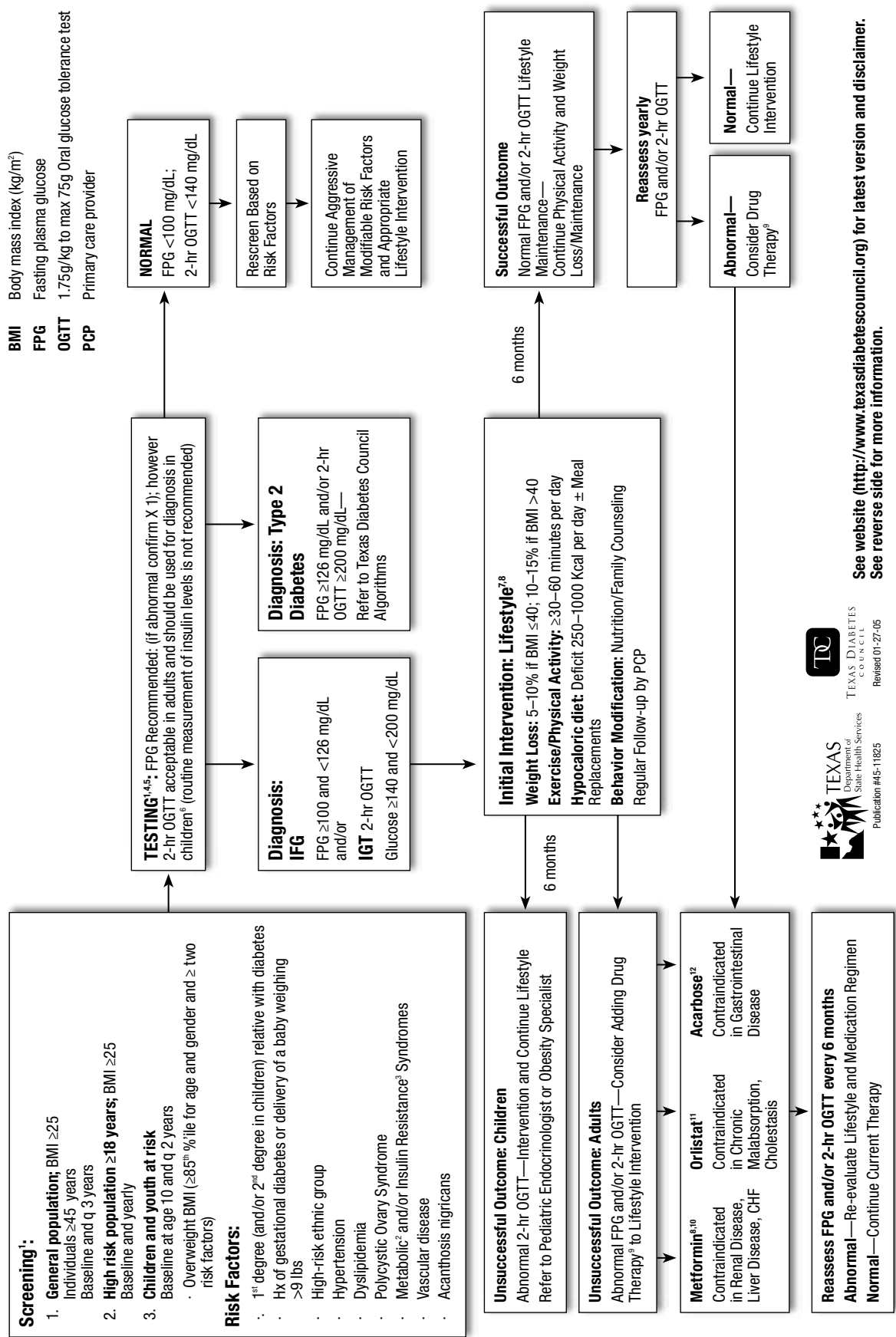# *Treatment Algorithms, Protocols, Guidelines, and Recommendations*

NOTE: the treatment algorithms are updated routinely. The most recent versions will appear online. Please be sure to use the most recent version by accessing the Texas Diabetes Council Web site at www.texasdiabetescouncil.org

Prevention and Delay of Type 2 Diabetes in Children and Adults with Impaired Fasting Glucose (IFG) and/or Impaired Glucose Tolerance (IGT)

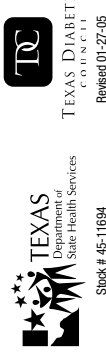**BMI** Body mass index (kg/m^2)
FPG Fasting plasma glucose
OGTT 1.75g/kg to max 75g Oral glucose tolerance test
PCP Primary care provider

Screening[1]:

1. **General population; BMI ≥25**
   Individuals ≥45 years
   Baseline and q 3 years

2. **High risk population ≥18 years; BMI ≥25**
   Baseline and yearly

3. **Children and youth at risk**
   Baseline at age 10 and q 2 years
   · Overweight BMI (≥85th %ile for age and gender and ≥ two risk factors)

Risk Factors:

· 1st degree (and/or 2nd degree in children) relative with diabetes
· Hx of gestational diabetes or delivery of a baby weighing >9 lbs
· High-risk ethnic group
· Hypertension
· Dyslipidemia
· Polycystic Ovary Syndrome
· Metabolic[2] and/or Insulin Resistance[3] Syndromes
· Vascular disease
· Acanthosis nigricans

TESTING[1,4,5]: FPG Recommended: (if abnormal confirm X 1); however 2-hr OGTT acceptable in adults and should be used for diagnosis in children[6] (routine measurement of insulin levels is not recommended)

NORMAL
FPG <100 mg/dL;
2-hr OGTT <140 mg/dL

Diagnosis: Type 2 Diabetes
FPG ≥126 mg/dL and/or 2-hr OGTT ≥200 mg/dL—
Refer to Texas Diabetes Council Algorithms

Diagnosis: IFG
FPG ≥100 and <126 mg/dL and/or
IGT 2-hr OGTT
Glucose ≥140 and <200 mg/dL

Rescreen Based on Risk Factors

Continue Aggressive Management of Modifiable Risk Factors and Appropriate Lifestyle Intervention

Initial Intervention: Lifestyle[7,8]
Weight Loss: 5–10% if BMI ≤40; 10–15% if BMI >40
Exercise/Physical Activity: ≥30–60 minutes per day
Hypocaloric diet: Deficit 250–1000 Kcal per day ± Meal Replacements
Behavior Modification: Nutrition/Family Counseling
Regular Follow-up by PCP

6 months

Successful Outcome
Normal FPG and/or 2-hr OGTT Lifestyle Maintenance—
Continue Physical Activity and Weight Loss/Maintenance

6 months

Reassess yearly
FPG and/or 2-hr OGTT

Normal—
Continue Lifestyle Intervention

Abnormal—
Consider Drug Therapy[9]

Unsuccessful Outcome: Children
Abnormal 2-hr OGTT—Intervention and Continue Lifestyle
Refer to Pediatric Endocrinologist or Obesity Specialist

6 months

Unsuccessful Outcome: Adults
Abnormal FPG and/or 2-hr OGTT—Consider Adding Drug Therapy[9] to Lifestyle Intervention

Metformin[8,10]	**Orlistat**[11]	**Acarbose**[12]
Contraindicated in Renal Disease, Liver Disease, CHF	Contraindicated in Chronic Malabsorption, Cholestasis	Contraindicated in Gastrointestinal Disease

Reassess FPG and/or 2-hr OGTT every 6 months
Abnormal—Re-evaluate Lifestyle and Medication Regimen
Normal—Continue Current Therapy

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TEXAS Department of State Health Services
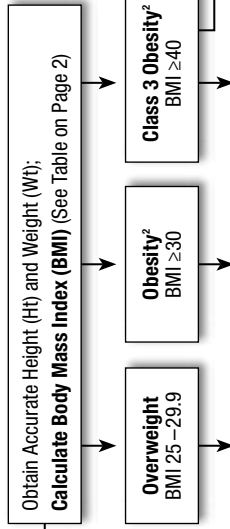Publication #45-11825   Revised 01-27-05

Footnotes:

1. American Diabetes Association: Clinical Practice Guidelines 2004. Screening for type 2 diabetes. *Diabetes Care*. 2004;27(suppl 1):S11-4; Diabetes Care. 2005;28(suppl 1):S4-S36.

2. National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III). *JAMA*. 2001;285(19):2486–97.

3. American College of Endocrinology position statement on the insulin resistance syndrome. *Endocr Pract*. 2003;9(3):237-52.

4. American Diabetes Association: Clinical Practice Guidelines 2004. The prevention or delay of type 2 diabetes. Diabetes Care. 2004;27(suppl 1):S47-54; *Diabetes Care*. 2005;28(suppl 1):S4-S36.

5. Edelstein SL, Knowler WC, Bain RP, et al. Predictors of progression from impaired glucose tolerance to NIDDM: an analysis of six prospective studies. *Diabetes*. 1997;46(4):701-10.

6. Sinha R, Fisch G, Teague B, et al. Prevalence of impaired glucose tolerance among children and adolescents with marked obesity. N Engl J Med. 2002;346(11):802-10. Erratum in: *N Engl J Med*. 2002;346(22):1756. Correction of dosage error in abstract.

7. See Texas Diabetes Council algorithms for treatment of exercise, weight loss, and nutrition.

8. Knowler WC, Barrett-Connor E, Fowler SE, et al. Diabetes Prevention Program Research Group. Reduction in the incidence of type 2 diabetes with lifestyle intervention or metformin. *N Engl J Med*. 2002;346(6):393-403 (dose of metformin 850 mg twice daily).

9. No medication is currently FDA-approved for prevention of type 2 diabetes in adults, but a number of studies provide evidence for drug treatment.

10. Metformin is as effective as lifestyle intervention in individuals <age 45 or those with BMI ≥35; metformin is nearly ineffective in individuals ≥age 60 or those with BMI <30 (DPP evidence).

11. Torgerson JS, Hauptman J, Boldrin MN, et al. XENical in the prevention of diabetes in obese subjects (XENDOS) study: a randomized study of orlistat as an adjunct to lifestyle changes for the prevention of type 2 diabetes in obese patients. *Diabetes Care*. 2004;27(1):155-61 (dose of orlistat 120 mg three times daily with food).

12. Chiasson JL, Josse RG, Gomis R, et al. Acarbose for prevention of type 2 diabetes mellitus: the STOP-NIDDM randomised trial. *Lancet*. 2002;359(9323):2072-7 (dose of acarbose 100 mg three times daily with food).

Weight Loss Algorithm for Overweight and Obese Adults[1]

TEXAS Department of State Health Services

Stock # 45-11694

TEXAS DIABETES COUNCIL

Revised 01-27-05

Obtain Accurate Height (Ht) and Weight (Wt);
Calculate Body Mass Index (BMI) (See Table on Page 2)

$$BMI = \frac{Wt\ in\ kg}{(Ht\ in\ m)^2}$$

$$= \frac{Wt\ in\ lb \times 703}{(Ht\ in\ inches)^2}$$

Normal
BMI 18.5−24.9

Reinforce Healthy Lifestyle, Diet, and Exercise

Overweight
BMI 25−29.9

Obesity[2]
BMI ≥30

Class 3 Obesity[2]
BMI ≥40

Assess Comorbidities and Risk Factors[3]
Metabolic[3] or Insulin Resistance[4] Syndromes; Waist Circumference (Men >40 inches; Women >35 inches);
Dyslipidemia[3] (Elevated LDL-C and/or TG; Low HDL-C); HTN[5];
Impaired Fasting Glucose (FPG 100−125 mg/dL); Impaired Glucose Tolerance (Post-challenge PG 140−199 mg/dL); Diabetes Mellitus[6]
(FPG ≥126 mg/dL; Post-challenge PG ≥200 mg/dL);
Coronary Heart or Other Vascular Disease (CVD; Sleep Apnea; DJD; GERD; Gallstones; NAFLD/NASH; Polycystic Ovary Syndrome;
Urinary Incontinence

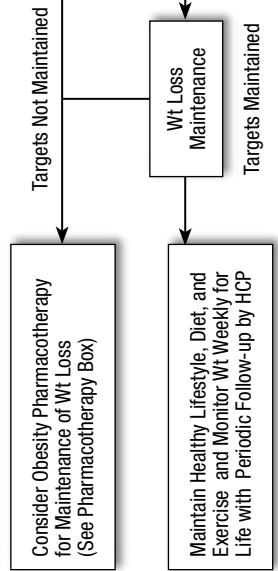**Consider Contributing Factors**
Drugs[7]
Hypothyroidism
Cushing Syndrome
Male Hypogonadism
Adult GH Deficiency

Offer Medically-Supervised Wt Loss Intervention[8]

Pt Motivated

Education;
Lifestyle Change−Hypocaloric Diet
(Deficit 250−1000 Kcal/d[9] ± Meal Replacements);
Exercise (≥30−60 minutes/day);
Behavior Modification; Nutrition/Family Counseling

Pt Not Motivated → **Educate; Manage Risk Factors Aggressively, and Reassess Readiness to Change Periodically**

3−6 months

Wt Loss Targets
2-3 unit Reduction in BMI
≥5-10% Reduction in Wt
(≥15% Wt Loss for Class 3 Obese Pts)
+ Significant Improvement in Comorbidities

Consider Obesity Pharmacologic Monotherapy as Adjunct to Lifestyle Changes if: BMI ≥27 with Comorbidities or if BMI ≥30

Pt Motivated and Adherent

Pt Not Motivated

Targets Not Met

Appetite Suppressants
Phentermine[10]
Contraindicated in: Uncontrolled HTN; CVD; Arrhythmia; Stroke; CHF; Hx; Substance Abuse; Glaucoma (Narrow-angle); Concurrent MAOI Rx

Sibutramine[11]
Contraindicated in: Uncontrolled HTN; Glaucoma (Narrow-angle);

Arrhythmia; Stroke; CVD; CHF; Concurrent SSRI & MAOI Therapy

Lipase Inhibitor Orlistat[11,12]
Supported by Evidence in Type 2 Diabetes Mellitus;
Contraindicated in: Chronic Malabsorption; Cholestasis; Orlistat Hypersensitivity; Concurrent Cyclosporin Therapy

Targets Met

Targets Not Met

If Unsuccessful in 4−12 Weeks (with Motivated/Adherent Pt), Consider Switching Drug Class or Using Combination Therapy[13]

6 months

Targets Maintained

Wt Loss Maintenance

Targets Not Maintained

Consider Obesity Pharmacotherapy for Maintenance of Wt Loss (See Pharmacotherapy Box)

Maintain Healthy Lifestyle, Diet, and Exercise and Monitor Wt Weekly for Life with Periodic Follow-up by HCP

Consider Referral for Bariatric Surgery[14] as Adjunct to Lifestyle Changes if BMI ≥35 with Comorbidities or if BMI ≥40

See website (http://www.texasdiabetescouncil.org) for latest version and disclaimer. See reverse side for more information.

