute insulin deficiency. (Pancreas produces little or no insulin.)
4. Affects 1 in 400-500 individuals before the age of 20.
5. Typically onset in children is acute and dramatic with frequent urination, thirst, extreme hunger and fatigue, rapid weight loss, and profoundly elevated glucose levels.

**Onset of symptoms in adults is more gradual, often being mistaken for type 2 diabetes.**

6. If untreated, can progress to ketoacidosis and coma.
7. Risk Factors
  - a. Autoimmune disease. Islet Cell Antibodies (ICA) destroy the beta cells of the pancreas and are often present at time of diagnosis.
  - b. Genetic predisposition. More than 90% of Caucasians with type 1 are haplotype DR3 and/or DR4 positive on genetic testing.
  - c. Environmental factors, i.e. viruses and unidentified factors.

### B. Type 2 – Previously called NIDDM or Adult Onset

1. Accounts for approximately 90% of people with diabetes.
2. Treatment is individualized, requiring weight control through diet and daily exercise, medication, or a combination of these items.
3. Usually develops over several years.
4. Usually seen after the age of 30 but can develop during adolescence.
5. 80-90% of individuals are overweight with positive, close family history.
6. Individual may not notice early signs. Half have a serious complication when first diagnosed.
7. May range from predominately insulin resistance with relative insulin deficiency to a predominantly secretory defect with insulin resistance.

8. Coexistence of three major metabolic abnormalities
  - a. Peripheral (muscle tissue) insulin resistance
  - b. Increased basal hepatic glucose production
  - c. Impaired insulin secretion
9. Risk Factors
  - a. Overweight ( $\geq 30$  pounds overweight or a Body Mass Index (BMI)  $\geq 27$  kg/m<sup>2</sup>)
  - b. Family history of DM
  - c. Hispanic, African American, Asian American, or Native American origin
  - d. Older than 30 years of age
  - e. History of large babies (> 9 pounds) or diabetes during pregnancy (gestational diabetes)
  - f. Sedentary lifestyle
  - g. High blood pressure ( $\geq 140/90$  mm Hg in adult)
  - h. High Density Lipoprotein Cholesterol (HDL) ( $\leq 35$  mg/dl and/or triglycerides  $\geq 250$  mg/dl)

### C. Gestational Diabetes Mellitus ( GDM)

1. Develops in 2 to 5% of all pregnancies.
2. Usually relieved immediately after delivery of the baby.
3. Associated with an increased risk of type 2 diabetes later in life (up to 50% incidence).
4. Risk Factors
  - a. Obesity
  - b. African American, Hispanic/Latino American, and American Indian origin
  - c. Family history of type 2 diabetes

### D. Other causes

1. Accounts for 1 to 2% of diagnosed cases of diabetes.
2. Results from specific genetic syndromes (Maturity Onset Diabetes of Youth), surgery, drugs, malnutrition, infections, and other illnesses.

### E. Impaired Fasting Glucose\*

1. Fasting plasma glucose  $\geq$  110 mg/dl but  $<$  126 mg/dl.

### F. Impaired Glucose Tolerance\*

1. Oral glucose tolerance test value  $\geq$  140 mg/dl but  $<$  200 mg/dl. May have normal or near normal glycated hemoglobin (A1c) level.

### G. Insulin Resistance\*

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

\* Can be reversed in many obese people through weight reduction (at least 7-10%) by daily physical activity (150 minutes/week) and reduced-fat/calories nutrition.



## *Facts about Diabetes*

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- A. Diabetes is a chronic disease. It affects daily life, most body systems, and is a family concern.
- B. Diabetes affects 17 million people (6.2%) in the United States, 1/3 of whom do not yet know it.
- C. Diabetes affects more than one million Texans, and another million are at high risk of impaired glucose tolerance/insulin resistance.
- D. People with diabetes are:
  - 1. 17 times more prone to kidney disease;
  - 2. 25 times more prone to vision loss from eye disease;
  - 3. 15–20 times more prone to nerve damage and lower limb amputation; and
  - 4. 2–6 times more prone to heart disease or stroke.
- E. Prevalence of diabetes by age groups:
  - 1. Age 65 or older – 20.1%
  - 2. Age 44-64 – 11.7%
  - 3. Age 20-43 – 8.6%
  - 4. Under age 20 – 0.19%
- F. Prevalence of diabetes by race/ethnicity in people 20 years or older:
  - 1. Non-Hispanic whites – 7.8%
  - 2. Non-Hispanic blacks – 13.0%
  - 3. Hispanics – 10.2%
  - 4. American Indians and Alaska Natives – 15.1% (Indian Health Services) varies among tribes. Ranges from less than 5% (Alaska Natives) to 50%.
  - 5. Asian American and Pacific Islanders – prevalence data are limited. Data (1996-2000) suggest that Native Hawaiians are 2.5 times more likely to have diagnosed diabetes as non-native residents of Hawaii.
- G. Direct and indirect costs of diabetes in Texas (1997) were more than \$9 billion, including:
  - 1. \$1.6 billion in medical costs (includes Medicaid and other state programs)
  - 2. \$2.4 billion in indirect costs (lost wages and early death)

*Source:* CDC National Diabetes Fact Sheet (2000 Census estimates)

## *Pre-diabetes*

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

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

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

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

**Co-morbidity:** “Pre-diabetes” is not just an “early warning” for type 2 diabetes. Persons with IGT have 1.5 times 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  $\geq$  110 mg/dl but  $<$  126 mg/dl.

Impaired Glucose Tolerance\*: Oral glucose tolerance test value  $\geq$  140 mg/dl but  $<$  200 mg/dl. May have normal or near normal glycated hemoglobin (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.

\* Can be reversed in many obese people through weight reduction (at least 7-10%) by daily physical activity (150 minutes/week) and reduced-fat/calories nutrition.

## *Criteria for Diagnosing Diabetes*

- A. Fasting plasma glucose (FPG)  $\geq$  126 mg/dl  
**OR**
- B. Symptoms plus casual plasma glucose  $\geq$  200 gm/dl  
**OR**
- C. 2 hour post prandial (PP) in OGTT value  $\geq$  200 mg/dl
- D. 2 tests of any combination required – separated by  $\geq$  24 hours.

<b>TEST</b>			
Stage	Fasting Plasma Glucose (FPG) (Preferred)*	Casual Plasma Glucose	Oral Glucose Tolerance Test (OGTT)
<b>Diabetes</b>	FPG $\geq$ 126 mg/dl (7.0 mmol/l)**	Casual Plasma Glucose $\geq$ 200 mg/dl (11.1mmol/l plus symptoms)***	Two-hour Plasma Glucose (2hPG) $\geq$ 200 mg/dl****
<b>Impaired Glucose Homeostasis</b>	Impaired Fasting Glucose (IFG) = FPG $\geq$ 110 and $<$ 126 mg/dl		Impaired Glucose Tolerance (IGT) = 2hPG $\geq$ 140 and $<$ 200 mg/dl
<b>Normal</b>	FPG $<$ 110 mg/dl		2hPG $<$ 140 mg/dl

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

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

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

\*\*\*\* OGTT should be performed using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water. The OGTT is not recommended for routine clinical use.

Source: American Diabetes Association (2003)

## *Diabetes Management Goals of Therapy*

<b>GOALS FOR NON-PREGNANT DIABETIC PATIENTS</b>	
Blood Sugar Before Meals	80–120 mg/dl (normal: < 100 mg/dl)
Blood Sugar 2 hrs. After Meals	Type 1: 120–140 mg/dl Type 2: 140–160 mg/dl
Blood Sugar at Bedtime	100–140 mg/dl (normal: <110 mg/dl)
Blood Sugar at 3:30 am	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	< 6.5-7% (non-diabetic range 4.0-6.0%); American College of Endocrinology (2001) recommends < 6.5%
Ketones	Negative
Blood Pressure	≤ 130/80 mmHg; if ≥ 1 g proteinuria, ≤ 125/95 mmHg
Triglycerides	< 150 mg/dL
LDL-Cholesterol	< 100 mg/dL
HDL-Cholesterol	> 40 mg/dL (men) and > 50 mg/dL (women)
Microalbuminuria	< 30 mg/24 hour
Body Mass Index (BMI)	< 27 (Overweight 25–29.9; Obesity ≥ 30)



Diabetes Mellitus Minimum Practice Recommendations Flow Sheet



Revised 07-24-03

Name: \_\_\_\_\_ ID or S.S.#: \_\_\_\_\_  
 Sex: M \_\_\_\_\_ F \_\_\_\_\_ D.O.B.: \_\_\_\_\_

**Exam/Test/Counseling** **Schedule**  
 Suggested Result Codes: O=Ordered, N=Result Normal, A=Result Abnormal, E=Done Elsewhere, R=Referred

Exam/Test/Counseling	Initial	Date	Result						
<b>1. Complete history &amp; physical</b> (Including risk factors, exercise & diet)	Initial	Date	Result						
<b>2. Weight/BMI</b> Overweight = BMI 25–29.9 Obesity = BMI ≥ 30	Every Visit	Date	Result						
<b>3. Blood Pressure &lt; 130/80 mm Hg</b> If ≥1g proteinuria < 125/75 mm Hg	Every Visit	Date	Result						
<b>4. Dilated Funduscopy Eye Exam</b> <i>By an ophthalmologist or therapeutic optometrist</i>	<u>Type 1</u> : Annually beginning 5 years from onset <u>Type 2</u> : Initial, then annually	Date	Result						
<b>5. Foot Exam</b> Visual inspection for skin and nail lesions, calluses, and infections Complete foot exam and neurologic assessment	Every Visit  Annually or with new abnormality	Date  Date	Result  Result						
<b>6. Oral/Dental Inspection</b> Refer for dental care	Every Visit Annually or as needed	Date Date	Result Result						
<b>7. A1c</b> A1c <6.5–7.0% (<0.5–1.0% above reference range)	Every 3–6 months	Date Date	Result Result						
<b>8. Lipid Profile</b> LDL-C <100 mg/dL HDL-C >40 mg/dL Triglycerides <150 mg/dL	Annually if at goal; otherwise every 3–6 months (≥ age 18)	Date Date	Result Result						
<b>9. Microalbuminuria</b> Random spot urine microalbumin: 30 mg creatinine ratio OR Urinary albumin >30 mg/24 hrs Quantitate 24-hr urine protein if microalbuminuria is present	<u>Type 1</u> : Annually beginning 5 years from onset <u>Type 2</u> : Initial, then annually  If significant proteinuria, monitor serum creatinine every 3–6 months.	Date Date	Result Result						
<b>10. Immunizations</b> Influenza (Flu) Vaccine Td Vaccine Pneumococcal Vaccine Childhood Immunizations	Annually Every 10 Years Initial; repeat per ACIP Per CDC Schedule	Date	Result						
<b>11. Aspirin/Antiplatelet Prophylaxis (if no contra-indications)</b>	Type 1 or 2 ≥ age 30	Date Date	Result Result						
<b>12. Diabetes Education*</b>	Initial & at clinician's discretion	Date Date	Result Result						
<b>13. Medical Nutrition Therapy</b>	Initial & at clinician's discretion	Date Date	Result Result						
<b>14. Exercise Counseling</b>	Initial & at clinician's discretion	Date Date	Result Result						
<b>15. Psychosocial Counseling</b>	Initial & at clinician's discretion	Date Date	Result Result						
<b>16. Growth and Development (including height) in Children and Adolescents</b>	Every Visit	Date Date	Result Result						

\*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





**BODY MASS INDEX TABLE (SEE NEXT PAGE)**

**ABBREVIATIONS**

- CHF** Congestive Heart Failure
- CVD** Cardiovascular Disease
- DJD** Degenerative Joint Disease
- FPG** Fasting Plasma Glucose
- GERD** Gastro-esophageal Reflux Disease
- HCP** Health Care Professional
- HDL-C** High-density Lipoprotein Cholesterol
- HTN** Hypertension
- LDL-C** Low-density Lipoprotein Cholesterol
- NAFLD** Non-alcoholic Fatty Liver Disease
- NASH** Non-alcoholic Steatohepatitis
- MAOI** Monoamine Oxidase Inhibitors
- SSRI** Selective Serotonin Reuptake Inhibitors
- TG** Triglycerides

**FOOTNOTES:**

- <sup>1</sup> Adapted from NIH/NHLBI/NAASO;1998; NIH Publication No. 98-4083 (*Obes Res* 1998; 6[Suppl 2]:51S-210S)
- <sup>2</sup> Consider starting obesity pharmacotherapy concurrent with other treatment modalities at presentation in motivated/adherent pts if BMI  $\geq 35$  with comorbidities or  $\geq 40$  with no comorbidities
- <sup>3</sup> National Cholesterol Education Program-Adult Treatment Panel III. *JAMA* 2001; 285:2466-97
- <sup>4</sup> American Association of Clinical Endocrinologists Consensus Conference on the Insulin Resistance Syndrome, Washington, DC; August 2002 (*Diabetes Care* 2003; 26:1297-1303)
- <sup>5</sup> Sixth Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. *Arch Intern Med* 1997; 157:2413-46
- <sup>6</sup> See Glycemic Control Algorithm in Type 2 Diabetes Mellitus in Children and Adults; Diabetes medications may need to be adjusted to avoid hypoglycemia in pts who lose wt
- <sup>7</sup> Most antipsychotics, tricyclic antidepressants, lithium, valproic acid, carbamazepine, insulin/insulin analogs, sulfonylureas, thiazolidinediones, cyproheptidine, glucocorticoids, and estrogens/progestins may be associated with wt gain
- <sup>8</sup> Assuming BMI  $\geq 25$  and/or waist circumference  $>40$  inches in men,  $>35$  inches in women, and one or more major *comorbidity*
- <sup>9</sup> Calorie deficit of 250 Kcal/day will result in  $\sim 1/2$  lb/week wt loss (1000 Kcal/day  $\sim 2$  lb/week wt loss)
- <sup>10</sup> FDA-approved for adjunctive short-term use  $\leq 3$  months for wt loss; see drug prescribing brochure;  $\sim$ Cost—\$0.85/30 mg pill (generic-AWP 2003)
- <sup>11</sup> FDA-approved for use for up to 2 years for wt loss and maintenance of wt loss; see drug prescribing brochures;  $\sim$ Cost—sibutramine \$3.64/15 mg pill; orlistat \$1.38/120 mg pill (AWP 2003)
- <sup>12</sup> *Diabetes Care* 1998; 21:1288-1294 ; *Diabetes Care* 2002; 25:1033-1041; *Diabetes Care* 2002; 25:1123-1128
- <sup>13</sup> Orlistat can be combined with the other agents; sibutramine and phentermine are not to be used in combination
- <sup>14</sup> After minimum of 6 months of intensive wt loss management (including obesity pharmacotherapy if no contraindications) in motivated and adherent pts