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
MAOI	Monoamine Oxidase Inhibitors
NAFLD	Non-alcoholic Fatty Liver Disease
NASH	Non-alcoholic Steatohepatitis
SSRI	Selective Serotonin Reuptake Inhibitors
TG	Triglycerides

Footnotes:

[1] Adapted from NIH/NHLBI/NAASO;1998; NIH Publication No. 98-4083 (*Obes Res* 1998; 6[Suppl 2]:51S-210S)

[2] Consider starting obesity pharmacotherapy concurrent with other treatment modalities at presentation in motivated/adherent pts if BMI ≥35 with comorbidities or ≥40 with no comorbities

[3] National Cholesterol Education Program-Adult Treatment Panel III. *JAMA* 2001; 285:2466-2497

[4] American Association of Clinical Endocrinologists Consensus Conference on the Insulin Resistance Syndrome, Washington, DC; August 2002 (*Diabetes Care* 2003; 26:1297-1303)

[5] The 7th Report of the Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure (JNC 7). *JAMA* 2003; 289: 2560-2572

[6] 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

[7] Most antipsychotics, tricyclic antidepressants, lithium, valproic acid, carbamazepine, insulin/insulin analogs, sulfonylureas, thiazolidinediones, cyproheptidine, glucocorticoids, and estrogens/progestins may be associated with wt gain

[8] Assuming BMI ≥25 and/or waist circumference >40 inches in men, >35 inches in women, and one or more major comorbidity

[9] Calorie deficit of 250 Kcal/day will result in ~1/2 lb/week wt loss (1000 Kcal/day ~2 lb/week wt loss)

[10] FDA-approved for adjunctive short-term use ≤3 months for wt loss; see drug prescribing brochure; ~Cost–$0.85/30 mg pill (generic- AWP 2003)

[11] FDA-approved for use for up to 2 years for wt loss and maintenance of wt loss; see drug prescribing brochures; ~Cost–sibutramine $3.64/15 mg pill; orlistat $1.38/120 mg pill (AWP 2003)

[12] *Diabetes Care* 1998; 21:1288-1294; *Diabetes Care* 2002; 25:1033-1041; *Diabetes Care* 2002; 25:1123-1128

[13] Orlistat can be combined with the other agents; sibutramine and phentermine are not to be used in combination

[14] 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

HEIGHT (ft/in)	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	46	48	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	28	30	32	34	36	37	38	40	41	43	44	46	48	50	51	53	55	57	59
5'4"	21	22	24	26	27	29	31	33	34	36	38	39	41	43	45	46	48	50	51	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	48	50	52	53
5'7"	19	20	22	23	25	27	28	30	31	33	34	36	38	39	41	42	44	45	47	49	50	52
5'8"	18	20	21	23	24	26	27	29	30	32	33	35	36	38	40	41	43	44	46	47	49	50
5'9"	18	19	21	22	24	25	27	28	30	31	32	34	35	37	38	40	41	43	44	46	47	49
5'10"	17	19	20	22	23	24	26	27	29	30	32	33	34	36	37	39	40	42	43	44	46	47
5'11"	17	18	20	21	22	24	25	27	28	29	31	32	33	35	36	38	39	40	42	43	45	46
6'0"	16	18	19	20	22	23	24	26	27	28	30	31	33	34	35	37	38	39	41	42	43	45
6'1"	16	17	18	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	27	29	30	31	32	34	35	36	37	39	40	41
6'4"	15	16	17	18	19	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	28	30	31	32	33	34	36	37	38	39
6'6"	14	15	16	17	18	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	16	18	19	20	21	22	23	24	25	26	27	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

HEIGHT (ft/in)
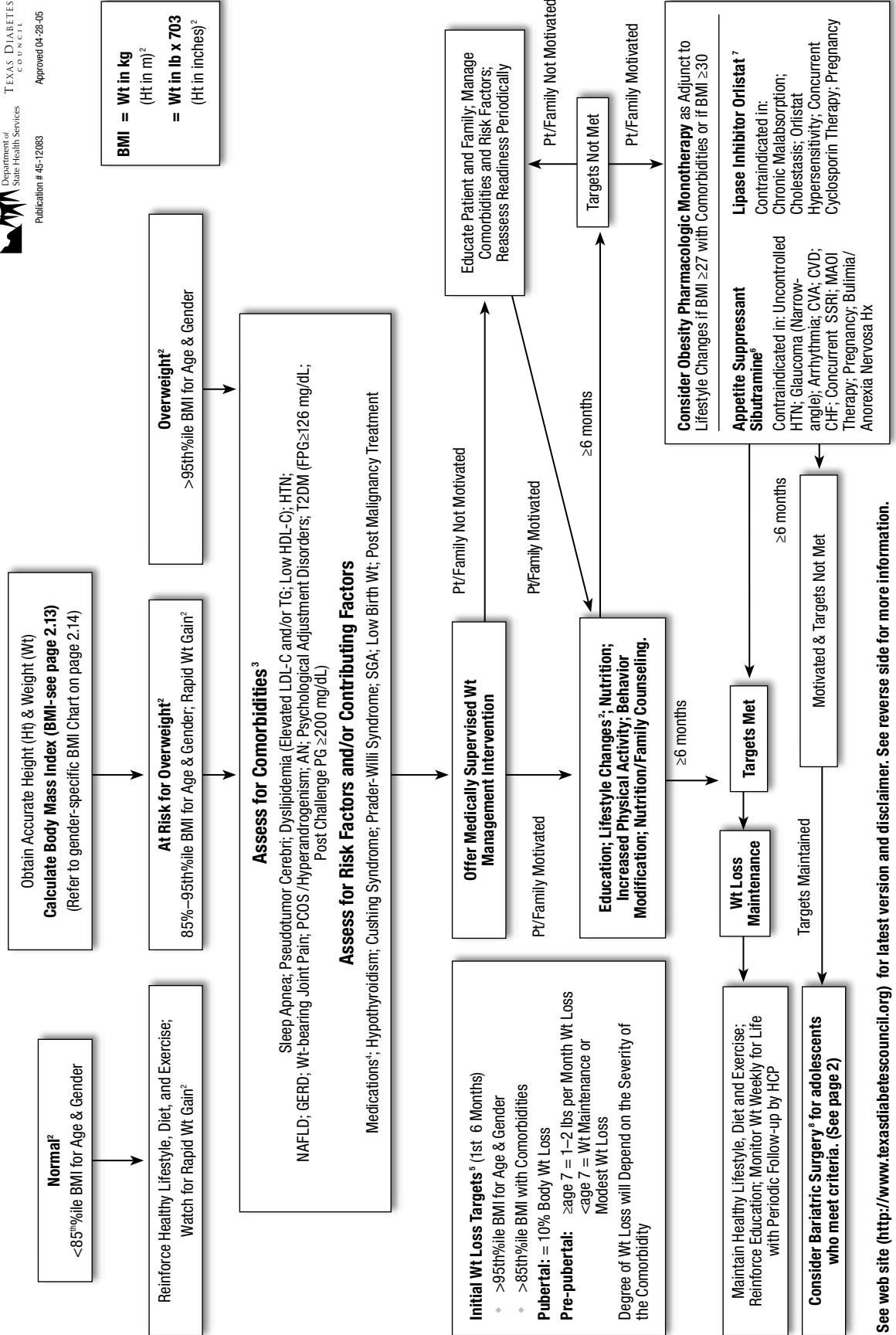
Less Risk → More Risk

Weight Management Algorithm for Overweight Children and Adolescents[1]

TDC
TEXAS DIABETES COUNCIL

TEXAS
Department of
State Health Services

Publication # 45-12083

Approved 04-28-05

$$BMI = \frac{Wt \text{ in kg}}{(Ht \text{ in m})^2}$$

$$= \frac{Wt \text{ in lb} \times 703}{(Ht \text{ in inches})^2}$$

Obtain Accurate Height (Ht) & Weight (Wt)
Calculate Body Mass Index (BMI–see page 2.13)
(Refer to gender-specific BMI Chart on page 2.14)

Normal[2]
<85th%ile BMI for Age & Gender

Reinforce Healthy Lifestyle, Diet, and Exercise;
Watch for Rapid Wt Gain[2]

At Risk for Overweight[2]
85%–95th%ile BMI for Age & Gender; Rapid Wt Gain[2]

Overweight[2]
>95th%ile BMI for Age & Gender

Assess for Comorbidities[3]

Sleep Apnea; Pseudotumor Cerebri; Dyslipidemia (Elevated LDL-C and/or TG; Low HDL-C); HTN;
NAFLD; GERD; Wt-bearing Joint Pain; PCOS /Hyperandrogenism; AN; Psychological Adjustment Disorders; T2DM (FPG≥126 mg/dL;
Post Challenge PG ≥200 mg/dL)

Assess for Risk Factors and/or Contributing Factors

Medications[4]; Hypothyroidism; Cushing Syndrome; Prader-Willi Syndrome; SGA; Low Birth Wt; Post Malignancy Treatment

Offer Medically Supervised Wt Management Intervention

Pt/Family Motivated

Pt/Family Not Motivated

Initial Wt Loss Targets[5] (1st 6 Months)
 ◆ >95th%ile BMI for Age & Gender
 ◆ >85th%ile BMI with Comorbidities
Pubertal: = 10% Body Wt Loss
Pre-pubertal: ≥age 7 = 1–2 lbs per Month Wt Loss
 <age 7 = Wt Maintenance or Modest Wt Loss
Degree of Wt Loss will Depend on the Severity of the Comorbidity

**Education; Lifestyle Changes[2]; Nutrition;
Increased Physical Activity; Behavior
Modification; Nutrition/Family Counseling.**

≥6 months

Pt/Family Motivated

Pt/Family Not Motivated

Educate Patient and Family; Manage
Comorbidities and Risk Factors;
Reassess Readiness Periodically

≥6 months

Targets Met

Wt Loss Maintenance

Targets Maintained

Maintain Healthy Lifestyle, Diet and Exercise;
Reinforce Education; Monitor Wt Weekly for Life
with Periodic Follow-up by HCP

**Consider Bariatric Surgery[8] for adolescents
who meet criteria. (See page 2)**

Motivated & Targets Not Met

≥6 months

Targets Not Met

Pt/Family Not Motivated

Pt/Family Motivated

Consider Obesity Pharmacologic Monotherapy as Adjunct to
Lifestyle Changes if BMI ≥27 with Comorbidities or if BMI ≥30

**Appetite Suppressant
Sibutramine[6]**
Contraindicated in: Uncontrolled
HTN; Glaucoma (Narrow-
angle); Arrhythmia; CVA; CVD;
CHF; Concurrent SSRI; MAOI
Therapy; Pregnancy; Bulimia/
Anorexia Nervosa Hx

Lipase Inhibitor Orlistat[7]
Contraindicated in:
Chronic Malabsorption;
Cholestasis; Orlistat
Hypersensitivity; Concurrent
Cyclosporin Therapy; Pregnancy

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

Abbreviations

AN: Acanthosis Nigricans

CHF: Congestive Heart Failure

CVA: Cerebrovascular Accident

CVD: Cardiovascular Disease

FPG: Fasting Plasma Glucose

GERD: Gastro-esophageal Reflux Disease

HCP: Health Care Professional

HDL-C: High-density Lipoprotein Cholesterol

HTN: Hypertension (>95th%ile Blood Pressure for Age & Gender & Ht)

LDL-C: Low-density Lipoprotein Cholesterol

MAOI: Monoamine Oxidase Inhibitors

NAFLD: Non-alcoholic Fatty Liver Disease

PCOS: Polycystic Ovary Syndrome

SGA: Small for Gestational Age

SSRI: Selective Serotonin Reuptake Inhibitors

T2DM: Type 2 Diabetes Mellitus

TG: Triglycerides

Criteria for Bariatric Surgery[8]

Adolescents being considered for bariatric surgery should:

- Have failed 6 months of organized attempts at wt management, as determined by their primary care provider

- Have attained or nearly attained physiologic maturity

- Be severely obese (BMI ≥40) with serious obesity-related comorbidities or BMI ≥50 with less severe comorbidities

- Demonstrate commitment to comprehensive medical and psychologic evaluations both before and after surgery

- Agree to avoid pregnancy for at least 1 yr postoperatively

- Be capable of and willing to adhere to nutritional guidelines postoperatively

- Provide informed consent to surgical treatment

- Demonstrate decisional capacity

- Have a supportive family environment

Footnotes:

1. Adapted from the Texas Council's *Weight Loss Algorithm for Overweight and Obese Adults*

2. Barlow SE, Dietz WH. Obesity evaluation and treatment: Expert Committee recommendations. The Maternal and Child Health Bureau, Health Resources and Services Administration and the Department of Health and Human Services. *Pediatrics*. 1998;102(3):E29

3. Barlow SE, Dietz WH. Obesity evaluation and treatment: Expert Committee recommendations. The Maternal and Child Health Bureau, Health Resources and Services Administration and the Department of Health and Human Services. *Pediatrics*. 1998;102(3):E29; and American Diabetes Association. Type 2 diabetes in children and adolescents. *Pediatrics*. 2000;105(3 Pt 1):671-80; Refer to appropriate

Texas Diabetes Council algorithms

4. **Medications that affect insulin sensitivity:**

   Inhaled steroids:

   - 1000 mcg/day fluticasone (Flovent)

   - 2000 mcg/day of all others

   Oral Steroids:

   - 20 days in previous year, or any within 60 days of screening

   - L-asparaginase

   - FK506 (Tacrolimus)

   - Cyclosporine (Neoral/Sandimmune)

   - Niacin

   Medications known to cause wt gain:

   - Risperidone (Risperdal)

   - Olanzapine (Zyprexa)

   - Clozapine (Clozaril)

   - Quetiapine (Seroquel)

   - Ziprasidone (Geodon)

   - Carbamazepine (Tegretol)

   - Valproic acid (Depakote/Depakene/Depacon)

   - Tricyclic Antidepressants

   - Lithium

   - Insulin/Insulin Analogs

   - Sulfonylureas

   - Cyproheptadine

   - Estrogens/Progestins

5. No evidence-based outcomes data are yet available for weight loss targets

6. Berkowitz RI, Wadden TA, Tershakovec AM, et al. Behavior therapy and sibutramine for the treatment of adolescent obesity: a randomized controlled trial. *JAMA*. 2003;289(14):1805-12; sibutramine is FDA-approved for ages ≥16 yr

7. McDuffie JR, Calis KA, Uwaifo GI, et al. Efficacy of orlistat as an adjunct to behavioral treatment in overweight African American and Caucasian adolescents with obesity-related co-morbid conditions. *J Pediatr Endocrinol Metab*. 2004;17(3):307-19; orlistat is FDA-approved for ages ≥12 yr

8. Inge TH, Krebs NF, Garcia VF, et al. Bariatric surgery for severely overweight adolescents: concerns and recommendations. *Pediatrics*. 2004;114(1):217-23

9. Rosner B, Prineas R, Loggie J, et al. Percentiles for body mass index in U.S. children 5 to 17 years of age. *J Pediatr*. 1998;132(2):211-22.
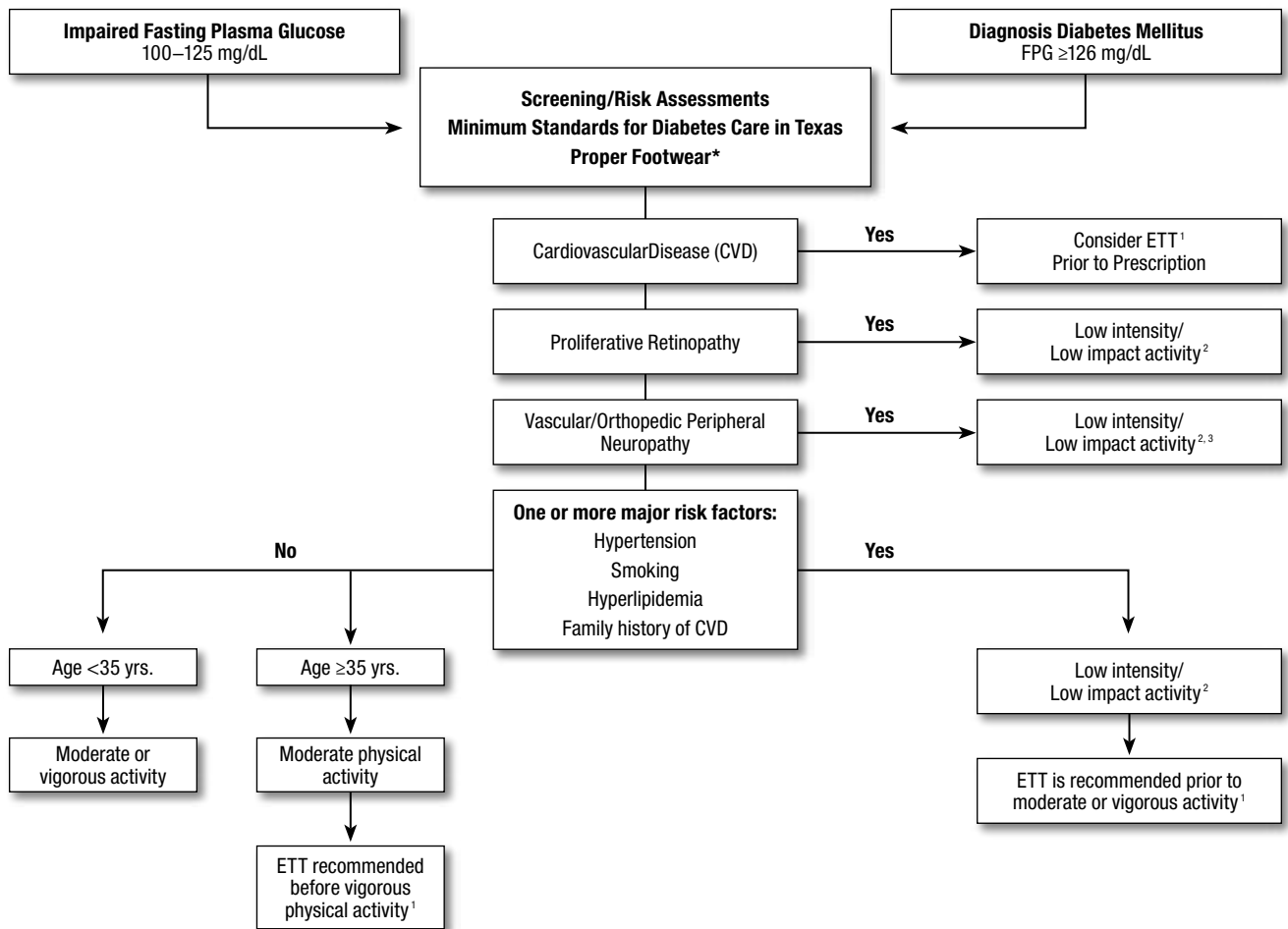
Additional References

Bobo N, Evert A, Gallivan J, et al. An update on type 2 diabetes in youth from the National Diabetes Education Program. *Pediatrics*. 2004;114(1):259-63

Garcia VF, Langford L, Inge TH. Application of laparoscopy for bariatric surgery in adolescents. *Curr Opin Pediatr*. 2003;15(3):248-55

Krebs NF, Jacobson MS; American Academy of Pediatrics Committee on Nutrition. Prevention of pediatric overweight and obesity. *Pediatrics*. 2003;112(2):424-30

APPENDIX. Weight table for different combinations of height (in ft) and BMI (kg/m²)

Height (in)										Weight (lb)								
58	24	26	28	29	31	33	35	37	39	43	42	44	46	48	50	52	54	55
59	25	27	29	31	33	35	37	41	41	45	45	47	49	51	52	57	58	58
35	27	29	31	33	35	37	39	41	43	45	47	49	51	53	55	57	59	62
52	28	30	32	35	—	—	41	45	47	47	50	52	54	63	55	—	—	62

| BMI (kg/m²) | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |

2 to 20 years: Girls
Body mass index-for-age percentiles

NAME _____ RECORD # _____

Date	Age	Weight	Stature	BMI*	Comments

*To Calculate BMI: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703

AGE (YEARS)

2 to 20 years: Boys
Body mass index-for-age percentiles

NAME _____ RECORD # _____

Date	Age	Weight	Stature	BMI*	Comments

*To Calculate BMI: Weight (kg) ÷ Stature (cm) ÷ Stature (cm) x 10,000
or Weight (lb) ÷ Stature (in) ÷ Stature (in) x 703

AGE (YEARS)

Exercise Algorithm
Type 2 Diabetes Prevention & Therapy

| **Impaired Fasting Plasma Glucose** 100–125 mg/dL | | **Diagnosis Diabetes Mellitus** FPG ≥126 mg/dL |

Screening/Risk Assessments
Minimum Standards for Diabetes Care in Texas
Proper Footwear*

| CardiovascularDisease (CVD) | **Yes** → | Consider ETT [1] Prior to Prescription |

| Proliferative Retinopathy | **Yes** → | Low intensity/ Low impact activity [2] |

| Vascular/Orthopedic Peripheral Neuropathy | **Yes** → | Low intensity/ Low impact activity [2, 3] |

One or more major risk factors:
Hypertension
Smoking
Hyperlipidemia
Family history of CVD

No ← / → **Yes**

| Age <35 yrs. | Age ≥35 yrs. | | Low intensity/ Low impact activity [2] |

| Moderate or vigorous activity | Moderate physical activity | | ETT is recommended prior to moderate or vigorous activity [1] |

ETT recommended before vigorous physical activity [1]

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[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 web site (http://www.texasdiabetescouncil.org) for latest version and disclaimer. See reverse side for more information.

TEXAS Department of State Health Services

TEXAS DIABETES COUNCIL

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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

Nutrition Recommendations and Interventions for Diabetes

Medical nutrition therapy (MNT) is important in preventing diabetes, managing existing diabetes, and preventing, or at least slowing, the rate of development of diabetes complications. It is an integral component of diabetes self-management education (or training). The following recommendations and interventions are evidence-based.

The goal of these recommendations is to make people with diabetes and health care providers aware of beneficial nutrition interventions. This requires the use of the best available scientific evidence while taking into account treatment goals, strategies to attain such goals, and changes individuals with diabetes are willing and able to make. Achieving nutrition-related goals requires a coordinated team effort that includes the person with diabetes and involves him or her in the decision-making process. It is recommended that a registered dietitian, knowledgeable and skilled in MNT, be the team member who plays the leading role in providing nutrition care. However, it is important that all team members, including physicians, certified diabetes educators, nurses, pharmacists and other providers, be knowledgeable about MNT and support its implementation.

Goals: At risk for diabetes or with pre-diabetes

1) To decrease the risk of diabetes and cardiovascular disease (CVD) by promoting healthy food choices and physical activity leading to moderate weight loss that is maintained.

Goals: Individuals with diabetes

1) Achieve and maintain

   · Blood glucose levels in the normal range or as close to normal as is safely possible

   · A lipid and lipoprotein profile that reduces the risk for cardiovascular disease

   · Blood pressure levels in the normal range, less than 130/80

2) To prevent, or at least slow, the rate of developing complications of diabetes by modifying nutrient intake and lifestyle

3) To address individual nutrition needs, taking into account personal and cultural preferences and willingness to change

4) To maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence

Goals: Specific Situations

1) For youth with type 1 diabetes, youth with type 2 diabetes, pregnant and lactating women, and older adults with diabetes, to meet the nutritional needs of these unique times in the life cycle.

2) For individuals treated with insulin or insulin secretagogues, to provide self-management training for safe conduct of physical activity, including the prevention and treatment of hypoglycemia and diabetes treatment during acute illness.

EFFECTIVENESS of Medical Nutrition Therapy

Recommendations

◆ Individuals who have pre-diabetes or diabetes should receive Individualized MNT; such therapy is best provided by a registered dietitian familiar with the components of diabetes MNT.

◆ Nutrition counseling should be sensitive to the personal needs, willingness to change, and ability to make changes of the individual with pre-diabetes or diabetes.

Reference: *Diabetes Care*. 2007 Jan;30 Suppl 1:S48-65.

A. Nutrition Guidelines

1. Stress consistent timing of meals, snacks, and portion control. Review the number of servings needed per meal and snacks.

2. Eat a variety of foods every day including fruits and vegetables.

3. Achieve or maintain a desirable weight.

4. Reduce total calories if overweight or obese to lose weight.

5. Read nutrition facts labels.

6. Eat foods high in fiber (whole grain products, vegetables, raw fruit, beans, and legumes).

7. Eat the least amount of saturated fats and trans fats.

B. Carbohydrate (CHO) Intake

Low carbohydrate diets, restricting total CHO to less than 130 grams per day, are not recommended.

1. Total grams of carbohydrate should be individualized based on glucose control, medication and physical activity.

2. Consume more complex (unrefined) carbohydrates with fiber.

3. Eat 2 servings of fruits each day, preferably with lunch and dinner. One serving equals: ½ c. canned fruit or juice, or 1 c. fresh fruit. Avoid juices (except when hypoglycemic) which may cause the blood glucose to rise 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 non-starchy vegetables each day. One serving equals: ½ c. cooked vegetable, ½ c. vegetable juice, or 1 c. raw vegetable.

5. Other CHO choices include: 1 tortilla, 1 slice of bread, 1/3 c. cooked pasta, rice, garbanzo beans, ½ c corn, peas, potatoes, beans, or 6 saltine crackers. Limit CHO choices to 2–3 per meal.

6. Sucrose containing foods can be substituted for other CHO choices in the meal plan, if added to the meal plan.

C. Fiber Intake

1. Eat 14 grams per 1,000 calories. Example: 22 grams for 1,500 calories, 28 grams for 2,000 calories a day.

2. Major sources: raw fruits, unpeeled vegetables, beans, legumes, whole grain breads, pastas, and fiber-rich cereals (≥ 5 grams per serving).

D. Protein Intake

1. 15-20% of total calories per day; approximately 4-6 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 early nephropathy. Restrict to 0.8gram protein/kg of body weight for adults with onset of later stages of nephropathy

3. One serving is: 1 oz. lean beef, chicken, turkey, pork, lamb or fish, 1 c. skim milk, yogurt, 1 oz. cheese, 1 egg, 1 T. peanut butter

4. Adjustments should be made for conditions such as renal failure, hypertension, or hyperlipidemia.

E. Fat Intake

1. Limit dietary cholesterol to less than 200 mg per day

2. Limit saturated fat to less than 7% of total calories per day

   Sources: Animal fats (found in fatty meats, poultry skin, hydrogenated shortenings and fats, some vegetable oils (coconut, palm, palm kernel, cocoa butter), whole milk, whole milk products, butter, and most commercially baked products.

3. Minimum intake of trans fatty acids (found in most commercially baked products)

4. Use more mono-unsaturated fats, i.e., olive oil and poly-unsaturated fats, i.e., canola or corn oils.

5. Two or more servings of fish per week (with the exception of commercially fried filets)

F. Alcohol (Use with doctor's approval)

1. Limited to a moderate amount (less than 1 drink per day for adult women and less than 2 drinks per day for adult men).

2. One drink is: 1.5 oz. distilled spirits, 5 oz. wine or 12 oz. beer.

3. Food should be consumed with alcoholic beverages to prevent hypoglycemia.

G. Reduced Calorie Sweeteners

Nonnutritive Sweeteners:

1. Acesulfame potassium

2. Aspartame

3. Neotame

4. Saccharin

5. Sucralose

Nutritive Sweeteners:

1. Glucose, dextrose, corn syrup

2. Fructose (fruit sugar), molasses, lactose

3. Honey, raw honey, invert sugar

4. Maltose, malted syrup, dextrin

Sugar Alcohols (Polyols):

1. Erythritol, isomalt, lactitol, maltitol, mannitol, sorbitol, xylitol, tagatose, and hydrogenated starch hydrolysates.

H. Sodium

- In normotensive and hypertensive individuals, a reduced sodium intake (e.g., 2,300 mg per day with a diet high in fruits, vegetables, and low-fat dairy products lowers blood pressure.