# Body Mass Index and Risks of Overweight

## WEIGHT

	120	130	140	150	160	170	180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330
4'5"	30	33	35	38	40	43	45	48	50	53	55	58	60	63	65	68	70	73	75	78	80	83
4'6"	29	31	34	36	39	41	43	46	48	51	53	56	58	60	63	65	68	70	72	75	77	80
4'7"	28	30	33	35	37	40	42	44	47	49	51	54	56	58	61	63	65	68	70	72	75	77
4'8"	27	29	31	34	36	38	40	43	45	47	49	52	54	56	58	61	63	65	67	70	72	74
4'9"	26	28	30	33	35	37	39	41	43	46	48	50	52	54	56	59	61	63	65	67	69	72
4'10"	25	27	29	31	34	36	38	40	42	44	46	48	50	52	54	57	59	61	63	65	67	69
4'11"	24	26	28	30	32	34	36	38	40	43	45	47	49	51	53	55	57	59	61	63	65	67
5'0"	23	25	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	61	63	65
5'1"	23	25	27	28	30	32	34	36	38	40	42	44	45	47	49	51	53	55	57	59	61	62
5'2"	22	24	26	27	29	31	33	35	37	38	40	42	44	46	48	49	51	53	55	57	59	60
5'3"	21	23	25	27	28	30	32	34	36	37	39	41	43	44	46	48	50	51	53	55	57	59
5'4"	21	22	24	26	28	29	31	33	34	36	38	40	41	43	45	46	48	50	52	53	55	57
5'5"	20	22	23	25	27	28	30	32	33	35	37	38	40	42	43	45	47	48	50	52	53	55
5'6"	19	21	23	24	26	27	29	31	32	34	36	37	39	40	42	44	45	47	49	50	52	53
5'7"	19	20	22	24	25	27	28	30	31	33	35	36	38	39	41	42	44	46	47	49	50	52
5'8"	18	20	21	23	24	26	27	29	30	32	34	35	37	38	40	41	43	44	46	47	49	50
5'9"	18	19	21	22	24	25	27	28	30	31	33	34	36	37	38	40	41	43	44	46	47	49
5'10"	17	19	20	22	23	24	26	27	29	30	32	33	35	36	37	39	40	42	43	45	46	47
5'11"	17	18	20	21	22	24	25	27	28	29	31	32	34	35	36	38	39	41	42	43	45	46
6'0"	16	18	19	20	22	23	24	26	27	29	30	31	33	34	35	37	38	39	41	42	43	45
6'1"	16	17	19	20	21	22	24	25	26	28	29	30	32	33	34	36	37	38	40	41	42	44
6'2"	15	17	18	19	21	22	23	24	26	27	28	30	31	32	33	35	36	37	39	40	41	42
6'3"	15	16	18	19	20	21	23	24	25	26	28	29	30	31	33	34	35	36	38	39	40	41
6'4"	15	16	17	18	20	21	22	23	24	26	27	28	29	30	32	33	34	35	37	38	39	40
6'5"	14	15	17	18	19	20	21	23	24	25	26	27	29	30	31	32	33	34	36	37	38	39
6'6"	14	15	16	17	19	20	21	22	23	24	25	27	28	29	30	31	32	34	35	36	37	38
6'7"	14	15	16	17	18	19	20	21	23	24	25	26	27	28	29	30	32	33	34	35	36	37
6'8"	13	14	15	17	18	19	20	21	22	23	24	25	26	28	29	30	31	32	33	34	35	36
6'9"	13	14	15	16	17	18	19	20	21	23	24	25	26	27	28	29	30	31	32	33	34	35
6'10"	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	34	35

Less Risk

More Risk

HEIGHT (ft/in)



**STANDARDS AND REVIEW CRITERIA**

# National Standards for Diabetes Self-Management Education

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that payers or purchasers of care would be used only as advisors and not as Task Force members. Thus, the following organizations, federal agencies, federally funded programs, and disciplines are represented on the Task Force:

**Organizations, federal agencies, and federally funded programs**

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

**Disciplines**

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

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

**STANDARDS**

**Structure**

**Standard 1.** *The DSME entity will have documentation of its organizational struc-*

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

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

**PROCEDURE FOR REVISION OF THE NATIONAL STANDARDS FOR DIABETES SELF-MANAGEMENT EDUCATION PROGRAMS** — The Task Force to Review and Revise the National Standards for Diabetes Self-Management Education Programs decided to do the following:

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

**Establishing procedure**

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

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

**REPRESENTATION ON THE TASK FORCE** — Representation on the Task Force consisted of individuals from all major organizations and disciplines with significant interest in the provision of quality diabetes care and self-management education. It was decided

ture, mission statement, and goals, and will recognize and support quality DSME as an integral component of diabetes care.

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

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

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

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

ness of self-management education (26–29).

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

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

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

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

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

DSME has been shown to be most effective when delivered by a multidisciplinary team with a comprehensive plan

of care (39,40–50). The multidisciplinary team utilized in DSME is one in which the different team members retain their individual disciplinary identity, work interdependently, consult with one another, and have shared goals (51). The team should have a collective combination of expertise in medical treatment, medical nutrition therapy, teaching skills, and behavioral psychology (8,51–56). It is essential in this collaborative and integrated team approach that individuals with diabetes assume an active role in their care (45).

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

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

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

Studies indicate that instructors without specialized training in diabetes (51, 83–89), behavioral interventions (74,76,79,90–92), teaching and learning skills (53,93–97), and counseling skills (78,98) may not focus on patient behavior change, and therefore, clinical outcomes may not improve. Quality diabetes care and education require that professional staff have continuing education in diabetes educational strategies and behavioral interventions beyond their basic preparation (77,78,85,87,94,98,99). Behavior and lifestyle changes are the keys to successful self-management of diabetes (74,76). Selected studies of health care professionals have shown a need for increased knowledge and ability to utilize behavioral interventions with individuals living with diabetes and other chronic diseases (79,98–101). Therefore, the instructors delivering quality DSME must remain current in therapeutic modalities and medical nutrition therapy, as well as teaching skills and behavioral interventions.

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

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

**Table 1—Diabetes education curricula**

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

The literature supports a strong core group of topics in the design of the curriculum (24,79,80,102–115). The curriculum is defined as a coordinated set of courses and educational experiences to accomplish a set of outcomes (116). The individual with diabetes needs the knowledge and skills to make informed choices, to facilitate self-directed behavior change (24,117,118), and ultimately to reduce the risk of complications (40,44,112). The value of diabetes education is evident from research demonstrating that patients who never received diabetes education showed a striking 4-fold increased risk of a major complication (119).

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

**Process**

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

Each participant or significant other living with diabetes brings unique life experiences and preferences to an encounter that help determine the intervention. The assessment includes relevant medical history, cultural influences, health beliefs and attitudes, diabetes knowledge, self-management skills and behaviors, readiness to learn, cognitive ability, physical

limitations, family support, and financial status (26,27,54,120–122).

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

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

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

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

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

**Outcomes**

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

Continuous quality improvement (CQI) is an effective methodology for the development, implementation, maintenance,

Table 2—Scope of practice guidelines

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

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

The CQI process relies on a demonstrated organizational commitment to provide quality DSME, and an ongoing effort by all organization and DSME team members to meet the needs and expectations of individuals with diabetes and other consumers (6,10–12,15,139,156). Quality improvement goals and objectives are consistent with the organizational goals and are based on an assessment of the DSME entity’s target populations (14).

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

**RECOMMENDATIONS FOR OVERSIGHT AND FUTURE REVIEWS**

DSME is an integral part of diabetes care and, like many aspects of health care, is an evolving process. The standards provide a benchmark for quality assessment of DSME. Standards for DSME must be based on a combination of the best scientific evidence and best practice where evidence is lacking (see Table 2 for Scope of Practice Guidelines). As new research emerges, the standards will need to be revised, and translation of the re-

search incorporated into the practice of diabetes education. With this in mind, the Task Force recommends the following:

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

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

**best practice**—A strategy or process that has been demonstrated to solve a problem, improve results, and is replicable.

**clients**—All individuals affected by diabetes, including people with diabetes, family members, caregivers, and significant others.

**community**—The social, cultural, political, and geographic environment of the DSME and its target population.

**continuous quality improvement (CQI)**—A cyclic series of steps designed to enhance DSME processes leading to improved patient and program outcomes. Steps include the following: identify the opportunity for improvement, collect

data, analyze data, choose an approach, develop the concepts and processes, implement, evaluate and improve.

**criteria**—A rule or test upon which a judgment or decision can be based.

**diabetes self-management education (DSME)**—An interactive, collaborative, ongoing process involving the person with diabetes and the educator(s). This process includes 1) assessment of the individual’s specific education needs; 2) identification of the individual’s specific diabetes self-management goals; 3) education and behavioral intervention directed toward helping the individual achieve identified self-management goals; 4) evaluation of the individual’s attainment of identified self-management goals (revised from *Report of the Task Force on the Delivery of Diabetes Self-Management Education and Medical Nutrition Therapy*, Diabetes Spectrum, Vol. 12, No. 1, 1999).

**educational intervention**—An exchange of knowledge, tools, and practices that will address the client’s assessed DSME needs.

**evaluation**—The act of examining DSME processes and outcomes to ascertain whether the desired goals and objectives were achieved.

**evidence-based**—Data or expert opinion which serves as proof or testimony.

**expert opinion**—Beliefs expressed by individual(s) who have mastered the content of a specific area.

**health professional**—An individual with a license/certification/registration in a health-related field, college degree.

**instructional staff**—Multidisciplinary and multifaceted, experienced, skilled health professionals who work with the client in the process of DSME.

**medical nutrition therapy**—See *J Am Diet Assoc* 94:838–839, 1994 (Identifying patients at risk: ADA’s definition for screening and nutrition assessment).

**multidisciplinary**—More than one discipline.

**paraprofessional**—Community members who serve as connectors between health care consumers and providers to promote health among groups that have traditionally lacked access to adequate care.

**participant**—Person with diabetes and/or family and significant other.

**services**—Those systems, which are derived through clear objectives and goals, that arise from the definitions of function and mission. Accomplishments and performance deal systematically with priori-



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ties, measurements, feedback, organized audit of objectives, and results.

**stakeholder**—A person who has a vested interest (gains or losses) in what will be learned from an evaluation and how that knowledge will be utilized. Includes individuals in program operation; those served.

**standard**—A delineation of acceptable levels of practice consisting of qualitative or quantitative parameters utilized in evaluation.

**target population(s)**—A group of individuals who meet defined specifications (e.g., age, sex, race/ethnicity, income, type of diabetes, health status, geographic location, etc.) to whom DSME activities are offered.

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## *Gestational Diabetes Mellitus (GDM) Diagnostic Criteria*

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### How to Screen (1-Hour 50g carbohydrate load)

#### A. Low risk

1. 24 – 28 weeks gestation
2. Without regard to eating or time of day
3. Abnormal > 140 mg/dl

#### B. High risk

1. Perform at initial visit
2. Repeat at 24 – 28 weeks if normal
3. Conditions same as above

#### C. Other diagnostic tests

1. Random plasma glucose  $\geq$  200 mg/dl or a fasting plasma glucose  $\geq$  126 mg/dl indicates need for 100 g OGTT.
2. Earlier testing for women at high-risk, i.e. marked obesity, family history of type 2 diabetes, previous GDM, or glycosuria.
3. Hemoglobin A1c or glycosylated proteins are not for screening.
4. Women found with elevated fasting glucose or abnormal OGTT in first trimester should be treated similar to women with pre-gestational diabetes.
5. Reflectance glucose meter (capillary) useful in management, but not accurate enough for screening or diagnosis.

### How to Diagnose

- A. 100 g oral glucose load
- B. In the morning after overnight fast x 8 hours
- C. 3 days of unrestricted diet ( $\geq$  150g carbohydrates per day)
- D. Venous plasma glucose measured at fasting, 1, 2, and 3 hours
- E. Subjects seated and not smoking during the test

### Significance

From 3 – 5% of pregnancies in women with diabetes result in death of the newborn compared with 1.5% for those without diabetes.

**POSITIVE DIAGNOSIS OCCURS IF  $\geq$  2 ABNORMAL VALUES:**

	<b>O’Sullivan*</b>	<b>ACOG&amp;NDDG**</b>	<b>4th International Workshop-Carpenter/Coustan***</b>
<b>Fasting</b>	90 mg/dl	105 mg/dl	95 mg/dl
<b>1-Hour</b>	165 mg/dl	190 mg/dl	180 mg/dl
<b>2-Hour</b>	145 mg/dl	165 mg/dl	155 mg/dl
<b>3-Hour</b>	125 mg/dl	145 mg/dl	140 mg/dl

\* Whole blood; Somogyi-Nelson method

\*\* Plasma or serum; Glucokinase or Hexokinase method (Today)

\*\*\* Plasma or serum; Glucokinase or Hexokinase method (New)

*Note:* The 4th International Workshop Conference on GDM also supported a one-step procedure for the detection of GDM using a *2-hour, 75 g* oral glucose tolerance test (WHO Criteria).

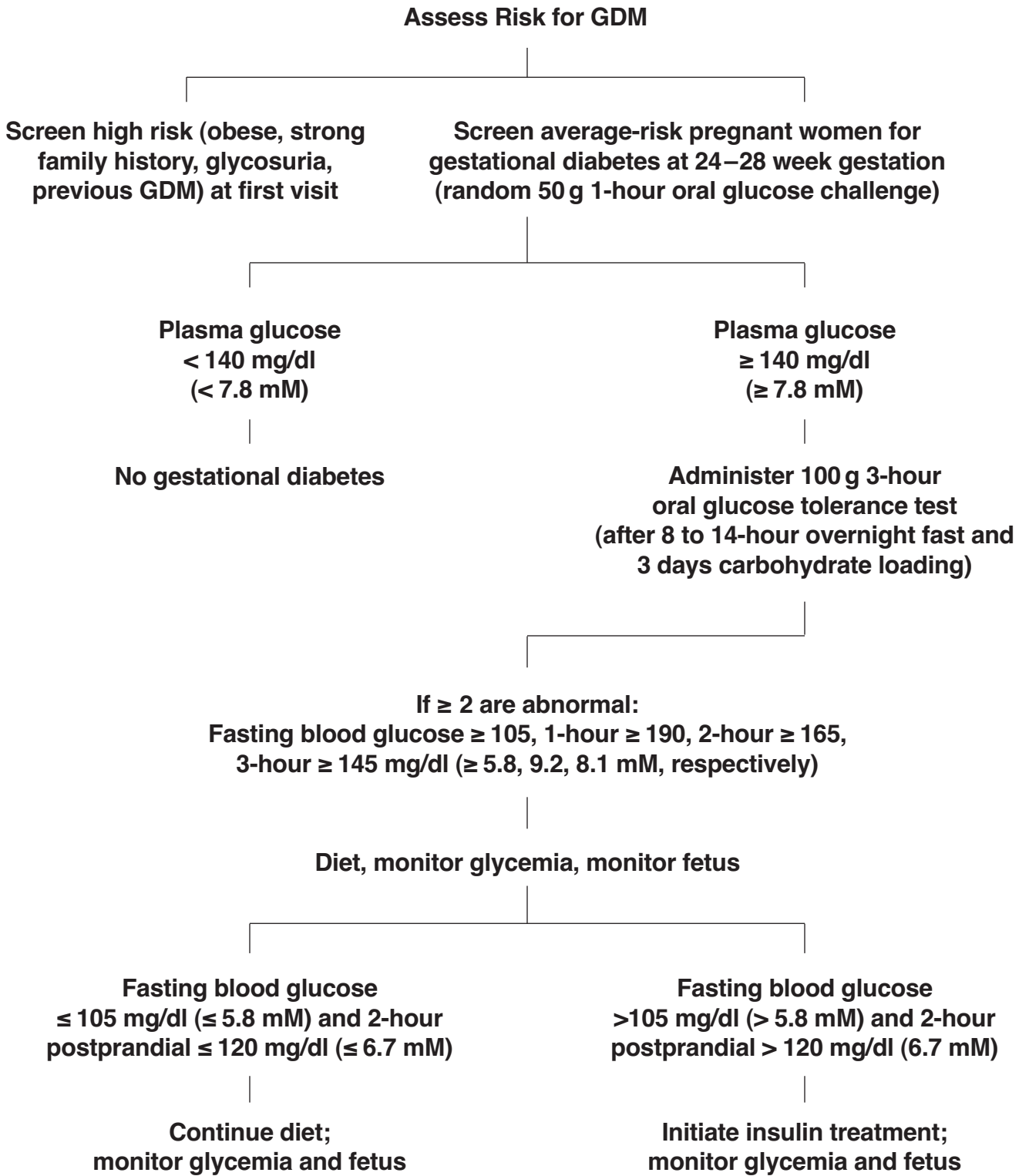
**POSTPARTUM EVALUATION AND DIAGNOSIS**

At 6–12 weeks, postpartum GDM should be re-evaluated:

1. Fasting plasma glucose
  - $\geq$  126 mg/dl on two occasions – DIABETES
  - 110–125 mg/dl – IMPAIRED FASTING GLUCOSE
  - < 110 mg/dl – further testing indicated annually
2. OGTT (75 g) if fasting random glucose < 110 mg/dl
  - 75 g test classified as per ADA or WHO criteria, i.e., Diabetes or Impaired.
  - If normal, then classification “previous abnormality of glucose tolerance (GDM)”
3. 75 g test administered under same conditions as for 100 g OGTT
4. Venous plasma glucose is measured at fasting and 2 hours

	<b>Normal</b>	<b>Impaired Glucose Tolerance</b>	<b>Diabetes Mellitus</b>
<b>Fasting</b>	< 110 mg/dl <i>and</i>	$\geq$ 110 – < 126 mg/dl <i>and</i>	$\geq$ 126 mg/dl <i>or</i>
<b>2-Hour</b>	< 140 mg/dl	$\geq$ 140 – < 200 mg/dl	$\geq$ 200 mg/dl

# *Diagnosis and Management of Gestational Diabetes*



From Coustan (6) with permission

## *Diabetes Management Goals of Therapy*

<b>FOR THE PATIENT WITH DIABETES AND PREGNANCY</b>	
Fasting Blood Sugar Levels	60–90 mg/dl (< 105 is acceptable)
Premeal Blood Sugar	< 105 mg/dl
1 Hour After Meal	< 120 mg/dl
2 Hours After Meal	< 100–120 mg/dl
A1c	< 6%
Ketones	Negative
Blood Pressure	120/70

<b>MINIMUM PRACTICE RECOMMENDATIONS</b>	
Hematocrit	initial and as needed
A1c	preconception and every 2–3 months
Urine Ketones	every visit and as indicated
Urine Dipstick for Glucose/Protein	each visit
24-hour Urine Collection Creatinine Clearance and Total Protein/Microalbuminuria	preconception and mid trimester
Weight/Blood Pressure	each visit
Eye Examination by Ophthalmologist/ Therapeutic Optometrist (Dilated Funduscopy Exam)	preconception and as indicated

## *Minimum Practice Recommendations*

### **GESTATIONAL DIABETES**

Team management, including a clinician with diabetes specialization, is recommended for patients with gestational diabetes.

#### **EDUCATION**

Preconception Counseling/Education	PRN
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Diabetes	PRN
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Medical Nutrition Therapy	PRN
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#### **LABORATORY**

Hematocrit	Initial and PRN
------------	-----------------

A1c	PRN
-----	-----

Urine Ketones	PRN
---------------	-----

Urine Dipstick for Glucose/Protein	Each visit
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#### **PHYSICAL/SCREENING/MONITORING**

Screening Glucose Tolerance	Screen high-risk patients or patients who have not been screened at initial visit. All women at 24-28 weeks gestation. If gestational diabetes, 6 weeks postpartum GTT and annual fasting glucose.
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Self Blood Glucose Monitoring (SBGM)	4x daily first two weeks after diagnosis of GDM to assure that glucose is stabilized. If not stabilized, may require further monitoring.
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Fasting and/or Postprandial Glucose	At preconception and PRN
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Fetal Evaluation	As per ACOG – A determination of maternal serum alpha-fetoprotein levels at 16–20 weeks of gestation should be used in association with an ultrasound study at 18–20 weeks in an attempt to detect neural tube defects and other abnormalities. Since maternal serum alpha-
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**Fetal Evaluation (continued)**

fetoprotein values may be lower in pregnancies complicated by diabetes, interpretation may need to be altered accordingly. During the third trimester a program of fetal surveillance should be initiated. The timing and frequency of biophysical surveillance, including the nonstress test, biophysical profile, or contraction stress test, depend on the degree of risk present. For example, in a pregnancy complicated by severe nephropathy, such testing may be initiated at 28 weeks. However, testing may be started considerably later in gestation for a patient whose condition has been well controlled, who does not have vascular disease, and whose fetus demonstrates normal growth on several ultrasound examinations. Other reasons to increase fetal surveillance include ketoacidosis, pyelonephritis, preeclampsia, and poor patient compliance.

<b>Weight</b>	Each visit
<b>Blood Pressure</b>	Each visit
<b>Complete History and Physical Including Risk Factors, Exercise, Diet</b>	Initial

After delivery, regard the patient as being at high risk for type 2 diabetes. Forty percent or more women develop diabetes within 20 years. Educate the patient about risk reduction and advise primary care provider to monitor.

## *Minimum Practice Recommendations*

### **PREEXISTING DIABETES AND PREGNANCY**

Team management, including a clinician with diabetes specialization, is recommended for patients with preexisting diabetes.

#### **EDUCATION**

Preconception Counseling/Education/Control	PRN
Diabetes	Initial and PRN
Medical Nutrition Therapy	Initial and PRN

#### **LABORATORY**

Hematocrit	Initial and PRN
A1c	Preconception and PRN
Urine Ketones	PRN
Urine Dipstick for Glucose/Protein	Each visit
24-hour Urine for Creatinine Clearance and Total Protein	Preconception and mid trimester

#### **PHYSICAL/SCREENING/MONITORING**

Self Blood Glucose Monitoring (SBGM)	Insulin therapy – 4x daily
Fasting and/or Postprandial Glucose	PRN
Fetal Evaluation	As per ACOG, a determination of maternal serum alpha-fetoprotein levels at 16–20 weeks of gestation should be used in association with an ultrasound study at 18–20 weeks in an attempt to detect neural tube defects and other abnormalities. Since maternal serum alpha-fetoprotein values may be lower in pregnancies complicated by diabetes, interpretation may need to be altered accordingly. During the third trimester, a program of fetal surveillance should be initiated. The timing and

**Fetal Evaluation (continued)**

frequency of biophysical surveillance, including the nonstress test, biophysical profile, or contraction stress test, depend on the degree of risk present. For example, in a pregnancy complicated by severe nephropathy, such testing may be initiated at 28 weeks. However, testing may be started considerably later in gestation for a patient whose condition has been well controlled, who does not have vascular disease, and whose fetus demonstrates normal growth on several ultrasound examinations. Other reasons to increase fetal surveillance include ketoacidosis, pyelonephritis, preeclampsia, and poor patient compliance.

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**Weight**

Each visit

---

**Blood Pressure**

Each visit

---

**Complete History and Physical Including Risk Factors, Exercise, Diet**

Initial

---

**Dilated Funduscopy Eye Examination by (Women with Established) an Ophthalmologist or Therapeutic Optometrist**

Preconception and PRN

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## *Teaching Self Blood Glucose Monitoring*

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### **ASSESSMENT**

1. Is a meter accessible to the client?
2. Is the client willing to test?
3. Is the client able to read and write (at least numbers)?
4. Is this particular meter appropriate for the client?
5. Does the client have adequate dexterity to perform the test?
6. Does the client have adequate vision to perform the test and to see the digital display?
7. Which family member/friend can be instructed along with the client?

### **INSTRUCTION**

Teach the client the procedure according to the manufacturer's directions. Have the client attempt to return the demonstration from the beginning to the end without assistance.

Repeat the instruction and return the demonstration as often as necessary until the client can perform the procedure completely and correctly without assistance.

#### **Instruct the client**

1. How and when to clean the meter
2. How to do the quality control tests
3. About interfering substances and conditions
4. About his/her personal blood glucose target range
5. What to do if blood glucose readings are out of the range
6. How often and what time of day to test
7. To document blood glucose readings in logbook
8. To bring blood glucose logbook to appointments with doctor

### **REFERRAL**

1. Refer the client to a health care provider or diabetes educator for comprehensive diabetes education, establishment of blood glucose target range, and guidelines for responding to results of tests.
2. Remind the client to use the 800 number on the back of the meter if there are questions or problems with the meter. Cover simple troubleshooting points: batteries, clean contacts, interchangeable brand names of meters and strips. Usually a meter lasts 3-5 years.
3. Instruct the client to bring the meter to appointments to review the procedure.

## *General Nutrition Guidelines*

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The goals of diabetes nutrition are to control blood glucose and lipid levels without compromising overall nutrition and health, to provide appropriate calories, to prevent, delay or treat nutrition related complications, and improve health.

### **A. Nutrition Guidelines**

1. Stress consistent timing of meals and control of food portions. Review portion size.
2. Eat a variety of foods every day.
3. Achieve or maintain a desirable weight.
4. Eat less sugar/use sugar substitute (Aspartame, Acesulfame Potassium and Saccharin).
5. Eat foods high in fiber.
6. Use less salt. If blood pressure > 130/80 mm/Hg, limit sodium to < 2.4 gm/day.
7. Consume the least amount of fat possible.

### **B. Carbohydrate (CHO) Intake**

1. Individualize based on client need. Total calorie reduction if overweight or obese.
2. Consume more complex (unrefined) carbohydrates with fiber.
3. Eat 2 servings of fruits each day, preferably with lunch and dinner.  
One serving equals: 1/2 c. canned fruit or juice, or 1 c. fresh fruit. Avoid juices (except when hypoglycemic) which may cause the blood glucose to elevate very rapidly. Focus on fresh fruits that have more fiber but no more than 2–3 servings per day.
4. Eat 4–6 servings of vegetables each day. One serving equals: 1/2 c. cooked vegetable or 1 c. raw vegetable.
5. Other CHO choices include: 1 tortilla or slice of bread, 1/2 c. cooked pasta, rice, or potatoes, or 4–6 saltine crackers. Limit starches to 2–3 per meal.

### **C. Fiber Intake**

1. Eat 25–35 grams per day.
2. Major sources: raw fruits and unpeeled vegetables, beans, legumes, whole grain breads, and cereals.

### **D. Protein Intake**

1. 20 to 30% of total calories; this equals 7 to 8 ounces per day (3 oz.= the size of a deck of cards).
2. Restrict to 0.8–1.0 gram protein/kg of body weight for adults with onset of nephropathy.

3. One serving is: 3 oz. lean beef, chicken, or fish, 1 c. skim milk, 1 c. yogurt, 3 oz. cheese, or 1 egg.
4. Adjustments should be made for conditions such as renal failure or hypertension.

### **E. Fat Intake**

1. Less than 30% of total calories per day.
2. Less than 10% of total calories per day from saturated fat.
3. Limit cholesterol intake to less than 300 mg/dl per day.
4. Avoid saturated fat: animal fats (found in fatty meats, poultry skin), hydrogenated shortenings and fats, some vegetable oils (coconut, palm, palm kernel, cocoa butter), whole milk and whole milk products, and most commercially baked goods.
5. Use more mono and poly-unsaturated fats, i.e. canola, olive or corn oils.

### **F. Alcohol (Use with doctor approval)**

1. No more than two equivalents 1 to 2 times per week.
2. One equivalent is: 1.5 oz. distilled beverage, 4 oz. wine or 12 oz. beer.
3. Food should be consumed with alcoholic beverages to prevent hypoglycemia.