- Individuals with diabetes at risk for CVD, diets high in fruits, vegetables, whole grains, and nuts may reduce the risk.

- Individuals with diabetes and symptomatic heart failure, dietary sodium intake of <2,000 mg. per day may reduce symptoms.

- In most individuals, a modest amount of weight loss beneficially affects blood pressure.

- Choose low-sodium foods: fresh or frozen vegetables (avoid regular canned foods) and powdered seasonings with sodium (avoid onion and garlic salt). Avoid salty sauces such as soy sauce. Eat less fast food and convenience foods, these foods contain high levels of sodium.

Diabetes Medical Nutrition Therapy and Prevention Algorithm

A1C	Glycosylated Hemoglobin A1C	**LDL-C** Low Density Lipoprotein Cholesterol
BMI	Body Mass Index	
BP	Blood Pressure	**PCP** Primary Care Provider
CHO	Carbohydrates	
IFG	Impaired Fasting Glucose	**PP** Postprandial
		TG Triglycerides
IGT	Impaired Glucose Tolerance	

IFG: Fasting glucose 100–125 mg/dL;
IGT: Post challenge glucose >140–199 mg/dL

Diabetes Mellitus
Fasting glucose ≥126 mg/dL;
2 hr. PP ≥200 mg/dL

Medical Nutrition Therapy
by Registered/Licensed Dietitian or Certified Diabetes Educator with Experience in Diabetes Nutrition Counseling

Individual Nutrition Assessment
BMI, Waist Circumference, Medical History, Lab Values, Diet History, Lifestyle, Physical Activity, Readiness to Change

Interventions

- **Self-monitored blood glucose**
- **Increase physical activity (Refer to Exercise Algorithm)**
- **Meal plan** [1]
  Distribute food throughout the day to avoid large concentrations of calories or carbohydrates that cause postprandial glucose elevations

Not Recommended: <130g CHO (~9 servings/day).

Recommended: 45-65% of Kcal from CHO
  Individualized meals and snacks to include healthy food choices.
  ↑ dietary fiber intake to 25–35 g/day
- **Incorporate other needed diet modifications with diabetes meal plan**
- **Promote weight loss, if needed** [2]
- **Set individualized goals to meet patient needs.**

Fasting glucose >110 mg/dL;
2-hr PP ≥140–180 mg/dL
Refer to Glycemic Control Algorithm

Overweight/Obesity [2]
BMI >25

Set weight loss goals
5–7% weight loss
minimum

Evaluate total calories from fat and CHO
If excessive, ↓ Kcal from CHO and/or fat, (especially from saturated fat) by 500-1000 Kcal below usual daily intake

TG [3]
>150 mg/dL

Decrease total CHO intake
↑ monounsaturated fats
↑ Omega-3 fatty acids
PCP to follow Lipid Algorithm

If TG >500 mg/dL,
↓ fat calories to <15% total calories

LDL-C
>100 mg/dL [3]

Saturated fat <7%
Chol intake < 200 mg/day
↑ monounsaturated fats
↑ soluble fiber
to 10–25 g/day
↓ trans fats

BP >130/80 mmHg [4]
Proteinuric >125/75 mmHg restrict protein to 0.8–1g/kg

Sodium Restriction
< 2.3 g/day,
If ≥ age 50, ≤ 1.5 g/day [5]

Monitor glucose (SMBG), A1C, weight, lipids, and blood pressure. Adjust food portions and distribution with medication and activity to achieve metabolic goals.

Follow-up Evaluation

Monitor glucose (SMBG), A1C, weight, lipids, and blood pressure. Modify meal plan as needed to achieve metabolic goals.

If metabolic targets are not met within 1–3 months, evaluate nutrition care plan, re-educate and review goals;
verify patient follow-up with PCP/healthcare provider for drug therapy (per Glycemic Control Algorithm)

Footnotes
1. *Diabetes Care*. 2006 Jan, 29 (suppl 1): S11-S14, *Diabetes Care*. 2004;27 (suppl 1):S36–S46; S55–7.
2. Refer to Weight Loss Algorithm.
3. Refer to Lipid Algorithm.
4. Refer to Hypertension Algorithm. See web site (http://www. texasdiabescouncil.org) for latest version and disclaimer.
5. Dietary Guidelines for Americans, 2005. Available online at http://www.health.gov/dietaryguidelines/dga2005/document/html/chapter8.htm. Accessed on April 21, 2006.
† This test requires the use of a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water. 2-hr post-challenge glucose.

TEXAS
Department of State Health Services

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TEXAS DIABETES COUNCIL

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Glycemic Control Algorithm for Type 2 Diabetes Mellitus in Children[1] and Adults

Initial Monotherapy Options:
- Metformin [1,7]
- TZDs
- Sulfonylureas [7]
- Insulin (See Insulin Algorithm)[2]

Other Monotherapy Options:
- Non-Sulfonylurea Secretogues — Nateglinide or Repaglinide
- Alpha-Glucosidase Inhibitors — Acarbose or Miglitol

Dual Therapy Options:
- Sulfonylurea + Metformin[7]
- Metformin + TZD
- Sulfonylurea or Metformin + Exenatide

Other Combination Options:
- Insulin (See Insulin Algorithm)[2]
- Non-Sulfonylurea Secretogues — Nateglinide or Repaglinide
- Alpha-Glucosidase Inhibitors — Acarbose or Miglitol

Definitions:
TZD Thiazolidinedione — Pioglitazone or Rosiglitazone
SMBG Self-Monitored Blood Glucose
PP Postprandial

Initial Intervention [2-4]
Diabetes Education, Medical Nutrition and Exercise [5]

FPG/SMBG/PP Targets Not Met After 1 Month

Begin Monotherapy or Dual Therapy [4,6]

Dual Therapy →

Monotherapy →

Targets Not Met After 3 Months
Begin Dual Therapy

Dual Therapy →

Targets Met
A1c every 3–6 months

Targets Met
Continue Therapy
A1c every 3–6 months

Targets Met
Continue Therapy
A1c every 3–6 months

Targets Not Met After 3–6 Months

Add 3rd oral agent or Exenatide if A1c <8.5%;
OR
Add insulin for any A1c >target
(See Insulin Algorithm); Consider referral to endocrinologist.

Targets
A1C ≤6.5%
Fasting SMBG ≤110 mg/dL
2-hr PP SMBG ≤140–180 mg/dL

Footnotes:

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

2. See Insulin Algorithm for Type 2 Diabetes Mellitus in Children and Adults.

3. If initial presentation with glucose ≥260 mg/dL in a symptomatic patient, consider insulin or insulin analog as initial intervention, probably with dual therapy.

4. Monotherapy with sulfonylurea or metformin does not sustain A1c reductions (UKPDS study); dual therapy certainly indicated if initial glucose ≥210 mg/dL or A1C ≥9.0%.

5. These interventions should be maintained life-long; see Medical Nutrition, Weight Loss, and Exercise Algorithms.

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

7. Sulfonylureas and metformin are the most studied and least expensive oral diabetes agents; glipizide ER and glimepiride have lower incidence of hypoglycemia than glyburide.

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Stock # 45-11265   Revised 04-27-06

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Metformin + Thiazolidinedione

Pioglitazone:
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Nateglinide or Repaglinide + Thiazolidinedione

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Fonseca V, Grunberger G, Gupta S, et al. Addition of nateglinide to rosiglitazone monotherapy suppresses mealtime hyperglycemia and improves overall glycemic control. *Diabetes Care*. 2003;26(6):1685-90.

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Triple Therapy

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Sulfonylurea + Metformin + Thiazolidinedione:
Dailey GE 3rd, Noor MA, Park JS, et al. Glycemic control with glyburide/metformin tablets in combination with rosiglitazone in patients with type 2 diabetes: a randomized, double-blind trial. *Am J Med*. 2004;116(4):223-9.

Aljabri K, Kozak SE, Thompson DM. Addition of pioglitazone or bedtime insulin to maximal doses of sulfonylurea and metformin in type 2 diabetes patients with poor glucose control: a prospective, randomized trial. *Am J Med*. 2004;116(4):230-5.

Sulfonylurea + Metformin + Exenatide
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Hypertension Algorithm for Diabetes in Adults

Assess Blood Pressure[1] (BP)
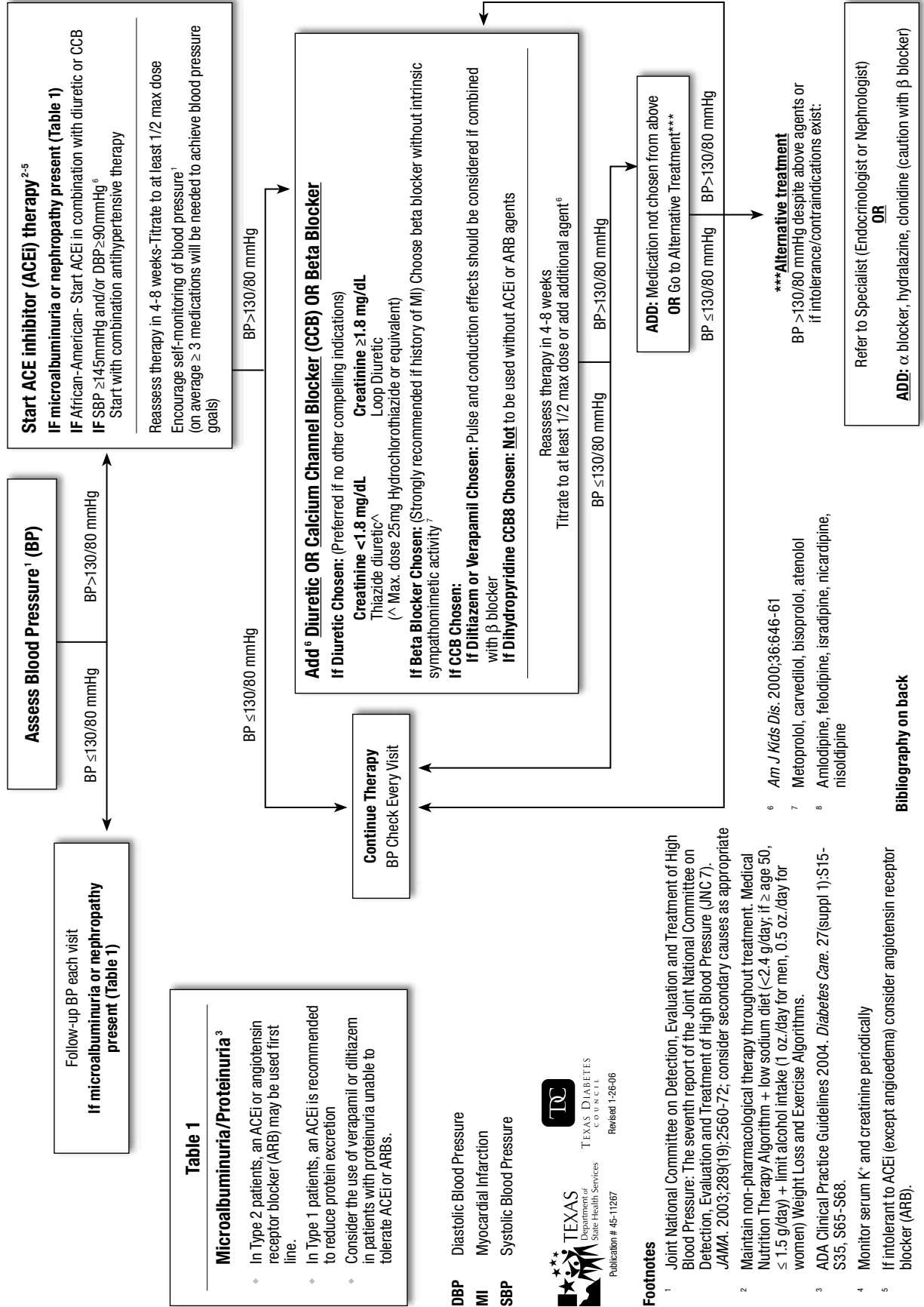
BP ≤130/80 mmHg   BP>130/80 mmHg

Follow-up BP each visit
If microalbuminuria or nephropathy present (Table 1)

BP ≤130/80 mmHg

Start ACE inhibitor (ACEi) therapy[2-5]
If microalbuminuria or nephropathy present (Table 1)
If African-American- Start ACEi in combination with diuretic or CCB
If SBP ≥145mmHg and/or DBP ≥90mmHg[6]
   Start with combination antihypertensive therapy

Reassess therapy in 4-8 weeks-Titrate to at least 1/2 max dose
Encourage self-monitoring of blood pressure[1]
(on average ≥ 3 medications will be needed to achieve blood pressure goals)

BP>130/80 mmHg

Add[6] Diuretic OR Calcium Channel Blocker (CCB) OR Beta Blocker
If Diuretic Chosen: (Preferred if no other compelling indications)

Creatinine <1.8 mg/dL	Creatinine ≥1.8 mg/dL
Thiazide diuretic^	Loop Diuretic
(^ Max. dose 25mg Hydrochlorothiazide or equivalent)	

If Beta Blocker Chosen: (Strongly recommended if history of MI) Choose beta blocker without intrinsic sympathomimetic activity[7]
If CCB Chosen:
  If Diltiazem or Verapamil Chosen: Pulse and conduction effects should be considered if combined with β blocker
  If Dihydropyridine CCB8 Chosen: Not to be used without ACEi or ARB agents

Reassess therapy in 4-8 weeks
Titrate to at least 1/2 max dose or add additional agent[6]

BP ≤130/80 mmHg   BP>130/80 mmHg

ADD: Medication not chosen from above
OR Go to Alternative Treatment***

BP ≤130/80 mmHg   BP>130/80 mmHg

***Alternative treatment**
BP >130/80 mmHg despite above agents or if intolerance/contraindications exist:

Refer to Specialist (Endocrinologist or Nephrologist)
OR
ADD: α blocker, hydralazine, clonidine (caution with β blocker)

Continue Therapy
BP Check Every Visit

Table 1

Microalbuminuria/Proteinuria[3]

- In Type 2 patients, an ACEi or angiotensin receptor blocker (ARB) may be used first line.
- In Type 1 patients, an ACEi is recommended to reduce protein excretion
- Consider the use of verapamil or diltiazem in patients with proteinuria unable to tolerate ACEi or ARBs.