### **G. Other Names for Sugar**

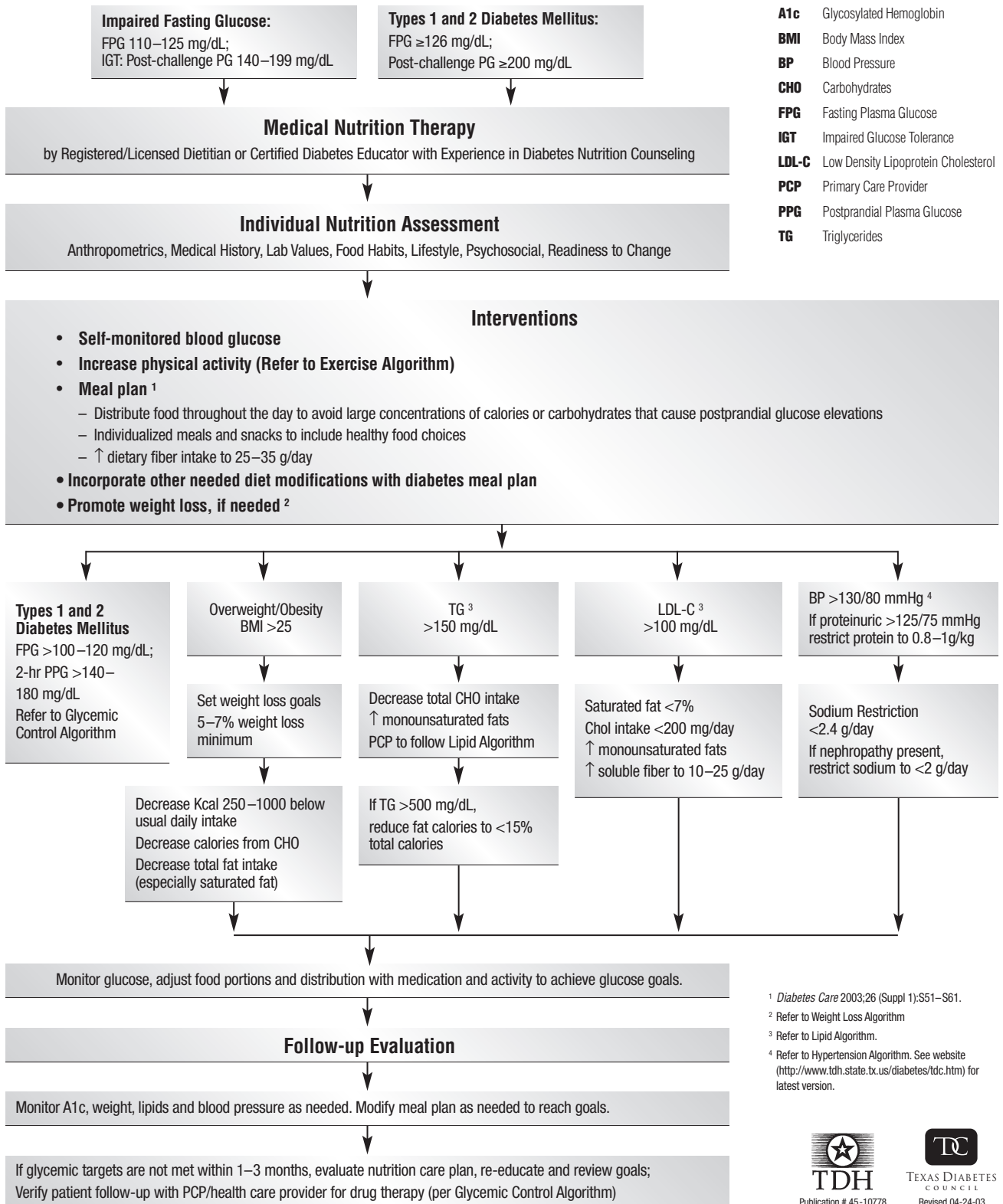
1. Glucose, dextrose, corn syrup
2. Fructose (fruit sugar), molasses, lactose
3. Honey, raw honey, invert sugar
4. Maltose, malted syrup, dextrin
5. Sugar alcohols: sorbitol, mannitol, xylitol

### **H. Sodium**

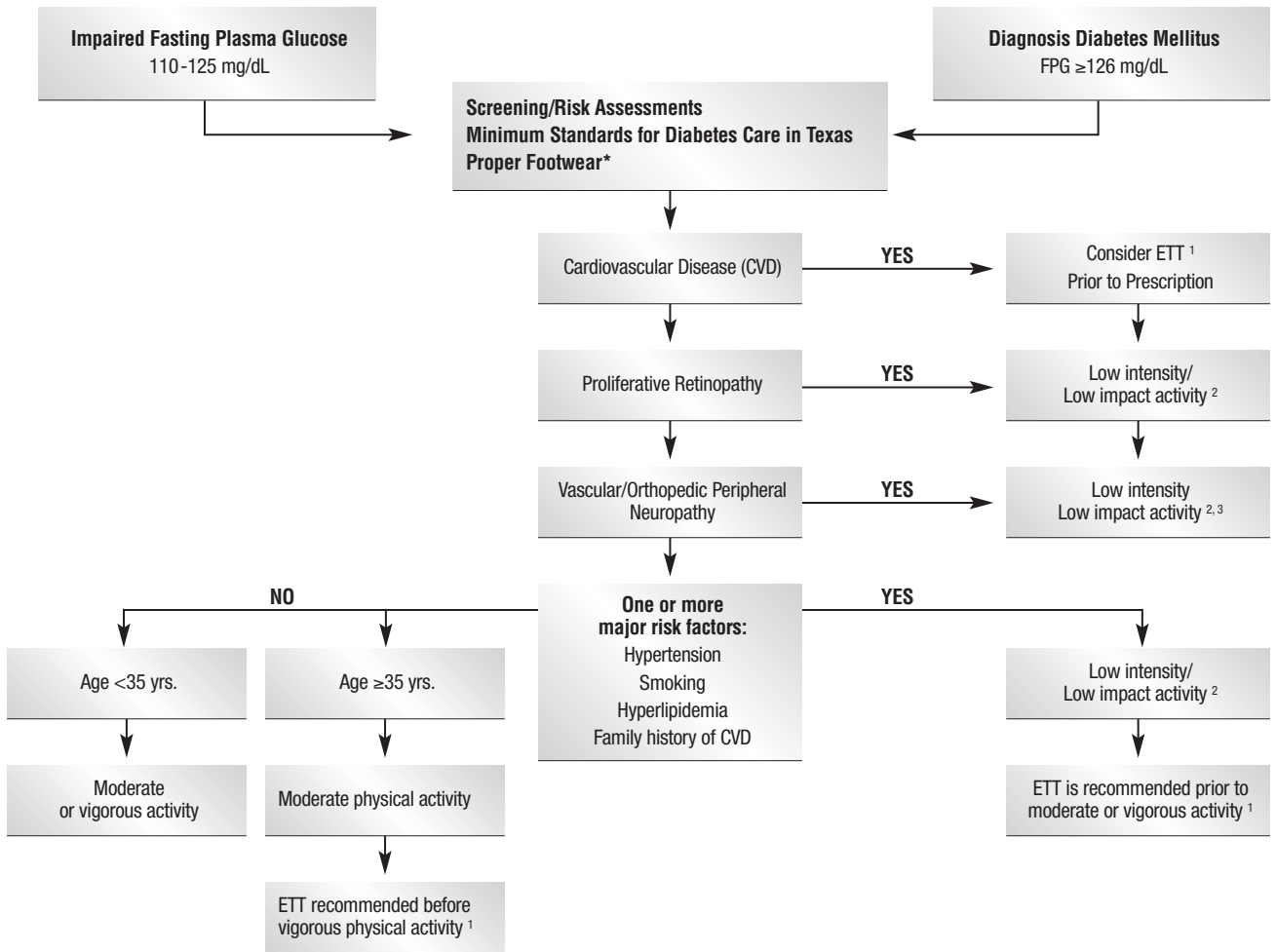
1. Read food labels. Choose low-sodium foods: fresh or frozen vegetables (avoid regular canned foods), powdered seasonings (avoid onion and garlic salt), fewer fast foods and convenience foods. Avoid salty sauces such as soy sauce.

# Diabetes Medical Nutrition Algorithm

## Type 2 Prevention and Therapy/ Type 1 Therapy



# Exercise Algorithm Type 2 Diabetes Prevention & Therapy



**1 Recommendation for Exercise Tolerance Test**

Based on the clinical context in which they occur, if your patients have any of the following signs or symptoms of cardiovascular or metabolic disease, consider an exercise tolerance test (ETT) before recommending moderate or vigorous activity.

- Pain, discomfort (or other anginal equivalent) in the chest, neck, jaw, arms, or other areas that may be ischemic in nature
- Shortness of breath at rest or with mild exertion
- Dizziness or syncope
- Orthopnea or paroxysmal nocturnal dyspnea
- Ankle edema
- Palpitations or tachycardia
- Intermittent claudication
- Unusual fatigue or shortness of breath with usual activities

- Any macrovascular disease
- Any microvascular disease
- Peripheral vascular disease

**2 Moderate activity is recommended to achieve physiologic improvement.**

**3 Orthotics as indicated.**

\* **Proper footwear** (socks, shoes, insoles) to prevent injury.

If your patients are “apparently healthy” and have fewer than two major risk factors for cardiovascular disease (CVD), then they are categorized by age.

- For men and women under 35 yrs. of age, there are no limitations. They can safely begin or continue a program of moderate or vigorous activity.
- If they exceed the age limit (≥35 yrs.), it is safe to limit your recommendations to moderate activity (55% to 70% maximum heart rate) for both genders. Patients in this group who wish to

participate in vigorous or competitive activities should be considered for an ETT screening.

If your patients have one or more major risk factors for cardiovascular disease, they should undergo an ETT before beginning a moderate exercise program. It is important to underscore the fact that the majority of your patients, regardless of risk factors, can and should be encouraged to start or continue a program of regular moderate physical activity.

**See website** (<http://www.texasdiabetescouncil.org>) **for latest version.**

**See reverse side for other considerations and precautions.**



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TEXAS DIABETES COUNCIL  
Revised 05-23-02

## Considerations for Prescribing Physical Activity for Type 2 Diabetes Prevention and Treatment

Significant health benefits can be obtained by including an accumulated 30 minutes of moderate physical activity on most, if not all, days of the week.

Regular physical activity lowers the risk of developing type 2 diabetes – *1996 Surgeon General's Report on Physical Activity and Health*.

“Regular physical activity” includes all movements in everyday life, including work, recreation, exercise, and sporting activities.

- **Low Intensity/Low Impact Activity** - includes activities like walking, housework, light gardening, light yard work, and social dancing
- **Moderate Intensity Activity** - includes activities like brisk walking, vigorous gardening, slow cycling, aerobic dancing, doubles tennis, or hard work around the house.

### PRECAUTIONS FOR EXERCISE PRESCRIPTION

#### Retinopathy

Patients with proliferative diabetic retinopathy have abnormal hemodynamic responses of the cerebral and ophthalmic circulation both at rest and with exercise. **Vigorous physical activity, especially isometric contractions, produces significant increases in blood pressure and can accelerate proliferative diabetic retinopathy with significant risk of retinal and vitreal hemorrhage and detachment.** Low impact/low intensity physical activity recommended.

#### Orthopedic Problems

Neuropathy and peripheral vascular disease can predict unnoticed foot injury. Footwear that relieves forefoot plantar pressure by up to 50% has been shown to be effective in preventing the recurrence of foot ulcers when worn for more than 60% of the day (Peirce, N. 1999. *British Journal of Sports Medicine*)

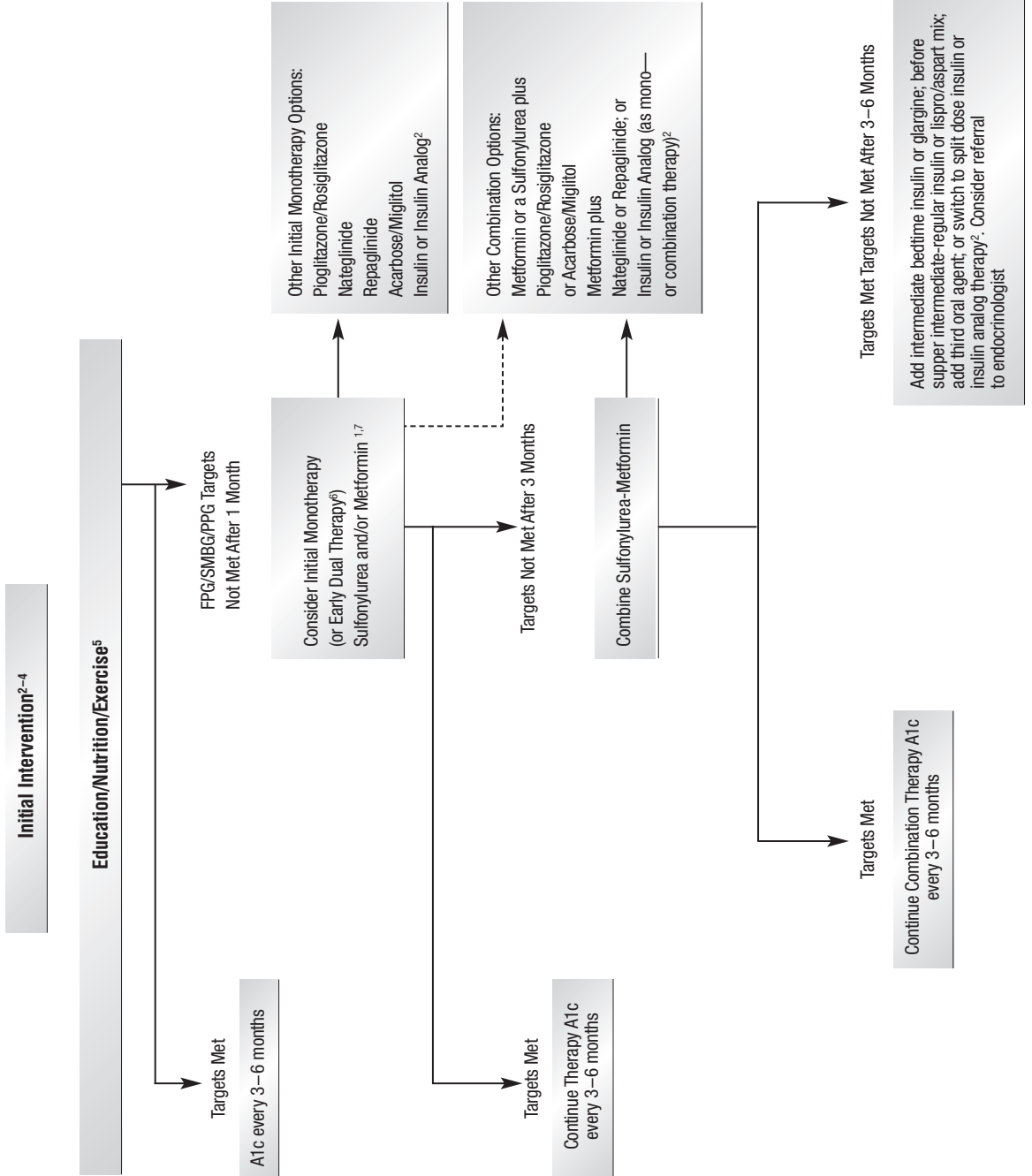
#### Guidelines for Exercise Prescription

1. Appropriate attire for physical activity, i.e. footwear - socks, shoes, insoles/orthotics.
2. Do not exercise at peak hypoglycemic times.
3. Monitor blood glucose before and during exercise if symptoms of hypoglycemia occur with exercise.
4. Wear a form of personal identification or medical alert.
5. Carry fast-acting carbohydrate, i.e. sucrose and glucose products.
6. Examine feet after exercise.
7. Maintain adequate hydration.