DBP Diastolic Blood Pressure
MI Myocardial Infarction
SBP Systolic Blood Pressure

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Department of State Health Services

Publication # 45-11267   Revised 1-26-06

Footnotes

1 Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure: The seventh report of the Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure (JNC 7). *JAMA*. 2003;289(19):2560-72; consider secondary causes as appropriate

2 Maintain non-pharmacological therapy throughout treatment. Medical Nutrition Therapy Algorithm + low sodium diet (<2.4 g/day; if ≥ age 50, ≤ 1.5 g/day) + limit alcohol intake (1 oz./day for men, 0.5 oz./day for women) Weight Loss and Exercise Algorithms.

3 ADA Clinical Practice Guidelines 2004. *Diabetes Care*. 27(suppl 1);S15-S35, S65-S68.

4 Monitor serum K+ and creatinine periodically

5 If intolerant to ACEi (except angioedema) consider angiotensin receptor blocker (ARB).

6 *Am J Kids Dis*. 2000;36:646-61

7 Metoprolol, carvedilol, bisoprolol, atenolol

8 Amlodipine, felodipine, isradipine, nicardipine, nisoldipine

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Verapamil or Diltiazem

Hansson L, Hedner T, Lund-Johansen P, et al. Randomized trial of effects of calcium antagonists compared with diuretics and beta-blockers on cardiovascular morbidity and mortality in hypertension. NORDIL. *Lancet* 356:359–65, 2000

Bakris GL, Copley JB, Vicknair N, et al. Calcium channel blockers versus other antihypertensive therapies on progression of NIDDM associated nephropathy. *Kidney Int* 50:1641–50, 1996

Dihydropyridine calcium channel blockers

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Dahlof B, Sever P, Poulter N, et al. Prevention of cardiovascular events with an antihypertensive regimen of amlodipine adding perindopril as required versus atenolol adding bendroflumethiazide as required, in the Anglo-Scandinavian Cardiac Outcomes Trial-Blood Pressure Lowering Arm (ASCOT-BPLA): a multicentre randomised controlled trial. Lancet 366: 895-906, 2005

Estacio RO, Jeffers BW, Hiatt WR, et al. The effect of nisoldipine as compared

with enalapril on cardiovascular outcomes in patients with non-insulin-dependent diabetes and hypertension. *N Engl J Med* 338:645–52, 1998

Alpha-Blockers

Major cardiovascular events in hypertensive patients randomized to doxazosin vs chlorthalidone. (ALLHAT Data) *JAMA* 283:1967–75, 2000

Blood Pressure Goal <130/80

American Diabetes Association: Clinical Practice Recommendations 2004. *Diabetes Care* 27 (suppl 1):S15-S35; S65-S67, 2004

Hansson L, Zanchetti A, Carruthers SG, et al. Effects of intensive blood-pressure lowering and low-dose aspirin in patients with hypertension: principal results of the Hypertension Optimal Treatment (HOT) randomised trial. *Lancet* 351:1755–62, 1998

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Urine Protein Excretion >1 gram/24 hour BP goal <125/75

Peterson JC, Adler S, Burkart JM, et al. Blood pressure control, proteinuria, and the progression of renal disease. The Modification of Diet in Renal Disease Study. *Ann Intern Med* 123:754–62, 1995

Angiotensin Receptor Blockers

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African Americans

Wright JT, Dunn JK, Cutler JA, et al. Outcomes in hypertensive black and nonblack patients treated with chlorthalidone, amlodipine, and lisinopril. *JAMA* 293:1595-1607, 2005

Wright JT, Bakris G, Greene T, et al. Effect of blood pressure lowering and antihypertensive drug class on progression of hypertensive kidney disease: results from the AASK Trial. *JAMA* 288:2421-31, 2002

Lipid Treatment Algorithm for Type 1 and Type 2 Diabetes in Adults [1]

FLP Goals:
LDL-C <100 mg/dL [1]
LDL-C <70 mg/dL [2]
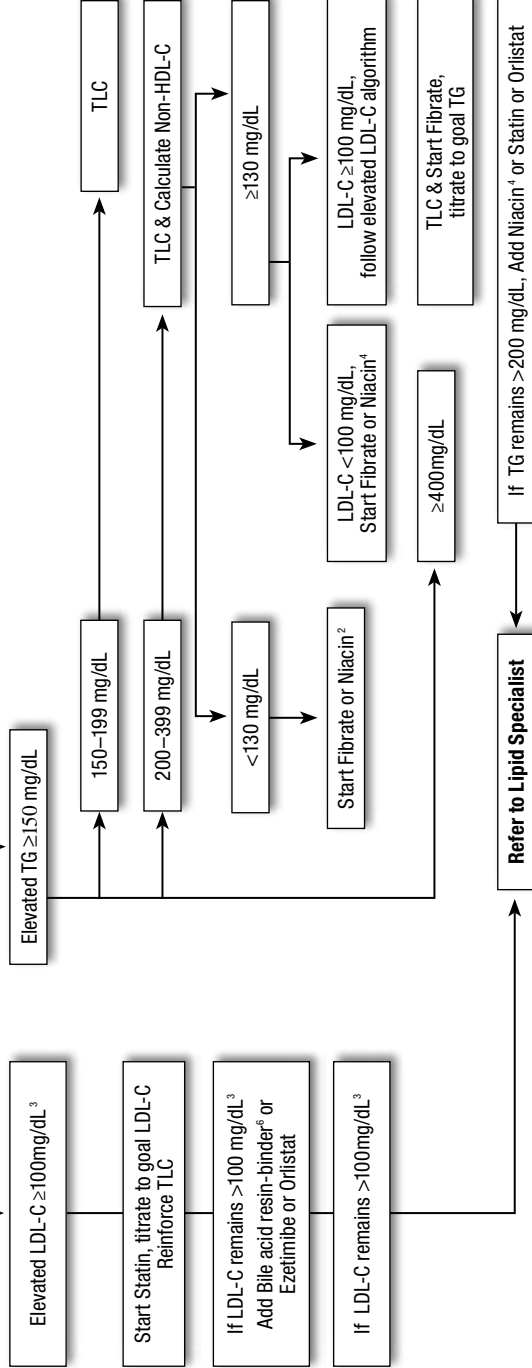HDL-C ≥40 mg/dL
TG <150 mg/dL

Legend
TLC — Therapeutic Lifestyle Changes (refer to TDC Medical Nutrition, Weight Loss, and Exercise Algorithms)
Statin — HMG Co-A Reductase Inhibitor [5]
TG — Triglycerides
Non-HDL-C — TChol minus HDL-C

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

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

Consider Fibrate, Niacin [4], or Statin

Elevated TG ≥150 mg/dL

Elevated LDL-C ≥100mg/dL [3]

Start Statin, titrate to goal LDL-C
Reinforce TLC

If LDL-C remains >100 mg/dL [3]
Add Bile acid resin-binder [6] or Ezetimibe or Orlistat

If LDL-C remains >100mg/dL [3]

150–199 mg/dL → TLC

200–399 mg/dL → TLC & Calculate Non-HDL-C

<130 mg/dL → Start Fibrate or Niacin [2]

≥130 mg/dL → LDL-C ≥100 mg/dL, follow elevated LDL-C algorithm

LDL-C <100 mg/dL, Start Fibrate or Niacin [4]

≥400mg/dL → TLC & Start Fibrate, titrate to goal TG

Refer to Lipid Specialist

If TG remains >200 mg/dL, Add Niacin [4] or Statin or Orlistat

[1] Consider statin therapy in all diabetics >age 40 with total cholesterol ≥135 mg/dL to achieve an LDL-C reduction of ~30% (**and** LDL-C <100 mg/dL) irrespective of initial LDL-C levels (Heart Protection Study. *Lancet* 361:2005-16; 2003).

[2] LDL-C goal is <70 mg/dl for the very high risk person: i.e., diabetes plus known heart disease such as acute coronary syndrome, or a history of previous cardiovascular events such as MI, CVA, etc. or UKPDS 10-yr event risk >20% (**http://www.dtu.ox.ac.uk/riskengine**).

[3] or LDL-C ≥70 mg/dL in the very high risk person.

[4] 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 CPK as soon as possible.

[5] See reverse side for more information.

[6] If TG <200 mg/dL.

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

FLUVASTATIN	PRAVASTATIN	LOVASTATIN	SIMVASTATIN	ATORVASTATIN	ROSUVASTATIN	LDL (%) ↓
20 mg	10 mg	10mg	—	—	—	15–20
40 mg	20 mg	20mg	5–10mg	—	—	21–29
80 mg	40–80mg	40 mg	20mg	10mg	—	30–38
—	—	80 mg	40mg	20mg	5–10mg	39–47
—	—	—	80mg	40mg	20mg	48–54
—	—	—	—	80mg	40mg	>55

Jones P, Kafonek S, Laurora I, et al. Comparative dose efficacy study of atorvastatin versus simvastatin, pravastatin, lovastatin, and fluvastatin in patients with hypercholesterolemia (the CURVES study) *Am J Cardiol*. 1998;81(5):582-7.

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* **Footnote:** This information is not based on head to head comparisons.

Adapted from: National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel IlI) *JAMA* 2001;285(19):2466-97.

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Effect of Niacin on Lipid and Lipoprotein Levels and Glycemic Control in Patients with Diabetes and Peripheral Arterial Disease (The ADMIT Study: A Randomized Trial) *JAMA* 2000; 284 (10):1263-70.

Macrovascular Risk Reduction in Diabetes: Antiplatelet Therapy

People with diabetes have a 2 to 4 fold higher risk of dying from cardiovascular disease. People with diabetes have a complex procoagulant state, which contributes to the increased risk of atherosclerotic events. Antiplatelet therapy is a simple intervention that can reduce the risk of events in this high-risk population. NHANES III data shows that 27% of people with diabetes are eligible for secondary prevention strategies, while an additional 71% had at least one risk factor for atherosclerotic disease. Thus, basically all persons with diabetes are candidates for antiplatelet therapy, yet only 13% of eligible patients were currently taking aspirin.[1, 2]

Recommendations:

1. People with diabetes who are age 30 or above should be offered aspirin therapy if no contraindications exist to therapy.

2. Dose: 75 to 325mg daily. An enteric-coated product may be used to minimize gastrointestinal side effects

3. If an aspirin allergy is present, clopidogrel may be recommended (75mg/day) for secondary prevention. Currently, no primary prevention trials in people with diabetes have been conducted. In primary prevention patients with multiple risk factors, the risk, benefit, and cost of clopidrogrel must be considered.

Do not use antiplatelet therapy in people with:

1. Bleeding tendency

2. Anticoagulant therapy

3. Recent gastrointestinal bleeding

4. Clinically active hepatic disease

5. Patients at risk of Reye's syndrome

Combination Therapy:

In people with diabetes who have an event on aspirin, aspirin resistance may play a role.[3]

1. The CURE trial used combination therapy with aspirin 75mg to 325mg and clopidogrel 75mg every day. Though over 22% of the patients enrolled had diabetes, the relative risk of an event in subjects with diabetes was not reduced significantly by the combination.

2. No benefit has been shown with the addition of warfarin to aspirin therapy [4]

SUMMARY OF THE MAJOR STUDIES
FOR USE OF ANTIPLATELET THERAPY IN PEOPLE WITH DIABETES

Secondary Prevention

1. Anti-platelet Trialists'

Antiplatelet Trialists' Collaboration: Collaborative overview of randomised trials of antiplatelet therapy, I: Prevention of death, myocardial infarction, and stroke by prolonged antiplatelet therapy in various categories of patients. *BMJ* 308:81-106, 1994

    a.   Meta-analysis of 145 prospective controlled trials of antiplatelet therapy

    b.   Risk reduction of 38±12 vascular events per 1000 diabetics treated (p<0.02)

    c.   Placebo rate of events 22.3%, reduced to 18.5% on doses of 75mg to 325mg a day

2. Early Treatment of Diabetic Retinopathy Study (ETDRS)

ETDRS Investigators: Aspirin effects on mortality and morbidity in patients with diabetes mellitus. *JAMA* 268:1292-1300, 1992

    a.   Mixed group of primary and secondary prevention in 3711 diabetics

    b.   Dose: 650mg/day or placebo

    c.   Results: 9.1% had myocardial infarction (MI) on aspirin vs. 12.3% on placebo

    d.   No increase in retinal bleeding was seen on serial eye exams

3. Hypertension Optimal Treatment (HOT)

Hansson L, Zanchetti A, Carruthers SG, et al: Effects of intensive blood-pressure lowering and low-dose aspirin in patients with hypertension: Principal results of the Hypertension Optimal Treatment (HOT) randomised trial. *Lancet* 351:1755- 1762, 1998

    a.   Mixed primary and secondary prevention trial in hypertensive type 2 diabetics

    b.   1501 diabetics enrolled in study for average of 3.8 years follow-up

    c.   Dose: 75mg or placebo

    d.   Results: 15% reduction in pooled cardiovascular events (p=0.03), and a 36% reduction in the risk of MI (p=0.002)

4. Clopidogrel versus Aspirin in Patients at Risk of Ischemic Events (CAPRIE)

    a.   19185 persons with recent atherosclerotic event randomized to clopidogrel or aspirin

    b.   Dose: clopidogrel 75mg every day, aspirin 325mg every day

    c.   5.32% risk of ischemic stroke, MI, or vascular death with clopidogrel vs. 5.83% for aspirin (p=0.043)

    d.   Post-hoc subset analysis of 3866 subjects diagnosed with diabetes by intake questionnaire from investigator[5]

e. Composite outcome endpoint was: vascular death, MI, stroke, or hospitalization for angina or bleeding event.

f. Event rate was 15.6% vs. 17.7%/ year (p=0.042), for clopidrogrel and aspirin respectively. No significant difference in individual outcomes.

g. Would need to treat approximately 47 individuals with clopidrogrel instead of aspirin to reduce one event.