# Glycemic Control Algorithm For Type 2 Diabetes Mellitus In Children<sup>1</sup> And Adults

## TARGETS

- A1c <6.5-7.0% (<0.5-1.0% above reference range)
- FPG <110-130 mg/dL
- Fasting SMBG <100-120 mg/dL
- 2-hr PPG <140-180 mg/dL



<sup>1</sup> Metformin is the only FDA-approved oral diabetic agent in children (≥ age 10); other oral agents may be used at the discretion of the clinician

<sup>2</sup> See Insulin Algorithm for type 2 Diabetes Mellitus in Children and Adults

<sup>3</sup> If initial presentation with FPG ≥260 mg/dL in a symptomatic patient, consider insulin or insulin analog as initial intervention.

<sup>4</sup> If initial FPG ≥210 mg/dL or A1c ≥8.0%, consider dual oral agent therapy (metformin-sulfonylurea or other options) at presentation.

<sup>5</sup> See Medical Nutrition and Exercise Algorithms

<sup>6</sup> If initial dual oral therapy is initiated, decide on add-on therapy options within 3-6 months if glycemic targets are not met.

<sup>7</sup> Preferred in overweight/obese or dyslipidemic patients.

See website (<http://www.tdh.state.tx.us/diabetes/t2c.htm>) for latest version.



## *Oral Agents for Diabetes Mellitus*

### **I. FIRST GENERATION ORAL HYPOGLYCEMIC AGENTS (SULFONYLUREAS)**

**Mechanism of Action:** lower the blood glucose by stimulating the release of insulin from the pancreas, which also helps to shut off glucose production in the liver. They may also increase insulin sensitivity slightly at the muscle. The effects are dependent on the functionality of the beta cells of the pancreatic islets.

**Considerations:** Take before or with meals

**Risk Hypoglycemia:** Yes

**Weight:** 1–2 kg increase

**Caution:**

1. Elderly, renal or hepatic insufficiency increases risk of hypoglycemia (start at lower dose).
2. Alcohol consumption may cause nausea/vomiting/flushing (disulfiram [Antabuse®] like reaction) if taken with chlorpropamide or tolazamide (also prolongs hypoglycemic effect).

**Drug interactions:**

↑ **effects:** (may cause hypoglycemia) caused by plasma protein binding changes. If occurs, will happen in first days of combination. Most at risk: patients with blood sugars well controlled on sulfonylureas. Examples: anticoagulants, androgens, fluconazole, salicylates, gemfibrozil, sulfonamides, tricyclic antidepressants, probenecid, MAO inhibitors, methyl dopa, digitalis glycosides, urinary acidifiers

<b>GENERIC</b>					
<b>GENERIC AVAILABLE</b> (Y=YES, N=NO)	<b>BRAND</b>	<b>TABLET</b>	<b>DAILY DOSAGE</b>	<b>DURATION</b>	<b>COMMENTS</b>
Acetohexamide (Y)	<i>Dymelor</i> ®	250, 500 mg	250–1500 mg	up to 16 hours	Active metabolite renally excreted
Chlorpropamide (Y)	<i>Diabinese</i> ®	100, 250 mg	100–500 mg	up to 72 hours	Do not use in renal insufficiency Deavynfar® or Insogen® (Mexico)
Tolazamide (Y)	<i>Tolinase</i> ®	100, 250, 500 mg	100–1000 mg	up to 10 hours	Avoid alcohol
Tolbutamide (Y)	<i>Orinase</i> ®	250, 500 mg	500–3000 mg	up to 10 hours	Artosin®, Diaval® or Rastinon® (Mexico)



## II. SECOND GENERATION ORAL HYPOGLYCEMIC AGENTS (SULFONYLUREAS)

**Mechanism of Action:** Same as first generation sulfonylureas

**Considerations:** Same as first generation sulfonylureas

**Risk Hypoglycemia:** Yes

**Caution:** Same as first generation sulfonylureas, but less risk of drug interactions

<b>GENERIC GENERIC AVAILABLE (Y=YES, N=NO)</b>	<b>BRAND</b>	<b>TABLET</b>	<b>DAILY DOSAGE</b>	<b>DURATION</b>	<b>COMMENTS</b>
Glipizide (Y)	<i>Glucotrol</i> <sup>®</sup>	5, 10 mg	5–40 mg QD-BID	Up to 20 hours	Can be given with or without meal Minodiab <sup>®</sup> (Mexico)
Glipizide extended release (N)	<i>Glucotrol XL</i> <sup>®</sup>	5, 10 mg	5–20 mg QD ONLY	24 hours	Slow-release form Do not cut tablet
Glyburide (Y)	<i>DiaBeta</i> <sup>®</sup> <i>Micronase</i> <sup>®</sup>	1.25, 2.5, 5 mg	1.25–20 mg QD-BID	Up to 24 hours	Daonil <sup>®</sup> , Euglucon <sup>®</sup> , Glibeni <sup>®</sup> , Glucal <sup>®</sup> , Norboral <sup>®</sup> (Mexico)
Glyburide, (micronized)(Y)	<i>Glynase</i> <sup>®</sup>	1.5, 3, 6 mg 4.5 mg (generic)	1.5–12 mg	Up to 24 hours	3 mg Glynase <sup>®</sup> = 5 mg Glyburide
Glimepiride (N)	<i>Amaryl</i> <sup>®</sup>	1, 2, 4 mg	1–8 mg QD	24 hours	Start 1 mg in renal insufficiency

### III. BIGUANIDE

**Mechanism of Action:** Decreases hepatic (liver) glucose output and increases peripheral glucose utilization (muscle sensitivity to insulin). Does not stimulate insulin secretion.

**Considerations:**

1. **Hypoglycemia:** No, may if combination therapy (insulin, sulfonylurea, meglitinide)
2. **Lipid effects:** ↓ triglycerides and ↓ LDL, ↔/↑ for HDL
3. **Weight:** May decrease 5–10 lbs. (secondary to ↑ satiety or “full” feeling)
4. **Side effects:** GI upset/abdominal discomfort/diarrhea (take with meal to minimize), metallic taste (rare)
  - a) **Titrate** — dose up to minimize GI side effects (example: 500 mg QD to 500 mg BID over 1 week with largest meal of day, then ↑ to 1 g [500 mg ii tabs] with largest meal and 500 mg with second largest meal, then 1 g BID with meals over 1 week.)
 

**Individualize** — titration as tolerated
  - b) Symptoms of GI upset decrease with time (5% intolerant despite titration)
  - c) Interferes with vitamin B<sub>12</sub> absorption
5. **Caution: Lactic acidosis**—risk rises if unable to renally secrete Metformin, if hepatic disease ↓ “metabolism of lactic acid”.

**Increased risk if:** (If risk factors present, consult health care prescriber)

1. *Alcohol Abuse* (binge or chronic use > 2 drinks/day or at one sitting)
2. *Renal insufficiency* (Scr ≥ 1.4 for women, ≥ 1.5 for men), GFR < 70 ml/minute, or > 80 years old (confirm renal function before use)
3. *Acute renal failure* — e.g., intravenous dyes for diagnostics, drugs, major surgery. *Action:* Hold medication x 48 hours after intervention to confirm stable renal function
4. *Type A Lactic Acidosis* — severe hypoxia in congestive heart failure, severe respiratory disease, myocardial infarction, shock, septicemia, carbon monoxide
5. *Type B Lactic Acidosis Overproduction/↓'ed clearance* — alcohol, liver failure, malignancy, seizures, salicylates

<b>GENERIC</b>					
<b>GENERIC AVAILABLE</b> (Y=YES, N=NO)	<b>BRAND</b>	<b>TABLET</b>	<b>DAILY DOSAGE</b>	<b>DURATION</b>	<b>COMMENTS</b>
Metformin (Y)	<i>Glucophage</i> <sup>®</sup> Bristol-Myers Squibb	500, 850, 1000 mg	1000–2550 mg (adult) up to 2000 mg (age 10 yrs +)	> 24 hours	Maximum effective dose is <b>1gm BID</b>
Metformin extended-release (N)	<i>Glucophage XR</i> <sup>®</sup> Bristol-Myers Squibb	500 mg	2000 mg		Take with food; no alcohol
Metformin/ Glyburide (N)	<i>Glucovance</i> <sup>®</sup> Bristol-Myers Squibb	250/1.25 mg 500/2.5 mg 500/5 mg	Usual 2000/20 mg (Titrated) Up to 2 tabs BID		Second line
Metformin/ Glipizide	<i>Metaglip</i> <sup>®</sup> Bristol-Myers Squibb	250/2.5 mg 500/2.5 mg 500/5 mg	Up to 2 tabs BID		

**IV. ALPHA-GLUCOSIDASE INHIBITORS**

**Mechanism of Action:** Delay the breakdown of carbohydrate into simple sugars for absorption in the proximal small intestine. Delay rapid rise in blood sugar post-prandially. Main effect on post-prandial blood glucose levels.

Decreases fasting blood sugars about 10%.

**Considerations:**

1. **Hypoglycemia:** No, may if combination therapy (insulin, sulfonylurea, meglitinide)
2. **Hypoglycemic treatment:** Glucose, milk (lactose), or fruit juice (fructose). Acarbose does not block absorption of glucose, lactose and most fructose.

May treat with any carbohydrate *if*:

1. > 2–3 hours since last dose of acarbose (enzyme blockage diminishes with time)
2. No other source of carbohydrate available
3. **Weight:** ↔/↓ slightly secondary to side effects (does not cause fecal loss of caloric intake)
4. **Diet:** Need complex carbohydrate diet for optimal effectiveness (limit simple sugars)
5. **Side effects:** Flatulence (75%), GI upset, abdominal discomfort, diarrhea, or gas (↑ delivery of “sugar” to microflora of bowel, which results in CO<sub>2</sub> production)

**Action:** Titrate up slowly to minimize; initiate medication with smallest carbohydrate meal of the day (example: 25 mg QD x 1 week, then 25 mg BID x 1 week, then 25 mg TID x 1 week, then up to 50 mg TID). **Individualize** titration based on side effects. **Beano-**, an alpha-glucosidase enzyme, may help to decrease GI side effects, but may decrease efficacy. (Lettieri JT, Dain B, Clinical Therapeutics 1998; 20(3): 497–504)

**Maximum dose:** Acarbose 50 mg TID for patients ≤ 60 kg, 100 mg TID for > 60 kg (Rare pre-clinical LFT elevations related to: 1) dose (> 300 mg/day) and 2) weight of patient)

**Caution/contraindication:**

1. GI disease: Ulcerative colitis, Crohn’s, possible bowel obstruction, short bowel syndrome
2. Renal insufficiency: Serum creatinine > 2.0 mg/dl – unstudied, metabolites are absorbed and excreted in urine (**Miglitol** – dose is absorbed and excreted by kidneys unchanged)

GENERIC	BRAND	TABLET	DAILY DOSAGE	DURATION
Acarbose	<i>Precose</i> <sup>®</sup> Bayer	50, 100 mg	25–100 TID	1–3 hours
Miglitol	<i>Glyset</i> <sup>®</sup> Upjohn/Bayer	25, 50, 100 mg	25–100 mg TID	1–3 hours
Voglibose	<i>Bansen</i> <sup>®</sup> Takeda, Japan	—	—	1–3 hours

## V. THIAZOLIDINEDIONES: “GLITAZONES OR TZDs”

**Mechanism of Action:** Stimulate nuclear receptor (PPAR  $\gamma$ ), which indirectly stimulates peripheral glucose utilization at muscle and suppresses hepatic glucose output. Promote insulin sensitivity at adipose tissue that may promote increasing sensitivity to insulin ( $\uparrow$  adipose differentiation-especially in abdominal subcutaneous tissue)

### Considerations:

1. **Hypoglycemia:** No, may if combination therapy (insulin, sulfonylurea, meglitinide)
2. **Lipid Effects: Triglycerides:**  $\downarrow$  with Pioglitazone,  $\leftrightarrow$ /if high  $\downarrow$  Rosiglitazone; **HDL:** Both  $\uparrow$ ; **LDL:**  $\uparrow$  Rosiglitazone,  $\leftrightarrow$  Pioglitazone
3. **Weight:**  $\uparrow$  5–10 lbs., more if started with sulfonylurea or insulin
4. **Dosing: Rosiglitazone, Pioglitazone** – with or without meals. **Both Q Day dosing** except **Avandia** may be slightly more effective if dosed BID ( $\sim$ 10 mg/dl FPG and 0.2–0.3% on A1c)
5. **Side Effects:**
  - a) **Edema/swelling** – Caution in patients with CHF, significant heart disease, secondary to  $\uparrow$ ing plasma volume by  $\sim$ 10% (class effect, but possibly dose related). May occur in patients with NO history of heart problems. Edema - combo with oral therapy 5%, insulin  $\sim$ 15%. Both with insulin — increased new CHF (1-2%), pulmonary edema without change in common cardiac function. Intervention: Stop if major; reduce dose if minor, further cardiac w/u may be indicated, diuretic prn
  - b) **Anemia**-hemodilutional effect from plasma volume increase
  - c) **Liver Toxicity** – Pre-marketing experience in  $\sim$  5000 patients for each medication did not show any cases of liver failure. (Incidence ALT  $>$ 3 X UNL = **Actos**-0.26% vs. 0.25% placebo **Avandia**-0.2% vs 0.2%). **Avandia**-Two reported cases: A1-Salman J & Forman LM, Ann Int Med 00; 132(2): 118-24. LFT elevations appear to be reversible with discontinuation. Two-year experience same as placebo (over 5000 patient-years) Lebovitz HE et al. ADA 60th Session, Abstract 159-OR; Rubin CJ et al. ADA 60th Sessions, Abstract 500-P; Actos-1 case report: Maeda K, Ann Int Med 2001; 135:306. LFT WNL within month of D/C. Action: Recommended LFT's every other month for one year. If ALT $>$ 2.5 X UNL, don't start; 1-2.5 X UNL, monitor close; ALT X 3 UNL, stop
6. **Drug interactions: Actos** (metabolism by 3A4 (17%) /2C8) does not inhibit 3A4. Caution with inhibitors of CYP450-3A4 (ketoconazole, itraconazole, erythromycin)  
**Avandia:** metabolism by CYP450-2C8, lesser extent by CYP450-2C9. No inhibition/interactions noted
7. **Caution:** anovulatory/polycystic ovarian disease resume ovulation (pregnancy potential)

<b>DAILY</b>					
<b>* GENERIC</b>	<b>BRAND</b>	<b>TABLET</b>	<b>DOSAGE</b>	<b>DURATION</b>	<b>COMMENTS</b>
Pioglitazone	<i>Actos</i> <sup>®</sup> Takeda/co-marketed with Eli Lilly	15, 30, 45 mg	30–45 mg QD	24 hours	
Rosiglitazone	<i>Avandia</i> <sup>®</sup> SmithKline Beecham	2, 4, 8 mg	4–8 mg QD or 2–4 mg BID	24 hours	BID (10 mg/dl) more effective than QD
Rosiglitazone/ Metformin	<i>Avandamet</i> <sup>®</sup> SKB	1 mg/500 mg 2 mg/500 mg 4 mg/500 mg	Up to 8 mg/ Up to 2000 mg	24 hours	

**VI. MELITINIDES/PHENYLALANINES**

**Mechanism of Action:** Lowers the blood glucose by stimulating the release of insulin from the pancreas (insulin secretagogue). Helps post-prandially to improve insulin release and stimulate glucose uptake in the muscles. Also helps to shut down hepatic glucose output after eating.

**Considerations:**

1. **Hypoglycemia:** Yes (less nocturnal hypoglycemia compared to sulfonylurea)
2. **Dosing:** *Prandin*<sup>®</sup>: Prior hypoglycemic agent or A1c>8%, start with 1-2mg before each meal. If hypoglycemic agent naïve or A1c<8%, start with 0.5mg before each meal *Starlix*<sup>®</sup>: 120mg each meal.
3. Give 0–30 minutes before a meal; if choose to skip a meal, **do not** take medication.
4. Depending on the person, day, schedule, etc., the number of times a day the patient takes the medication may change.
5. If do not take medication *with* each meal with carbohydrate, control has been shown to be no better than placebo. (Wolffenbuttel BH. Eur J Clin Pharm 1993; 45(2): 113-6)

**Caution:**

1. Caution in hepatic insufficiency (excreted in bile)
2. **Renal insufficiency:** Initial dose is unchanged, but subsequent increases in dose should be instituted with caution.
3. **Drug interactions:** Possible drug interactions, but short half-life makes importance of interactions unknown (metabolized by CYP450-3A4 system).

Important drugs that may increase risk of hypoglycemia are itraconazole, ketoconazole, erthythromycin, clarithromycin.

* GENERIC	BRAND	TABLET (MG)	DAILY DOSAGE	DURATION OF EFFECT	COMMENTS
Repaglinide	<i>Prandin</i> <sup>®</sup> Novo Nordisk	0.5, 1, 2 mg	0.5–4 mg given before each meal max=16 mg/day	Maximum effect: ~1 hour Duration: ~2–3 hours	Maximum effective dose appears to be 2 mg before meals
Nateglinide	<i>Starlix</i> <sup>®</sup> Novartis	60-120 mg	60-120 mg taken 10 minutes before meal	Maximum effect: ~1 hour Duration: ~4 hours	60 mg if near A1c goal; Maximum effective dose appears to be 120 mg

Last updated: 3-1-03 \*Intended only as an education/ teaching aid. For complete prescribing information, please consult the package insert of the appropriate medication. All opinions stated within this aid are based on the author’s review of the literature.

<sup>1</sup> Lacy, Charles, et al. *Drug Information Handbook*, Cleveland, Ohio, Lexicomp, 2001.

# Lipid Treatment Algorithm for Type 1 and Type 2 Diabetes Mellitus in Adults

## FLP Goals:

LDL-C <100 mg/dL  
 HDL-C ≥40 mg/dL  
 TG <150 mg/dL

## Determine Fasting Lipid Profile (FLP) yearly

Abnormal FLP ⇒ **TLC; control diabetes**; evaluate and treat secondary causes of dyslipidemia: alcohol, estrogen, anabolic steroids, corticosteroids, hypothyroidism, hepatic disease, nephrotic syndrome, chronic renal failure. If LDL-C elevated = primary treatment target, unless TG ≥ 400 mg/dL, which then becomes the primary treatment target

Consider Fibrate, Niacin<sup>1</sup>, or Statin

**Isolated low HDL-C <40 mg/dL**  
 (LDL-C <100 mg/dL & TG <150 mg/dL)

**TLC**

Therapeutic Lifestyle Changes (refer to TDC Medical Nutrition, Weight Loss, and Exercise Algorithms)

**Statin**

**TG**

**Non-HDL-C**

HMG Co-A Reductase Inhibitor<sup>2</sup>

Triglycerides

TChol minus HDL-C

**Elevated LDL-C ≥100mg/dL**

Start Statin, titrate to goal LDL-C Reinforce TLC

If LDL-C remains >100 mg/dL, add Bile acid resin-binder<sup>3</sup> or Ezetimibe or Orlistat

**Elevated TG ≥150 mg/dL**

150–199 mg/dL

200–399 mg/dL

<130 mg/dL

Start Fibrate or Niacin<sup>1</sup>

≥400mg/dL

TLC

TLC & Calculate Non-HDL-C

≥130 mg/dL

LDL-C <100 mg/dL, start Fibrate or Niacin<sup>1</sup>

LDL-C ≥100 mg/dL, follow elevated LDL-C algorithm

If LDL-C remains ≥100mg/dL

**Refer to Lipid Specialist**

TLC & Start Fibrate, titrate to goal TG

If TG remains >200 mg/dL, add Niacin<sup>1</sup> or Orlistat

<sup>1</sup> Use with caution in patients with diabetes. Need to closely follow self-monitoring blood glucose (SMBG) as may worsen glycemic control. Recheck FLP and ALT 2–3 months after drug therapy initiation/titration. If patient develops myalgias, hold lipid-lowering drug and check CKP as soon as possible.

<sup>2</sup> See reverse side for more information.

<sup>3</sup> If TG <200 mg/dL.

See website (<http://www.tdh.state.tx.us/diabetes/toc.htm>) for latest version.





**HMG CO-A REDUCTASE INHIBITORS LDL-C EQUIVALENCY  
IN PATIENTS WITH HYPERCHOLESTEROLEMIA**

Fluvastatin	Lovastatin	Pravastatin	Simvastatin	Atorvastatin	↓ LDL (%)
20mg	10mg	10mg	—	—	17-19
40mg	20mg	20mg	5-10mg	—	23-29
80mg	40mg	40-80mg	20mg	10mg	31-38
—	80mg	—	40mg	20mg	41-46
—	—	—	80mg	40mg	48-54
—	—	—	—	80mg	60

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**Adapted from:**

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# Insulin Algorithm for Type 1 Diabetes Mellitus<sup>1</sup>

## Targets

- A1c <6.5-7.0% (<0.5-1.0% above reference range)
- FPG <110-130 mg/dL
- Fasting SMBG <100-120 mg/dL
- 2-hr PPG <140-180 mg/dL

## Multi-dose Insulin Therapy (MDI)<sup>2</sup>

### -2 shots

Split mix Intermediate-acting insulin (IAI) + Short-acting insulin (SAI) (vial) (2:1 ratio AM, 1:1 ratio PM; or sliding scale<sup>3</sup>)

**-3 shots** (especially if nocturnal hypoglycemia) SAI: ACB and ACS sliding scale<sup>3</sup> (pen/vial)

+

IAI: ACB and HS (pen/vial) or Long-acting insulin (LAI): HS (vial)

**Starting dose:** 0.3-0.5 units/kg/day; 2/3 as IAI/LAI; 1/3 as SAI

Glycemic Targets Not Met After 3-6 Months

## Intensive Insulin Therapy (IIT)—Physiologic Insulin Replacement<sup>2</sup>

### 1:1 basal:bolus ratio SQ

**Basal:** Intermediate-acting insulin (IAI) at ACB, ACS or HS (or QID) (pen/vial); or Long-acting insulin (LAI) at HS (vial)

**Bolus:** Short-acting insulin (SAI) at each meal (especially Lispro/Aspart) (pen/vial)

### Premeal insulin dose includes:

1. Insulin to cover carbohydrate ingested<sup>4</sup>
2. Additional insulin to correct for high SMBG (1 unit SAI lowers PG [mg/dL] by approximately 1500/TDI for Regular; 1800/TDI for Lispro/Aspart)

**Starting dose:** 0.3-0.5 units/kg/day

Follow A1c Every 3-6 months and Adjust Regimen to Maintain Glycemic Targets



TEXAS DIABETES COUNCIL  
Revised 07-24-03



TDH  
Stock # 45-11649

## ABBREVIATIONS

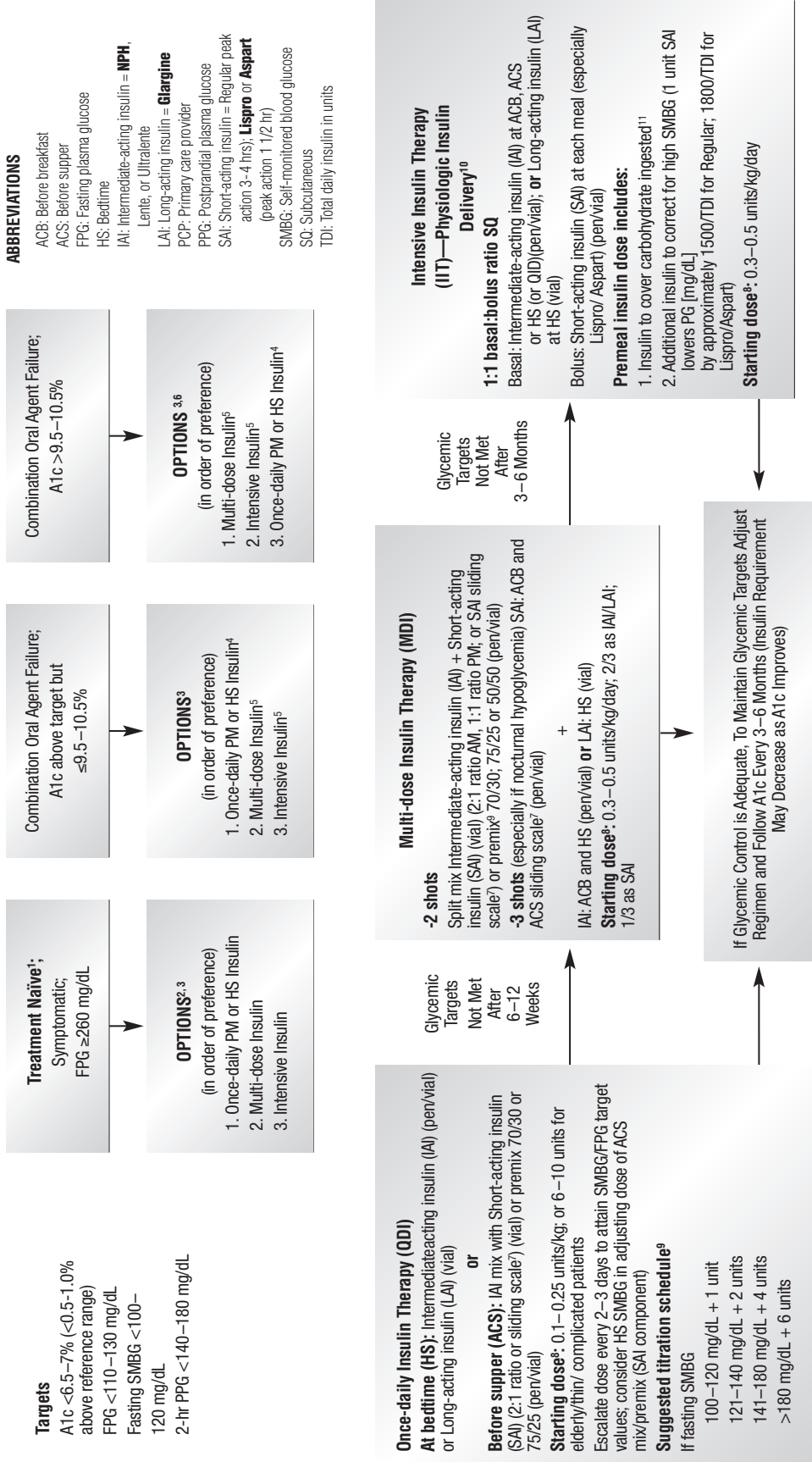
- ACB: Before breakfast
- ACS: Before supper
- FPG: Fasting plasma glucose
- HS: Bedtime
- IAI: Intermediate-acting insulin = **NPH**, Lente, or Ultralente
- LAI: Long-acting insulin = **Glargine**
- SAI: Short-acting insulin = Regular (peak action 3-4 hrs); **Lispro** or **Aspart** (peak action 1 1/2 hrs)
- SMBG: Self-monitored blood glucose
- TDI: Total daily insulin dosage in units

## Footnotes

1. Consider referring all type 1 patients to pediatric/adult endocrinologist/comprehensive diabetes specialty team
2. Most type 1 patients need IIT to attain glycemic targets; IIT may be by SQ injection or by insulin pump
3. ~1 unit for every 25-50 mg/dL above target SMBG; Regular insulin if used needs to be given 30-60 minutes AC meal
4. Dosages may differ in children and adolescents
5. Typical "carb" bolus = 1 unit SAI covers 500/TDI x g carbohydrate from meal; strongly recommend referral to Registered/Licensed Dietitian or Certified Diabetes Educator with experience in diabetes nutrition counseling