5. Effects of Clopidogrel in Addition to Aspirin in Patients with Acute Coronary

Syndromes without ST-Segment Elevation. The Clopidogrel in Unstable Angina to Prevent Recurrent Events Trial Investigators (CURE) *N Eng J Med* 345:494-502, 2001

a. 12, 562 subjects who presented to the hospital with an acute coronary syndrome within 24 hours of symptoms

b. Given aspirin 75mg to 325mg every day plus one time dose of clopidogrel 300mg, followed by 75mg every day vs. aspirin alone

c. Results: In 2849 subjects who had diabetes, the combination group experienced a 14.2% event rate vs. 16.75% in the aspirin alone group.

d. Though the relative risk favored addition of clopidogrel, the reduction was not significant

6. Ticlopidine in Microangiopathy of Diabetes (TIMAD)

TIMAD Study Group: Ticlopidine treatment reduces the progression of nonproliferative diabetic retinopathy. Arch Ophthalmol 108:1577-1583, 1990

a. 435 diabetic with nonproliferative diabetic retinopathy

b. ticlopidine 250 mg two times a day or placebo

c. followed up to 3 years

d. fluorescein angiograms of eyes done

e. Reduction in progression of retinopathy by 67% (p=0.03) in ticlopidine group vs. placebo

f. Side effects limit usefulness: 2-3% experience neutropenia, serial CBC's must be followed for a minimum of 3 months

Primary Prevention

1. Physician's Health Study

Steering Committee of the Physicians' Health Study Research Group: Final report on the aspirin component of the ongoing Physicians' Health Study. *N Engl J Med* 321:129-135, 1989

a. Dose: 325mg every other day or placebo

b. 22, 071 participants followed for approximately 5 years, 533 had diabetes

c. Outcome: myocardial infarction in 11/275 (4.0%) on aspirin vs. 26/258 on placebo (10.0%). Relative risk = 0.39 (significance not reported)

References:

1. Rolka DB, Fagot-Campagna A, Narayan KM: Aspirin use among adults with diabetes: Estimates from the Third National Health and Nutrition Examination Survey. *Diabetes Care* 24:197-201, 2001

2. American Diabetes Association. Position Statement. Aspirin Therapy in Diabetes. Diabetes Care. 25:S78-S79, 2002; *Diabetes Care*. 2004 Jan;27 Suppl 1:S72-3.

3. Gum PA, Kottke-Marchan K, Poggio ED, et al. Profile and prevalence of aspirin resistance in patients with cardiovascular disease. *Am J Cardiol* 88:230-5, 2001

4. Fiore LD, Ezekowitz MD, Rophy MT, et al. Department of veterans affairs cooperative studies program clinical trial comparing combined warfarin and aspirin with aspirin alone in survivors of acute myocardial infarction: primary results of the CHAMP study. *Circulation* 105:557-563, 2002

5. Cannon CP. CAPRIE Investigators. Effectiveness of clopidrogrel versus aspirin in preventing acute myocardial infarction in patients with symptomatic atherothrombosis (CAPRIE trial). *American Journal of Cardiology* 90(7):760-2;2002

Insulin Algorithm for Type 1 Diabetes[1] in Children and Adults

ABBREVIATIONS

BASAL: Glargine or Detemir

BOLUS (Prandial):

Reg: Regular Insulin (peak action 3-4 hrs)

RAI: Rapid Acting Insulin = Aspart, Glulisine, or Lispro (peak action 1-1 ½ hrs)

PPG: Post-Prandial Glucose

SMBG: Self-monitored blood glucose[2]

TDI: Total daily insulin dosage in units

Targets

A1c ≤6.5%

Fasting SMBG[2] <110 mg/dL

2-hr PPG SMBG <140-180 mg/dL

Individualization is recommended for those with chronic disease or other comorbidities associated with high risk for hypoglycemic events, especially younger children† and elderly.

† American Diabetes Association Clinical Practice Recommendations 2006, Diabetes Care 2006:29(suppl 1):S27.

Split-Mix Insulin Therapies[3]

1. NPH + Reg or RAI

   2:1 ratio AM; 1:1 ratio PM

2. AM: NPH + Reg or RAI

   PM: Reg or RAI

   HS: NPH

   2/3 TDI ÷ as 2/3 AM NPH + 1/3 as Reg or RAI

   1/3 TDI ÷ as ½ PM Reg or RAI + ½ NPH at HS

3. Premix[9]

   2/3 AM + 1/3 PM

Total Daily Insulin*: 0.3-0.5 units/kg/day, and titrate to glycemic targets

OR

Intensive Insulin Therapy (IIT) – Physiologic Insulin

1:1 basal:bolus ratio SQ

Basal: Glargine QD or Detemir QD-BID[5,8]

Bolus: RAI (or Reg) before each meal: If meal skipped, skip dose.

Premeal insulin dose includes:

1. Insulin to cover carbohydrate ingested[6], 1 unit RAI covers 500/TDI grams carbohydrate from meal

2. Additional insulin to correct for high SMBG; 1 unit RAI lowers PG by approximately 1800/TDI mg/dL. (Reg lowers PG by ~1500/TDI)

3. Consider adjustment for exercise[7]

Total Daily Insulin*: 0.3-0.5 units/kg/day and titrate to glycemic targets

Pramlintide[1,8]
Consider as adjunct therapy to insulin in patients unable to stabilize PPG.

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

Footnotes

1. **Consider referring all type 1 patients to pediatric/adult endocrinologist/comprehensive diabetes specialty team and consider continuous glucose monitoring.** If insulin pump therapy is considered - refer to Certified Pump Trainer.

2. Modern glucose meters give values corrected to plasma glucose.

3. Most type 1 patients need IIT to attain glycemic targets; IIT may be by SQ multiple injection or by SQ continuous insulin pump.

4. Dosages may differ in children and adolescents

5. Twice daily dosing may be required at low basal insulin doses.

6. Strongly recommend referral to Registered/Licensed Dietitian or Certified Diabetes Educator with experience in diabetes nutrition counseling.

7. Consider decreasing 1 unit for every 30 minutes of vigorous physical activity.

8. **IMPORTANT:** See package insert for dosing

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Insulin Algorithm for Type 2 Diabetes in Children[1] and Adults

ABBREVIATIONS

ACB: Before breakfast
ACS: Before supper
FPG: Fasting plasma glucose
HS: Bedtime
LAI: Long-acting insulin = **Glargine**
PCP: Primary care provider
PPG: Postprandial plasma glucose
SAI: Short-acting insulin = Regular (peak action 3–4 hrs); **Lispro** or **Aspart** (peak action 1½ hr)
SMBG: Self-monitored blood glucose
SQ: Subcutaneous
TDI: Total daily insulin in units

Targets*
A1c ≤6.5%
FPG/SMBG ≤110 mg/dL
2-hr PPG/SMBG ≤140–180 mg/dL

* Individualization is recommended for those with chronic diseases or other comorbidities associated with high risk for hypoglycemic events, especially younger children[1] and elderly.

[1] American Diabetes Association. Clinical Practice Recommendations 2005. *Diabetes Care.* 2005;28(suppl 1): S22.

Treatment Naïve[1]:
Symptomatic; FPG ≥260 mg/dL in adults or A1c ≥10%, ketoacidosis or recent rapid wt loss in children

OPTIONS [2,3]
(in order of preference)
1. Once-daily Insulin
2. Multi-dose Insulin (pediatric)
3. Intensive Insulin Management

Oral Agent Failure;
A1c above target but <8.5%

OPTIONS [3]
(in order of preference)
1. Once-daily Insulin [4]
2. Multi-dose Insulin [5]
3. Intensive Insulin Management [5]

Oral Agent Failure;
A1c ≥8.5%

OPTIONS [3,6]
(in order of preference)
1. Multi-dose Insulin [5]
2. Intensive Insulin Management [5]
3. Once-daily Insulin [4]

Once-daily Insulin Therapy (QDI)

At bedtime (HS): NPH (pen/vial) **or** q daily Long-acting insulin (LAI) (pen/vial)

or

Before supper (ACS): NPH mix with Short-acting insulin (SAI) (2:1 ratio or sliding scale[7]) (vial) or premix 70/30 or 75/25 (pen/vial)

Starting dose[8]: 0.1–0.25 units/kg; or 6–10 units for elderly/thin/complicated patients

Escalate dose **every 2–3 days** to attain SMBG/FPG target values; consider HS SMBG in adjusting dose of ACS mix/premix (SAI component)

Suggested titration schedule[9]

If fasting SMBG
>180 mg/dL + 6 units
141–180 mg/dL + 4 units
121–140 mg/dL + 2 units
100–120 mg/dL + 1 unit
<80 mg/dL - 2 units

Multi-dose Insulin Therapy (MDI)[10]

-2 shots Split mix NPH + Short-acting insulin (SAI) (vial) (2:1 ratio AM, 1:1 ratio PM, or SAI sliding scale[7]) **or** premix 70/30; 75/25 or 50/50 (pen/vial)

-3 shots (especially if nocturnal hypoglycemia) SAI: ACB and ACS sliding scale[7] (pen/vial)

+

NPH: ACB and HS (pen/vial) **or** LAI: q daily (pen/vial)

Starting dose[8]: 0.3–0.5 units/kg/day (or if current dose >0.5 units/kg/day, take 80% of QDI dosage) divided 2/3 as NPH/LAI; 1/3 as SAI; titrate to achieve glycemic targets

Glycemic Targets Not Met After 6–12 Weeks

Glycemic Targets Not Met After 3–6 Months

Intensive Diabetes Management— Physiologic Insulin Delivery[10]

1:1 basal:bolus ratio SQ

Basal: NPH at ACB, ACS, or HS (or QID)(pen/vial); or Long-acting insulin (LAI) q daily (pen/vial)

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

Premeal insulin dose includes:
1. Insulin to cover carbohydrate ingested[11]
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[8]: 0.3–0.5 units/kg/day (or if current dose >0.5 units/kg/day, take 80% of total NPH dosage as glargine [basal]; bolus dose=80% of glargine dose divided tid)

Follow A1c Every 3–6 Months and Adjust Regimen to Maintain Glycemic Targets
(Insulin Requirement May Decrease as A1c Improves)

Pramlintide[10,12]
Consider as adjunct therapy to insulin in patients unable to stabilize post-prandial glucose.
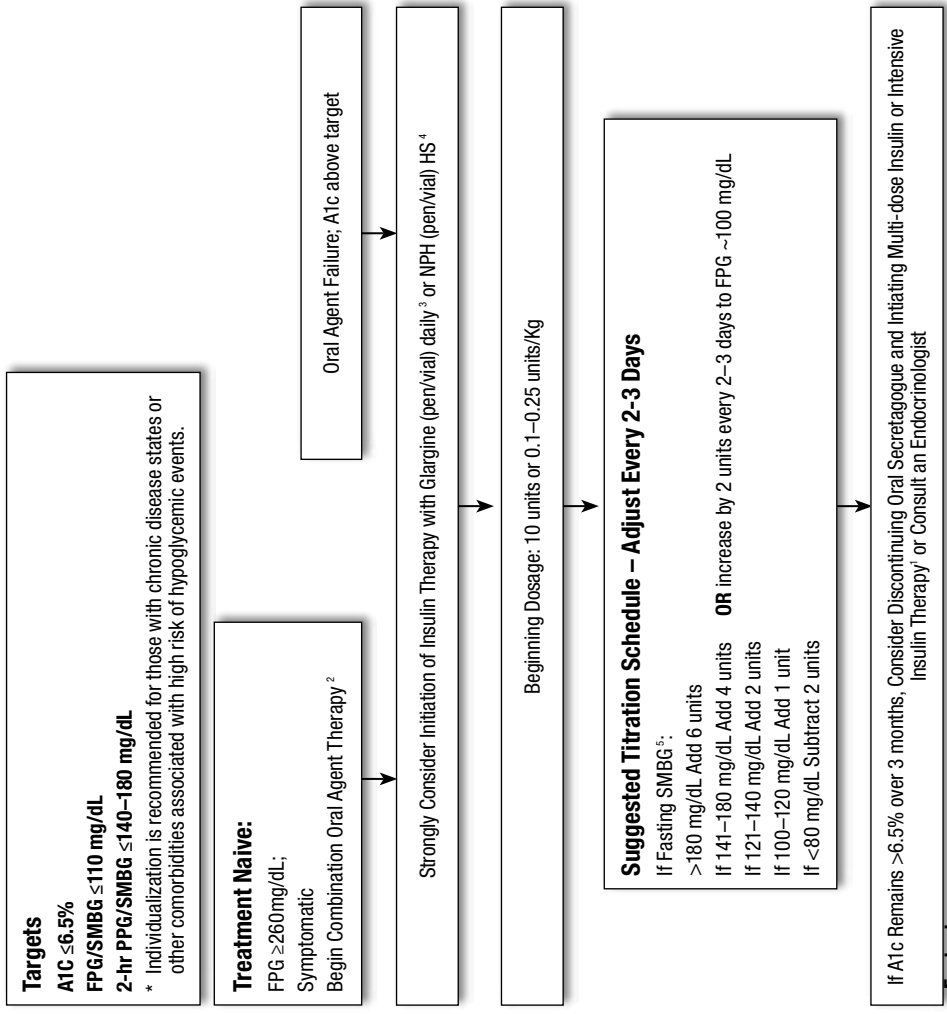
Footnotes

[1] See Glycemic Control Algorithm for Type 2 Diabetes Mellitus in Children and Adults

[2] Consider simultaneous combination oral agent therapy

[3] Combining metformin with insulin therapy has been shown to result in less weight gain and better glycemic control with lower insulin requirements

[4] Continue combination oral agent therapy ± sulfonylurea

[5] Continue metformin (±3rd oral agent); probably discontinue sulfonylurea

[6] PCP may decide to "ease" patient with poor beta-cell reserve into insulin therapy initially with QDI

[7] ~1–2 units for every 50 mg/dL above target SMBG; Regular insulin to be given 30- 60 minutes AC meal

[8] Dosages may differ in children and adolescents: **consider referral to pediatric endocrinologist/comprehensive diabetes specialty team**

[9] Go lower and slower for thin/elderly/complicated patients

[10] **Consider referral to pediatric/adult endocrinologist/diabetes specialty team (option— insulin pump, Pramlintide)**

[11] Typical "carb" bolus = 1 unit SAI covers 500/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 (see Worksheet D.)**

[12] **IMPORTANT:** See package insert for dosing

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Initiation of Insulin Therapy for Type 2 Diabetes in Children and Adults[1]: A Simplified Approach

Abbreviations:

FPG: Fasting plasma glucose
HS: Bedtime
PPG: Post-prandial plasma glucose
SMBG: Self-monitored blood glucose
TDI: Total daily insulin in units

Targets
A1C ≤6.5%
FPG/SMBG ≤110 mg/dL
2-hr PPG/SMBG ≤140–180 mg/dL
* Individualization is recommended for those with chronic disease states or other comorbidities associated with high risk of hypoglycemic events.

Treatment Naive:
FPG ≥260mg/dL;
Symptomatic
Begin Combination Oral Agent Therapy [2]

Oral Agent Failure; A1c above target

Strongly Consider Initiation of Insulin Therapy with Glargine (pen/vial) daily [3] or NPH (pen/vial) HS [4]

Beginning Dosage: 10 units or 0.1–0.25 units/Kg

Suggested Titration Schedule – Adjust Every 2-3 Days
If Fasting SMBG[5]:
>180 mg/dL Add 6 units
If 141–180 mg/dL Add 4 units   **OR** increase by 2 units every 2–3 days to FPG ~100 mg/dL
If 121–140 mg/dL Add 2 units
If 100–120 mg/dL Add 1 unit
If <80 mg/dL Subtract 2 units

If A1c Remains >6.5% over 3 months, Consider Discontinuing Oral Secretagogue and Intiating Multi-dose Insulin or Intensive Insulin Therapy[1] or Consult an Endocrinologist

Footnotes:
1 See Insulin Algorithm for Type 2 Diabetes Mellitus in Children and Adults
2 Usually with an insulin secretagogue (sulfonylurea, repaglinide, or nateglinide) and sensitizer (metformin or thiazolidinedione); see Glycemic Control Algorithm
3 FDA-approved in 2003 for q daily dosing
4 The pharmacokinetic profile of NPH compared to that of glargine is less predictable, therefore can result in blood sugar variations and increased nocturnal hypoglycemia. Cost of glargine is 1.5–2 times that of NPH. Lispro 75/25 or Aspart 70/30 can be considered at pre-supper, adjusting dosage according to HS and fasting SMBG
5 If daytime hypoglycemia develops, contact healthcare professional

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Worksheet: Advancing to Intensive/Physiologic Basal: Bolus Insulin Therapy

Note: "Analog" = Rapid Acting (Bolus) Analog insulin throughout this document.

A. Conversion from once-daily insulin to intensive/physiologic insulin replacement:

Oral therapy failure: Once-daily glargine was added to the oral regimen and titrated to 30 units per day. How do you add analog insulin if the patient reports the following SMBG values?

	FPG	2-HR PP BRKFT	2-HR PP LUNCH	2-HR PP DINNER
Case 1	105	140	140	240
Case 2	105	140	190	240
Case 3	105	190	240	240

Case 1

a. Continue the oral agents (± sulfonylurea) and 30 units glargine (or NPH)

b. There are 2 approaches for adding analog 10 minutes before a meal:

    #1 Arbitrary start: 5 units
              Titrate: Add 2 units every 2 days to reach 2-hr pp goal

    #2 Carb-counting   1 unit/50 mg/dL over 2-hr pp goal

                             PLUS

                             1 unit/15 grams carbohydrate
              Titrate: Add 1 unit/50 mg/dL >2-hr pp goal every 2 days

Cases 2 and 3

As above, but add and titrate analog before each meal where the postprandial glucose is above goal. Also, see part D, below, for more information on how to optimize the use of analog insulin. Re-evaluate each week to be certain that about half of the total daily dose is basal and half is bolus insulin.

B. Conversion from once-daily premix to intensive/physiologic insulin replacement:

Oral therapy failure: Once-daily 70/30 premixed insulin was added and titrated to 30 units per day. The fasting glucose is at goal, but daytime control is poor. How do you convert to physiologic insulin therapy?

a. **Basal insulin dose:** The first step in the conversion is based on the total dose of intermediate-acting insulin. In this case, the person is taking 21 units of NPH or aspart-protamine insulin (70% x 30 units=21 units). So, give 21 units basal glargine (use "unit-

for-unit" conversion for once-daily intermediate regimens). *Remember, do not stop oral agents (± sulfonylurea) at this time.*

b. **Bolus insulin dose:** There are several ways to start the analog.

    i. *See Case 1 (Arbitrary start or Carb-counting)*

    ii. Begin with the previous dose of fast-acting insulin, divide it before meals and titrate every 2 days. In this case, the person was using 30 units of 70/30 or about 9 units of fast-acting insulin (30% x 30 units=9 units). So give 3 units of analog before each meal and titrate every 2 days as per Case 1.

C. Conversion from twice-daily premix to intensive/physiologic insulin replacement:

Oral therapy failure in an 80 kg person: 70/30 premixed insulin was started and advanced to 60 units per day: 40 units before breakfast and 20 units before dinner. The fasting glucose was at goal, but wide glycemic excursions occurred at other times during the day and night. How do you convert this person to physiologic insulin therapy? There are several approaches. Use which ever method you want.

a. Start over and begin insulin at 0.5 units/kg. Give half as basal insulin and half as analog, divided before meals. In this case, the starting dose would be 40 units per day. Start giving 20 units glargine each morning and about 7 units analog before each meal. Titrate the basal and bolus insulins every 2 days to fasting and 2-hr postprandial goals.

b. Conversion based on current insulin usage:

Basal dose: The first step in the conversion is based on the 80% of the total dose of intermediate-acting insulin. In this case, the person is taking 42 units of NPH or aspart-protamine insulin (70% x 60 units = 42 units). When a person is taking multiple doses of intermediate-acting insulin, we give only 80% as glargine. So, give 34 units basal glargine (80% x 42=~34). *Remember, do not stop oral agents (+ sulfonylurea) at this time.*

  Bolus insulin dose: There are several ways to start the analog.

    i. *See Case 1 (Arbitrary start or Carb-counting)*

    ii. Begin with the previous dose of fast-acting insulin, divide it before meals and titrate every 2 days. In this case, the person was using 60 units of 70/30 or 18 units of fast-acting insulin (30% x 60 units = 18 units). So, give 6 units of analog before each meal and titrate every 2 days as per Case 1.

c. The "80%-80%"rule: Similar to the above method, but yields an ideal ratio of basal: bolus insulin in one step. The dose of basal glargine will be 80% of the total intermediate insulin, and the analog will be 80% of the glargine dose, divided before meals.

    Basal dose: =   80% of total intermediate insulin
                   =   80% x 42 units (70% x 60 = 42)
                   =   34 units glargine

Analog dose:	=	80% of the glargine dose, divided tid
	=	80% x 34 units, divided tid
	=	27 units, divided tid
	=	9 units aspart or lispro before meals

Note: Total dose of insulin is conserved and an ideal ratio between basal and bolus will always result with the "80%-80%" method.

D. Optimizing analog insulin use

Tight control of blood glucose requires that the patient participates in the management of their diabetes. This includes monitoring their blood glucose and learning to count carbohydrates or "carb count." The following material explains how to calculate the dose of analog required to cover a meal and how to add extra analog to correct a hyperglycemic event.

a. Determining the dose of analog insulin to use before a meal

The "Rule of 500" is used to determine how many grams of carbohydrate 1 unit of analog insulin will cover. When this number is known, then the person can easily give the correct dose of analog by simply counting the grams of carbohydrate they intend to eat at the meal.

Specifically, 500 divided by the total daily insulin dose (500/TDI) yields the number of grams of carbohydrate that 1 unit of analog will cover. For example, if a person has established that they require about 50 units of insulin per day, then it follows that 1 unit of analog will cover 10 grams of carbohydrate (500/50 = 10). If the person carb counts 140 grams in the dinner meal, then the dose of analog will be 14 units given 10 minutes before eating.

b. Correcting for hyperglycemia

The **"Rule of 1800"** is used to determine how much insulin to use to bring a high glucose reading back to goal. Even with tight control, hyperglycemia occurs and people need to be able to correct this situation.

Specifically, 1800 divided by the total daily insulin dose yields a value indicating how much 1 unit of analog insulin will lower the blood glucose. Thus, if a person uses 90 units of insulin per day, then 1 unit of analog will reduce the blood glucose by 20 mg/dL (1800/90 = 20). **This augment dose of insulin can be used by itself to correct hyperglycemia, or added to the bolus dose if glucose is high before a meal.**

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ONCE DAILY INSULIN

Morning vs. Bedtime NPH

Groop LC, Widen E, Ekstrand A, et al. Morning or bedtime NPH insulin combined with sulfonylurea in treatment of NIDDM. *Diabetes Care.* 1992;15(7):831-4.

Morning vs. Bedtime Glargine

Fritsche A, Schweitzer MA, Haring HU. Glimepiride combined with morning insulin glargine, bedtime neutral protamine hagedorn insulin, or bedtime insulin glargine in patients with type 2 diabetes. A randomized, controlled trial. *Ann Intern Med.* 2003;138(12):952-9.

NPH vs. Glargine

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ONCE DAILY vs. TWICE DAILY REGIMEN

Raskin P, Allen E, Hollander P, et al. Initiating insulin therapy in type 2 diabetes: a comparison of biphasic and basal insulin analogs. *Diabetes Care.* 2005;28(2):260-5.

INSULIN ADMINISTRATION

MULTIPLE DOSE INSULIN REGIMENS

2-shot regimens

NPH/Regular vs. NPH/ short acting analogue therapy

Vignati L, Anderson JH Jr, Iversen PW. Efficacy of insulin lispro in combination with NPH human insulin twice per day in patients with insulin-dependent or noninsulin-dependent diabetes mellitus. Multicenter Insulin Lispro Study Group. *Clin Ther.* 1997;19(6):1408-21.

70% NPH/ 30% Regular vs. Humalog Mix 75/25™ or Novolog Mix 70/30™

Roach P, Yue L, Arora V. Improved postprandial glycemic control during treatment with Humalog Mix25, a novel protamine-based insulin lispro formulation. Humalog Mix25 Study Group. *Diabetes Care.* 1999;22(8):1258-61.

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3-shot Regimens

Ohkubo Y, Kishikawa H, Araki E, et al. Intensive insulin therapy prevents the progression of diabetic microvascular complications in Japanese patients with non-insulin-dependent diabetes mellitus: a randomized prospective 6-year study. Diabetes Res Clin Pract. 1995;28(2):103-17.

Intensive Insulin Therapy

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Bretzel RG, Arnolds S, Medding J, et al. A direct efficacy and safety comparison of insulin aspart, human soluble insulin, and human premix insulin (70/30) in patients with type 2 diabetes. *Diabetes Care.* 2004;27(5):1023-7.

IV Insulin Infusion Protocol for Critically-Ill Adult Patients in the ICU Setting

Intended for use in hyperglycemic critically-ill adult patients: Sepsis, pre- and post-surgery, high-dose steroid therapy, TPN, those requiring ventilator support, etc. **This algorithm is not intended to be used for those individuals with diabetic emergencies such as diabetic ketoacidosis or hyperglycemic hyperosmolar states.**

GENERAL GUIDELINES:

Goal BG = 80–140 mg/dL (Generally ~110 mg/dL)

1. **Standard drip:** 100 units/100 mL 0.9% NaCl via an infusion device.

2. IV insulin therapy should be started when BG > established goal; insulin infusions should be discontinued when a patient is eating AND has received 1st dose of SC basal/bolus insulin (see 10. below).

3. **BOLUS & INITIAL INSULIN INFUSION RATE:** Divide initial BG level by 100, then round to nearest 0.5 units for bolus AND initial infusion rate.

   Examples: 1) Initial BG=326 mg/dL: 326÷100=3.26, round ~ to 3.5:
   IV bolus 3.5 units + start infusion @ 3.5 units/h

   2) Initial BG=174 mg/dL: 174÷100=1.74, round ~ to 1.5: IV bolus 1.5 units + start infusion @1.5 units/h

4. **Intravenous Fluids:**

   - Most patients will need 5–10 g glucose per hour
     ~ D_5W or $D_5W1/2NS$ at 100–200 mL/h or equivalent (TPN, enteral feeds, etc.).

5. **Adjusting the Infusion:**

   - **Algorithm 1:** Start here for most patients.

   - **Algorithm 2:** For patients not controlled with Algorithm 1, or start here if s/p CABG, s/p solid organ transplant or islet cell transplant, receiving glucocorticoids, or patient with diabetes receiving >80 units/day of insulin as an outpatient.

   - **Algorithm 3:** For patients not controlled on Algorithm 2.
     NO PATIENTS START HERE without authorization from the endocrine service.

   - **Algorithm 4:** For patients not controlled on Algorithm 3.
     NO PATIENTS START HERE without authorization from the endocrine service.

Algorithm 1		Algorithm 2		Algorithm 3		Algorithm 4	
BG	units/h	BG	units/h	BG	units/h	BG	units/h
<60 = Hypoglycemia (See below for treatment)							
<70	Off	<70	Off	<70	Off	<70	Off
70–109	0.2	70–109	0.5	70–109	1	70–109	1.5
110–119	0.5	110–119	1	110–119	2	110–119	3
120–149	1	120–149	1.5	120–149	3	120–149	5
150–179	1.5	150–179	2	150–179	4	150–179	7
180–209	2	180–209	3	180–209	5	180–209	9
210–239	2	210–239	4	210–239	6	210–239	12
240–269	3	240–269	5	240–269	8	240–269	16
270–299	3	270–299	6	270–299	10	270–299	20
300–329	4	300–329	7	300–329	12	300–329	24
330–359	4	330–359	8	330–359	14	330–359	28
>360	6	>360	12	>360	16	>360	32

6. **Moving from Algorithm to Algorithm:**

   - **Moving Up:** An algorithm failure is defined as BG outside the goal range (see above target), and the BG does not change by at least 60 mg/dL within 1 hr.

   - **Moving Down:** When BG is < 70 mg/dL X 2.