# Insulin Algorithm for Type 2 Diabetes Mellitus in Children and Adults<sup>1</sup>

**MEDICATIONS**



**ABBREVIATIONS**

- ACB: Before breakfast
- ACS: Before supper
- FPG: Fasting plasma glucose
- HS: Bedtime
- IA: Intermediate-acting insulin = **NPH**, Lente, or Ultralente
- LA: Long-acting insulin = **Glargine**
- PCP: Primary care provider
- PPG: Postprandial plasma glucose
- SAI: Short-acting insulin = Regular peak action 3–4 hrs); **Lispro Aspart** (peak action 1 1/2 hr)
- SMBG: Self-monitored blood glucose
- SQ: Subcutaneous
- TDI: Total daily insulin in units



TEXAS DIABETES COUNCIL  
 Revised 07/24-03



TDH  
 Stock #45-11647

**Footnotes**

- See Glycemic Control Algorithm for Type 2 Diabetes Mellitus in Children and Adults
- Consider simultaneous combination oral agent therapy
- Combining metformin with insulin therapy has been shown to result in less weight gain and better glycemic control with lower insulin requirements
- Continue combination oral agent therapy ± sulfonylurea
- Continue metformin (±3rd oral agent); probably discontinue sulfonylurea
- PCP may decide to “ease” patient with poor beta-cell reserve into insulin therapy initially with QDI
- 1, 2 units for every 50 mg/dL above target SMBG; Regular insulin to be given 30–60 minutes AC meal
- Doses may differ in children and adolescents; consider referral to pediatric endocrinologist/comprehensive diabetes specialty team
- Go lower and slower for thin/elderly/complicated patients
- Consider referral to pediatric/adult endocrinologist/diabetes specialty team (option—insulin pump)
- Typical “carb” bolus = 1 unit SA covers 5000/TDI x g carbohydrates from meal (~10–15 g); strongly recommend referral to Registered/Licensed Dietitian or Certified Diabetes Educator with experience in diabetes nutrition counseling

## *Hypoglycemia*

### **BLOOD GLUCOSE LESS THAN 70 mg/dl**

<b>Onset:</b>	Sudden	
<b>Symptoms:</b>	Shaky Tired/sleepy Grouchy/irritable Rapid heart beat Sweaty	Hungry Headache Poor concentration Numbness or tingling around mouth or tongue
<b>Causes:</b>	Delayed or missed meal Too much exercise Too much insulin/diabetes pill	
<b>Treatment:</b>	Eat a food containing 15 gm fast-acting carbohydrate (sugar) – 1/2 c. juice or regular soda                      6–7 hard candies 5 sugar cubes    3 glucose tablets 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, or 1 cup skim milk, or cheese and crackers.

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 MD if they have three episodes of hypoglycemia within a one-week period or if one episode results in loss of consciousness.

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

### **OBTAIN DIABETES EDUCATION**

## *Hyperglycemia*

### **BLOOD GLUCOSE MORE THAN 240 MG/DL**

<b>Onset:</b>	Can develop slowly, getting a little higher each day. Can develop quickly after a big meal or illness.	
<b>Symptoms:</b>	Thirstier than usual Urinary frequency Blurred vision Cuts/sores that heal slowly	Hungrier than usual More tired/sleepier than usual Dry, itchy skin
<b>Causes:</b>	Too much food Too little/no exercise	Not enough insulin/diabetes pill Infection/stress/illness
<b>Treatment:</b>	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 MD if blood sugars are averaging over 200 mg/dl for a week or more.

**PREVENTION:**    Follow meal plan  
                           Monitor blood glucose  
                           Regular exercise

### **OBTAIN DIABETES EDUCATION**



## *Vibrio vulnificus*

### FACT SHEET FOR HEALTH CARE PROVIDERS

#### Did you know...

Every year, millions of Americans eat raw molluscan shellfish—especially oysters and clams. However, for some people, eating raw or undercooked molluscan shellfish can cause serious illness or even death from *Vibrio vulnificus*.

#### What is it?

*Vibrio vulnificus* is a gram-negative bacterium and is considered the most serious of the vibrios found in brackish and salt water. This naturally occurring bacterium is not associated with bacteriological or chemical pollution in marine waters. It is found in filter-feeding shellfish, including oysters and clams, in higher concentrations during the warm weather months of April through October.

#### Who is at “high risk?”

Most healthy individuals are not at risk from *V. vulnificus* infections. Persons at “high risk” include those who have **liver disorders, hemochromatosis, or diabetes mellitus**. “High-risk” individuals also include those with other immunocompromising conditions such as AIDS or HIV infection, gastric disorders, inflammatory bowel disease, cancer, or steroid dependency.

#### How does infection occur?

Individuals become infected with *V. vulnificus* from eating raw or undercooked oysters or clams. Infection can also occur when cuts, burns, or sores come in contact with seawater containing *V. vulnificus*.

#### What types of illnesses result?

Infections with *V. vulnificus* are associated with three distinct clinical syndromes:

1. **Primary septicemia** occurs when food containing *V. vulnificus* is consumed, allowing the bacteria to invade the bloodstream. This illness is characterized by fever and chills and is usually accompanied by nausea, vomiting, and diarrhea. A sharp drop in blood pressure commonly occurs with possible outcomes of intractable shock and death. The majority of patients also develop painful skin lesions. Initially, the skin appears red with blisters quickly developing and eroding into necrotic ulcers.
2. Ingesting food containing *V. vulnificus* can also cause **gastroenteritis**. Patients with gastroenteritis have a relatively milder syndrome consisting of vomiting, diarrhea, and abdominal cramps. Patients with gastroenteritis may require hospitalization but rarely die.

3. *V. vulnificus* **wound infections** are acquired when skin lacerations and abrasions come in direct contact with seawater containing *V. vulnificus*. Additionally, wound infections can occur during acute, penetrating marine injuries. *V. vulnificus* wound infections typically begin with swelling, redness, and intense pain around the infected site. Fluid-filled blisters often develop and progress to tissue necrosis in a rapid and severe process resembling gas gangrene. Fifty percent of patients with *V. vulnificus* infected wounds require surgical debridement or amputation. In some patients, infection spreads to the blood stream, and in such cases, death commonly occurs.

### How is it diagnosed?

Although *V. vulnificus* infection is diagnosed by routine stool, wound, or blood cultures, laboratories should be notified when this infection is suspected so that a special growth medium can be used to increase the diagnostic yield.

### Treatment...

The mainstays of medical treatment for *V. vulnificus* infections are prompt antimicrobial therapy and supportive care. Tetracycline and intravenous doxycycline with ceftazidime have been recommended as the antibiotics of choice for *V. vulnificus* infections.

### Long-term consequences...

*V. vulnificus* infection is usually an acute illness in healthy persons, and those who recover should not expect long-term consequences. Infection in “high-risk” individuals often results in death. Those “high-risk” individuals who recover often develop necrosis that frequently requires skin grafting or limb amputation.

### Reducing risk of infection...

*V. vulnificus* infection case reviews have shown a median time period of 48 hours or less from hospital admission to death, which emphasizes the limited effectiveness of treatment and the importance of prevention.

Individuals at “high risk” should abstain from eating raw oysters or clams. *V. vulnificus* infections can be prevented by eating thoroughly cooked shellfish. *V. vulnificus* infections may also be prevented in individuals by avoiding contact of cuts, burns, or sores with marine waters.

### Recommendations for prevention...

- Provide “high-risk” patients, including those who are immunocompromised, with information regarding the risk of consuming raw oysters or clams. A copy of the brochure entitled “The Risk of Eating Raw Oysters Or Clams” may assist consumers in understanding their risk.
- Instruct “high-risk” patients to not eat raw oysters or clams.

*Developed by:* ISSC, Interstate Shellfish Sanitation Conference, 115 Atrium Way, Suite 117, Columbia, SC 29223, (803) 788-7559, FAX: (803) 788-7576, EMAIL: ISSC142@IBM.net

## *Chronic Complications of Diabetes*

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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.

### **Blindness**

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

### **Kidney disease**

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

### **Nervous system disease**

- About 60% to 70% of people with diabetes have mild to severe forms of nervous system damage. The results of such damage include loss of usual sensation or feeling pain in the feet or hands, slowed digestion of food in the stomach, carpal tunnel syndrome, sexual impotence, and other nerve problems.
- Severe forms of diabetic nerve disease increase the risk of lower-limb (toe, foot, or leg) amputations.

### **Amputations**

- More than half of nontraumatic lower-limb amputations in the United States occur among people with diabetes.
- Preventing amputations takes good blood sugar control, protective footwear (not walking around barefoot), daily inspections at home for cuts that a person might not feel, proper

nail trimming, foot checks at every doctor visit, and a foot exam for sensation at least yearly.

### 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 not higher than 130/80.
- 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.

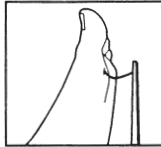


# Patient Foot Screening Form

Patient \_\_\_\_\_ Chart Number \_\_\_\_\_ Date \_\_\_\_\_

**Instructions:**

- The patient's lower extremity should be resting comfortably on a padded surface, with obstructed view of foot.
- After visual inspection, diagram dimensions of the following:  
 Callus :      Pre-Ulcer:   
 Ulcer:      Other:
- Instruct the patient to respond when a stimulus is felt by saying "touch" or "yes."
- Establish the patient's normal cutaneous sensation by testing with the 2.83 on the dorsal surface to the sites indicated below. Apply the monofilament with sufficient force to bend as illustrated. Apply the stimulus up to three times in the same location to elicit a response. A single response indicates normal sensitivity.
- Repeat the same process using the 3.61 monofilament on the plantar surface. Apply the stimulus to the sites shown (below).
- If the patient does not respond to the stimulus, choose the next largest monofilament. For filaments 4.31-6.65, only one stimulus is necessary.
- To maintain the patients attention during the test, intermittently move the monofilament to test areas known to have sensation.



- Record results using colored pencils that correspond to the colors on the filament handle, as noted in the chart.  
 • If only testing with the 5.07, follow instructions #1 and #2. Then apply the 5.07 to the test sites as shown in the diagram. Record results using a ✓ to indicate each area with sensation and an X for lack of sensation.

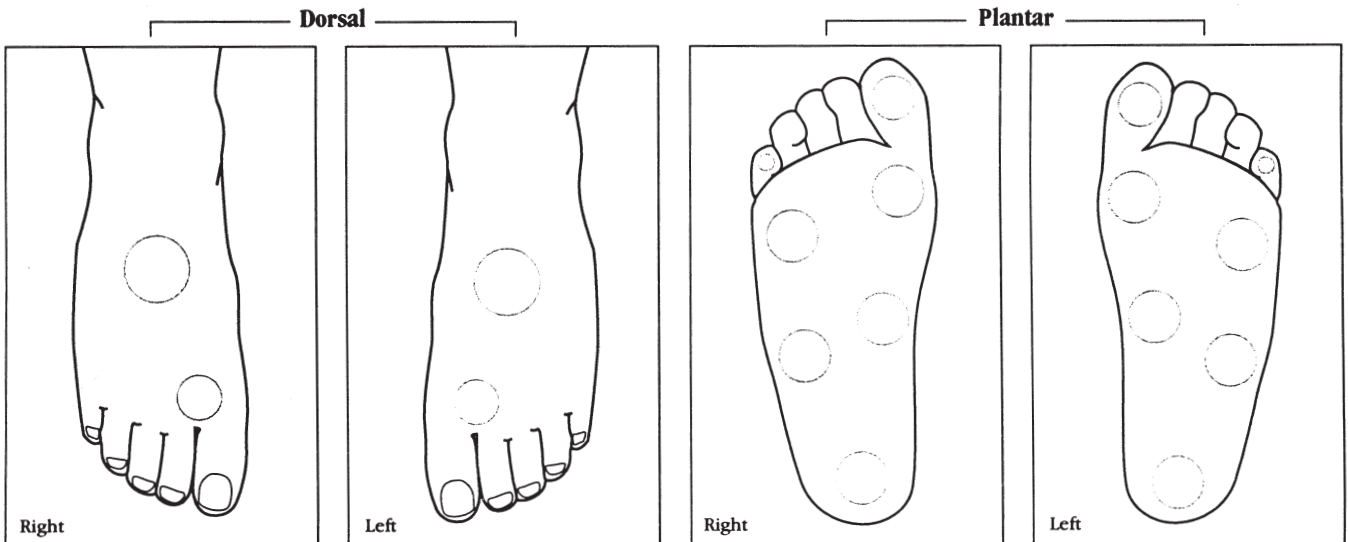
Circulatory Assessment- Temp: \_\_\_\_\_ Pulse: \_\_\_\_\_

**Assign Risk Category:**

- \_\_\_\_\_ 0 No loss of protective sensation, no deformity.  
**No Present Risk.**
  - \_\_\_\_\_ 1 No loss of protective sensation. Deformity present.  
**Impending Risk.**
  - \_\_\_\_\_ 2 Loss of protective sensation with or without weakness, deformity, callus, pre-ulcer or history of ulceration.  
**High Risk.**
- Adapted from the National Foot Treatment Center LEAP Program.

Source: Journal of Hand Therapy, April/June 1993, volume 6, no. 2: pages 114-123 and Military Medicine, December 1990, volume 155, no.12: pages 575-579.

Monofilament Size	Representation	Plantar Surface Threshold
2.83	Green	Normal (dorsal surface)
3.61	Blue	Normal
4.31	Purple	Diminished Light Touch
4.56	Red	Diminished Protective Sensation
5.07	Red	Loss of Protective Sensation
6.65	Red	Deep Pressure Sensation Only



**Instructions for Care**

Clean the monofilament handle with a damp sponge or cloth using mild soap. Monofilaments can be disinfected using a cold soak in an instrument disinfectant.

Evaluator \_\_\_\_\_

Suggested Billing Code: CPT 95926 Somatosensory Testing.

To order additional monofilaments or evaluation forms (Lower Extremity Form, NC12749), contact North Coast Medical at 800 821-9319












# Foot Screening Mapping Examples

## Touch-Test™ Sensory Evaluators

North Coast Medical, Inc.  
 18305 Sutter Boulevard  
 Morgan Hill, CA 95037-2845  
 800 821-9319  
 www.touch-test.com



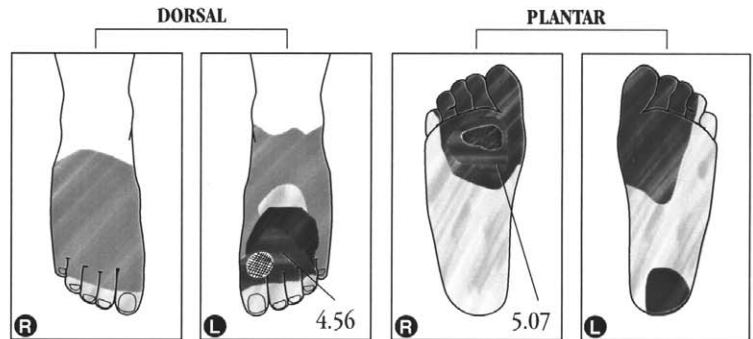
Key	Monofilament Size	Representation	Dorsal Surface Threshold	Plantar Surface Threshold
 Callus	2.83	 Green	Normal	Normal
 Pre-ulcer	3.61	 Blue	Diminished light touch	Normal
 Ulcer	4.31	 Purple	Diminished protective sensation	Diminished light touch
	4.56	 Red	Loss of protective sensation	Diminished protective sensation
	5.07	 Red	Loss of protective sensation	Loss of protective sensation
	6.65	 Red	Deep pressure sensation only	Deep pressure sensation only

### Initial Evaluation - Visit #1

RIGHT FOOT: Superficial ulcer on plantar surface over the second metatarsal head.

LEFT FOOT: Pre-ulcer proximal to the first dorsal web space.

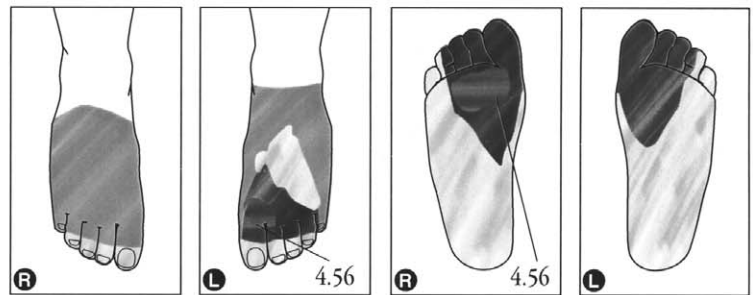
Patient education, treatment intervention and wound care management initiated.



### Re-evaluation - Visit #2

RIGHT FOOT: Ulcer healed. Improved to diminished protective sensation on plantar surface over the second metatarsal head.

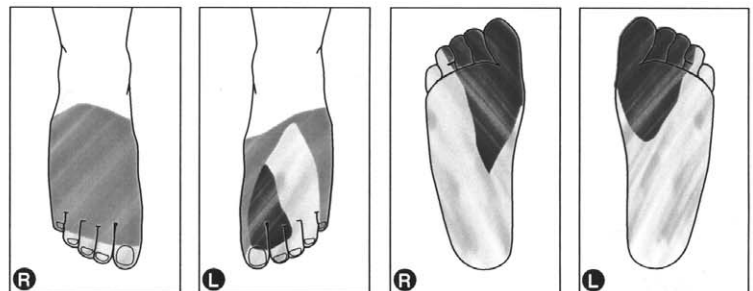
LEFT FOOT: Pre-ulcer healed. Loss of protective sensation proximal to the first dorsal web space.



### Re-evaluation - Visit #3

BOTH FEET: Diminished light touch sensation at toes and plantar surfaces.

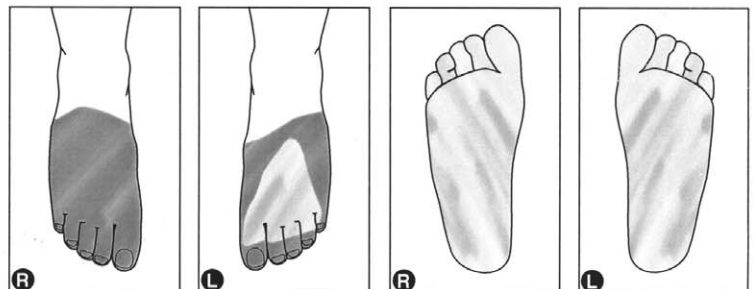
LEFT FOOT: Improved to diminished protective sensation proximal to the first dorsal web space.



### Re-evaluation - Visit #4

RIGHT FOOT: Normal throughout.

LEFT FOOT: Improved to diminished light touch ensation over dorsal web spaces.



## *Educating the Person with Diabetes*

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### **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*

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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.

## CONSIDERATIONS FOR ELDERLY PERSONS WITH DIABETES

More than 15% of persons ages 65-74 years are diagnosed with diabetes (CDC, 2000). More than 45% of Americans with diabetes are age 65 and older. Health care services for the elderly account for more than \$6 billion; more than 80% are due to hospitalizations. Treatment goals may be different and highly individualized. Diabetes is the second leading cause of blindness in persons over the age of 65, and it causes a threefold higher rate of non-traumatic lower extremity amputation in those older than 65 years of age.

### Physiologic Changes in Glucose Metabolism

The elderly are prone to glucose intolerance and thus are at higher risk for developing diabetes. Fasting Plasma Glucose increases 1-2mg/dl and the 2-hour postprandial glucose increases on average 8-20mg/dl per decade of age after the age of 30-40 years. The changes to glucose intolerance have been attributed to age-related defects, post receptor defects in insulin action with decrease in velocity of glucose transport and/or other post receptor defects. There is also a depletion of intracellular pool of transporters or a defect in insulin-mediated translocation to the plasma membrane, along with impairment of the intracellular glucose metabolism beyond the defect in transporters.

### Diagnostic Criteria

The diagnostic criteria and goals of therapy remain the same throughout the lifespan. The minimum level of plasma glucose required for diabetes-related complications is between 140-150mg/dl, thus the same criteria for diagnosis in younger adults with diabetes should be used with the elderly.

### Goals of Therapy

- Maintain quality of life by minimizing impact of this disease.
- Preserve functional capacity by preventing complications.
- Minimize risk of hypoglycemia.
- Meet realistic weight goals.
- In general:
  - Fasting glucose values <140 mg/dL
  - No glucose readings >200 mg/dL
- For frail elderly
  - No fasting or bedtime glucose < 100 mg/dL

### Acute Complications Are Common in the Elderly

- Increased frequency of infections (respiratory, skin, urinary). Foot infections can lead to amputations.
- Difficulty healing of breaks in the skin even without infection
- Hyperglycemic Hyperosmolar Nonketotic Syndrome
- DKA, not rare

**Atypical Presentation of Hyperglycemia in the Elderly**

- A vague sense of not feeling oneself.
- Electrolyte imbalance and dehydration (blunted sense of thirst).
- Incontinence (masking polyuria).
- Appetite loss (due to depression, GI disease, or drug side effects).
- Fatigue (“just getting old”) and gradual profound loss (unnoticed for months).

**Diabetes Symptoms Often Present Differently in Frail Elderly**

PATHOPHYSIOLOGIC STATE	TYPICAL PRESENTATION	COMMON PRESENTATION IN FRAIL ELDERLY
Hyperglycemia/ hyperosmolarity	Polydipsia	Impaired vision, confusion, dehydration
Catabolism due to lack of insulin	Polyphagia	Weight loss, anorexia
Increased urinary volume due to glucosuria	Polyuria	Incontinence

**Drugs That May Worsen Hyperglycemia in the Elderly**

- Glucocorticoids
- Thiazide diuretics particularly
- Phenytoin
- Lithium and Phenothiazines
- Estrogens
- Growth Hormone
- Isoniazid and Sympathomimetic agents
- Sugar-containing medications

**Altered Presentation of Hypoglycemia in the Elderly**

- Adrenergic symptoms: sweating, nervousness, tremor
- Neuroglycopenic symptoms: confusion

- Elderly lose the adrenergic symptoms (loss of autonomic nerve function) and have more profound neuroglycopenic symptoms than the young: reversible hemiparesis.
  - This occurs late in the course of hypoglycemia.

#### **Consequences of Severe Hypoglycemia:**

- Tissue damage in elderly patients with impaired cardiac and cerebral circulation and serious chronic neurological consequences
- Exacerbation of ischemic heart disease with anginal symptoms
- Injuries including fractures
- Death caused by hypoglycemia or its consequences

#### **Cause of Serious or Fatal Hypoglycemia**

- Skipping meals or not eating enough
- Error in dosage of sulfonylurea or insulin agents (10% of SFU-related hypoglycemia patients die)
- Excessive activity or exercising with a low blood sugar
- Alcohol abuse associated with skipped meals

#### **Contraindications of Tight Control in the Elderly**

- Dementia
- Autonomic nerve dysfunction
- Physical disability
- Social isolation or food restriction
- Chronic renal insufficiency
- Cirrhosis

Goal: Decrease hyperglycemic symptoms and prevent hyperosmolar state

#### **Monitoring in the Elderly**

- Most elderly incorrectly perform glucose and urine tests.
- Blood Glucose monitoring correlates to A1c and is better tool for titrating insulin.
- Assess Albuminuria to assess cardiovascular status and treat HTN/Lipids.
- Feet should be screened/treated vigorously.

## Medical Nutrition Therapy Goals and Points of Consideration

- Individualize dietary modifications. Consider preferences and household.
- Minimize unnecessary restrictions.
- Vitamin and mineral supplements may be indicated. Talk to physician prior to starting any supplement.
- Minimal weight loss for obese can be very effective. Limit intake of saturated and trans fats as much as possible. Fats should consist of less than 10% of the calories.
- Unless medically contradicted, encourage drinking 2 quarts of water per day.
- Recommend at least 20 grams of fiber per day to prevent constipation and reduce heart disease and cancer.
- Calcium intake should be encouraged. Those older than 70 years need 1,200 mg per day (32 ounces of milk equivalent).
- The recommended daily dose of Vitamin D and B-12 supplements for those over the age of 70 are 600 IU for Vitamin D and 2.4 micrograms for Vitamin B-12 (many elderly are unable to absorb Vitamin B-12 from food).
- Overdose of Vitamin A is more likely in the elderly, since Vitamin A is absorbed more readily and clears more slowly.
- Protein needs to make up greater part of elders' meal plans since they usually take in fewer calories.

## Exercise in Older Adults

- Consider risks and benefits of specific activities.
- Conduct pre-exercise evaluation (medical evaluation, ECG, exercise stress testing).
- Start with low intensity; slowly increase activity.
- Range-of-motion exercises, walking and swimming are great choices.
- Perform some light weight lifting (strength building).

## Diabetes-Associated Changes That Affect Teaching-Learning

- Sensory - (visual acuity, lens clarity, night vision, hearing)
  - Impaired seeing syringe marks, perceiving blue-tone colors, interpreting home glucose monitoring instruments
  - Impaired communication may lead to non-adherence
- Cognition - memory, complex psychomotor tasks
  - May need repetition or caretaker assistance



- May have difficulty with insulin administration (mixing insulins and injection, site rotation) and glucose monitoring
- Cutaneous - skin vibratory and thermal sensitivity, tactile sensitivity
  - Impaired ability to discern temperature and pressure
  - Potential for unawareness of burns and ischemia
  - Decreased manual dexterity for injections and glucose monitoring
- Urinary - decreased renal function, altered renal threshold for glucose
  - Potential for hypoglycemia, increasing drug half-life
  - Decreased utility of urine testing
- Gustatory, Olfactory - taste, smell
  - Reduced dietary adherence
- Gastrointestinal - thirst mechanism, motility, delayed gastric emptying
  - Altered dietary intake
  - Potential for hypoglycemia and dehydration
- Vestibular-Proprioceptive-Equilibrium - sense of bodily orientation
  - Vertigo and imbalance, potential for falls
  - Decreased motivation for exercise/activity
- Limit other medications that can increase risk of falls:
  - Drowsiness
  - Dizziness
  - Urinary or fecal problems

## *Statewide Organizations*

### **Children's Health Insurance Program in Texas (CHIP)**

<http://www.texcarepartnership.com>  
1-800-647-6558

In May 1999, Texas law authorized state agencies to develop a program to provide comprehensive health insurance to children (newborn through age 18) in families who earn too much to qualify for Medicaid but still cannot afford to buy health insurance. Families can apply for CHIP using a toll-free phone number or a mail application.

### **Medicaid Texas Department of Human Services**

Statewide: 1-800-252-8263

For information on Medicaid eligibility and coverage.

### **Children with Special Health Care Needs (formerly CIDC)**

1-800-252-8023  
or 1-800-422-2956 (Family Health Services)

Children with Special Health Care Needs (formerly CIDC) provides state-funded assistance for children with type 1 and type 2 diabetes.

### **Texas Lions Camp**

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

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

### **Youth Camps**

<http://www.diabetes.org>

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

### **Texas Diabetes Program/Council**

Texas Department of Health  
1100 West 49th Street  
Austin, Texas 78756  
(512) 458-7490  
<http://www.texasdiabetescouncil.org>

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



T E X A S   D I A B E T E S  
C O U N C I L

The Diabetes Council offers free education  
on the Web at:

[www.tdh.state.tx.us/diabetes/healthcare/  
conted.htm](http://www.tdh.state.tx.us/diabetes/healthcare/conted.htm)

## *National Organizations*

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### **American Association of Diabetes Educators**

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

### **American Diabetes Association**

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

### **American Dietetic Association**

216 West Jackson Blvd., Suite 800  
Chicago, Illinois 60606-6995  
1-800-745-0775

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

### **Centers for Disease Control and Prevention Division of Diabetes Translation**

4770 Buford Highway, NE, Mailstop K-10  
Atlanta, Georgia 30341  
1-877-CDC-DIAB (232-3422)  
<http://www.cdc.gov/diabetes>

### **Juvenile Diabetes Research Foundation International**

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

### **Medic Alert Foundation**

P.O. Box 819008  
Turlock, California 95381-1009  
1-800-ID-ALERT (432-5378)

For medical information jewelry and national  
registry service.

### **National Diabetes Information Clearinghouse**

1 Information Way  
Bethesda, Maryland 20892-3560  
(301) 654-3327  
1-800-GET LEVEL  
[ndic@info.niddk.nih.gov](mailto:ndic@info.niddk.nih.gov)  
<http://www.niddk.nih.gov>

## *Publications and Audiovisual Resources*

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

## *Books and Brochures*

### **Texas Diabetes Program/Council Texas Department of Health**

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

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

[www.texasdiabetescouncil.org](http://www.texasdiabetescouncil.org)

### **United States Department of Agriculture Food and Nutrition Information Center**

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

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

### **Weight-control Information Network**

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

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

## *Patient Magazines*

### **Practical Diabetology**

150 22nd Street  
New York, NY 10011

### **Diabetes Self-Management**

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

### **Voice of the Diabetic**

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

### **Diabetes Wellness Letter**

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

### **Diabetes Interview (monthly)**

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