7. **Patient Monitoring:**

   - Once hourly venous BG < 500 mg/dL, check capillary BG (i.e., fingersticks) every hr until it is within goal range for 4 hrs, then decrease to every 2 hrs for 4 hrs, and if remains stable may decrease to every 4 hrs.

   - Hourly monitoring may be indicated for critically ill patients even if they have stable BG.

   - In hypotensive patients, capillary BG may be inaccurate and obtaining the blood sample from an indwelling vascular catheter is advisable.

   - If any of the following occur, consider the temporary resumption of hourly BG monitoring, until BG is again stable (2–3 consecutive BG values within target range):

   a) Any change in insulin infusion rate (i.e., BG out of target range).

   b) Significant changes in clinical condition.

   c) Initiation or cessation of pressor or steroid therapy.

   d) Initiation or cessation of renal replacement therapy (dialysis).

   e) Initiation, cessation, or rate change of nutritional support (TPN, PPN, tube feedings, etc.)

8. **Treatment of Hypoglycemia (BG < 60 mg/dL)**

   - Discontinue insulin drip AND

   - Give $D_{50}W$ IV
     ~ BG 40–60 mg/dL: 12.5 g (1/2 amp)

  ~ BG <40 mg/dL 25 g (1 amp)

- Recheck BG every 15–30 minutes and repeat $D_{50}W$ IV as above. Restart drip once BG > 80 mg/dL X 2. Restart drip with lower algorithm (see *Moving Down*).

9. **Notify the physician:**

- For patients not responding to Algorithm 1 or 2.

- For hypoglycemia which has not resolved after administration of $D_{50}W$ IV and discontinuing the insulin drip.

10. **Transition from IV insulin to SC insulin:** [Wait 4 hours to DC IV after 1st long-acting insulin (basal) dose is given SC]

Calculate TDI (80% total daily infusion dose)

Begin glargine = 50% TDI
analog/Reg = 50% TDI ÷ 3 (TID AC)

OR

Begin NPH AM = 4/9 TDI
Reg AM = 2/9 TDI
Reg PM = 1/9 TDI
NPH HS = 2/9 TDI

* **If NPH/Reg regimen used, overlap drip 1 hr with 1st SC Reg insulin dose; with analog therapy, drip can be discontinued < 15 minutes after SC Rapid-acting analog dose is given.**

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ABBREVIATIONS:

AC:	Before meals	**PPN:**	Peripheral parenteral nutrition
BG:	Blood glucose	**SC:**	Subcutaneous
CABG:	Coronary artery bypass surgery	**TDI:**	Total daily insulin in units
HS:	Bedtime	**TID:**	Three times daily
ICU:	Intensive care unit	**TPN:**	Total parenteral nutrition
IV:	Intravenous	**U:**	Units

ICU Insulin Orders
IV Insulin Infusion Protocol

(Not intended for use in patients with DKA or hyperglycemic hyperosmolar states)

1) **Start an IV Insulin Flow Sheet and keep with bedside record**

2) **Start IV:** _____ D5W at 100ml/h

   _____ D5W½NS at _____ ml/h

   _____ Other: _____

3) **Mix standard insulin drip** (Circle One):

   ◆ 100 units Regular insulin or NovoLog in 100 cc NS (1 unit insulin /cc)

4) **Give initial insulin bolus:**

   ◆ Bolus units of insulin = BG ÷ 100 (e.g. BG = 240 mg/dL ÷ 100 = 2.5 units)

5) **Start insulin infusion:**

   ◆ Initial infusion rate of insulin units/h = BG ÷ 100 (e.g. from 4, above; 2-2.5 units/h)

6) **Target range for BG:**

   ◆ Low Target (circle one)   High Target (circle one)

   70   100   or _____ mg/dL   110   120   140   or _____ mg/dL

7) **Monitor finger-stick BG every hour:**

   ◆ Get *lab* glucose if finger-stick BG is <40 or >450 mg/dL

8) **Adjust the insulin infusion rate each hour starting with Algorithm 1**

   ◆ Begin Algorithm 2 if s/p CABG, transplant, glucocorticoids, or >80 units/d insulin outpatient
   ◆ Advance 1 algorithm if glucose does not change by 60 mg/dL within the **first** hour
   ◆ Decrease 1 algorithm if BG 60-69 mg/dL x 2
   · No patient begins at Algorithm 3 or 4 without endocrine service authorization

Algorithm 1		Algorithm 2		Algorithm 3		Algorithm 4	
BG	units/h	BG	units/h	BG	units/h	BG	units/h
<60 = Hypoglycemia (See below for treatment)							
<70	Off	<70	Off	<70	Off	<70	Off
70–109	0.2	70–109	0.5	70–109	1	70–109	1.5
110–119	0.5	110–119	1	110–119	2	110–119	3
120–149	1	120–149	1.5	120–149	3	120–149	5
150–179	1.5	150–179	2	150–179	4	150–179	7
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240–269	3	240–269	5	240–269	8	240–269	16
270–299	3	270–299	6	270–299	10	270–299	20
300–329	4	300–329	7	300–329	12	300–329	24
330–359	4	330–359	8	330–359	14	330–359	28
>360	6	>360	12	>360	16	>360	32

9) **Treat for hypoglycemia if BG <60 or _____ mg/dL.**

  · If BG is 40-59 mg/dL: Give ½ ampule (12.5 grams glucose) D50W by slow IV push over 30 seconds.

  · If BG is <40 mg/dL: Give 1 ampule D50W (25 grams glucose) by slow IV push over 30 seconds

  · Decrease insulin drip rate by moving-down 1 algorithm; i.e. from Algo 3 to Algo 2, etc.

  · Recheck BG in 15 minutes and repeat D50W, as above, if necessary

10) **Call Endocrine Service if:**

  · Other physicians make changes to subcutaneous or IV insulin regimen

  · TPN, steroids or feedings are started, stopped or changed

  · Other physicians turn off the insulin drip for any reason

  · Patient does not respond to above pathways for glycemic control

11) **Transition from IV insulin to SC insulin:** *Proceed to the Insulin Transition Pathway*

Physician: _____   Time:_____   Date:_____

Insulin Pump Therapy

Introduction

The goal of insulin delivery is to regulate blood glucose levels to achieve normoglycemia. In someone without diabetes, pancreatic B-cells continuously secrete insulin throughout the day and night, providing a continuous insulin infusion or basal amount. In response to meals, the pancreas provides "bursts" of insulin referred to as boluses.

Pump therapy is intended to more closely mimic this pancreatic function. Continuous subcutaneous insulin infusion (CSII) utilizes only fast acting insulins (Humalog, Novolog) and eliminates the use of long-acting insulins (NPH, Ultralente, Lantus). Pumps can deliver insulin in 0.1 unit increments as a basal/continuous flow between meals and through the night. Basal rates can be increased or decreased at any point, allowing for exercise, illness, skipped meals, sensitivity to insulin and the dawn phenomenon. Boluses of insulin can be delivered via the pump to provide insulin to compensate for carbohydrate intake and hyperglycemic episodes when needed.

Insulin pump therapy gives people with diabetes the freedom to enjoy life, despite their chronic condition. The value of an improved lifestyle, increased flexibility and optimal diabetes control is obvious from the impact the insulin pump has made in the twenty-five years since its inception.

The ability to control how and when insulin is delivered provides the "pumper" with increased flexibility in scheduling their day-to-day activities. For those people with erratic lifestyles, a desire to achieve optimal glycemic control (A1c ≤ 6.5%) and prevent chronic complications, the pump is an ideal choice.

INDICATIONS FOR PUMP THERAPY

Clinical Indications

1. Inadequate glycemic control with MDI (Multiple Daily Injections) therapy
2. Recurrent severe hypoglycemia
3. Recurrent hyperglycemia
4. Hypoglycemia unawareness
5. Dawn phenomenon
6. Preconception
7. Pregnancy
8. Gastroparesis
9. Early neuropathy or nephropathy, when improvement in glucose control can reduce acceleration of complications
10. Renal transplantation

11. Frequent DKA

12. Uncontrolled diabetes

13. Erratic Blood Glucose

14. Prevent or delay complications

15. Desire to improve lifestyle flexibility

16. A1c greater than 6.5%

Lifestyle indications

1. Erratic schedule

2. Varied work shifts

3. Desire for improved flexibility

4. Inconvenience of multiple daily injections

Advantages of Pump Therapy

1. More flexible lifestyle

2. Improved overall control

3. Prevent chronic complications

4. Improved control during exercise and "growth spurts"

5. Tight control during pregnancy

Characteristics of Pump Candidates

Ready, willing, and able

1. Is motivated — pump therapy requires a strong desire to improve one's health and is a time investment for weeks or months in advance and during the initiation of pump therapy.

2. Has realistic expectations — a potential pump candidate must understand that the pump will not "fix" blood glucose variations automatically, nor will it grant freedom from frequent SMBG (self monitoring of blood glucose).

3. Demonstrates independent diabetes management — a thorough knowledge of diabetes and its management and the ability to demonstrate appropriate self-care behaviors provide the foundation for advanced self-management skills required by pump users.

4. Is practicing counting carbohydrates — has a willingness to practice the Carbohydrate (CHO or carb) Counting method, and an understanding of insulin actions and pre-meal bolus dosing calculations.

5. Has manual dexterity — able to use buttons on the pump and has good visual acuity to see the screen.

6. Has a good support system — emotional support is crucial to the success of pump therapy.

7. Demonstrates emotional stability — a potential pumper must attend education sessions and attend to tasks that require routine attention. The patient must keep physician appointments.

Poor Candidates for Pump Therapy

1. Patients who are unwilling to comply with follow-up appointments.

2. Patients who are unwilling to receive diabetes education.

3. Patients who are unwilling to perform SMBG 8 times a day initially and then, 4-6 times a day after CSII therapy is established.

4. Patients who are unable or unwilling to count carbohydrates.

DETERMINING TOTAL DAILY DOSE AND BASAL RATE

Method #1:

Pre-pump Total Daily Dose (TDD)

Reduce pre-pump Total Daily Dose by 25%

Divide "pump" TDD in half: 50% for basal; 50% for bolus

Method #2:

Using Patients Weight Factor: Weight (lbs) X 0.1 = basal rate per hour

Start with 1 basal rate per 24 hours.

Based on blood glucose results during the times listed below, it may be necessary to implement additional basal rates based on patient's blood glucose (BG)

> 12:00 midnight – 3:00 a.m.
>
> 3:00 a.m. – 7:00 a.m.
>
> 7:00 a.m. – 12:00 noon
>
> 12:00 noon – 6:00 p.m.
>
> 6:00 p.m. – 12:00 midnight

Time Frame For Beginning Pump Therapy

1. 1–2 months before pump start:

- ◆ Assess whether or not patient meets the criteria for a "pumper."

- MD writes orders for insulin pump therapy. Contacts the insurance company for pre-authorization of coverage.

- Patient is seen by a CDE/dietitian for carbohydrate counting instruction.

- Patient is seen by the pump trainer for knowledge assessment and education as needed — to include: hypoglycemia, hyperglycemia and sick day management, prevention of DKA, patient's responsibilities, and general knowledge regarding diabetes.

2. 1-2 weeks before pump start:

- Patient watches video/DVD on use of the pump several times to familiarize him/herself with the pump.

- May attend "pump school" via the Internet if available.

- Meets with pump trainer for basal rates, boluses, insulin to carbohydrate ratio, and insulin correction factor if not already done.

3. Day before pump start:

- Discontinue use of long-acting insulin (NPH, Lantus, Ultralente).

- Continue injecting Novolog or Humalog before meals.

- Use "correction formula" to cover for "highs."

4. Day of pump start:

- Eat breakfast and inject Humalog or Novolog as usual.

- Wear comfortable, loose-fitting clothing — preferably 2-piece outfit.

- Allow 3 hours for training.

- Bring supplies with you to include:

    Pump, User's Manual, Infusion Sets — at least 2, Cartridges — at least 2, Skin Prep, Glucose Meter / Lancets / Strips, Alcohol Wipes, Insulin (Novolog or Humalog), Batteries, Carbohydrate Snack.

5. First Day of Pump Therapy:

- Begin "Four-Day Plan."

- Call pump trainer with glucose levels and carbohydrate intake.

6. When "Four-Day Plan" completed:

- Come into office for first follow-up. Patients MUST bring: documentation of glucose readings, boluses (for elevated glucoses or meals), diary of carbohydrate Intake.

- Begin "Three-Day Plan."

7. Within 1–2 days after completing "Three-Day Plan"

- Call pump trainer with readings.

- Adjust basals/boluses as needed.

8. Weekly for four weeks:

- ◆ Call pump trainer and report complete record.
- ◆ Adjust basals, insulin to carbohydrate ratios as needed.
- ◆ Instruct on added features of the pump, i.e., Dual and Square Wave Boluses, utilizing temporary basal rate, Easy Bolus, Audio Bolus.
- ◆ Adjust basal rates first, based on fasting glucoses. When fasting glucoses are at goal, adjust boluses and/or insulin to carbohydrate ratios to achieve pre- and post-meal glucose goals.

TESTING BASAL RATES: FOUR DAY PLAN

First Day

1. Eat supper by 7 p.m.
2. **Skip a bedtime snack.**
3. Test blood sugar every 2 hours between supper and bedtime; at 12:00 Midnight, and at 3:00 a.m.
4. Record your results!

Second Day

1. Eat breakfast.
2. **Skip lunch.**
3. Test blood sugar every 2 hours between breakfast and supper.
4. Record your results!

Third Day

1. **Skip breakfast.**
2. Test blood sugar every 2 hours between waking up until lunch.
3. **DO NOT SLEEP IN!**
4. Record your results!

Fourth Day

1. Skip supper.
2. Test blood sugar every 2 hours between lunch and your bedtime snack at 10:00 p.m.
3. Record your results!

NOTE: Do not "fix" a high blood sugar during the time you are checking every 2 hours. Correct at your next scheduled meal using your correction factor.

If you miss a day, continue the plan the next day. But try not to miss a day — the sooner the plan is completed, the sooner your basal rates will be set.

PRE-PUMP EDUCATION CHECKLIST

Patient Name _____ Date _____

Certified Pump Trainer _____

MD's Name _____

Pump Model _____ Serial # _____

UNDERSTANDING PUMP THERAPY

☐ Theory   ☐ Meal Bolus
☐ Insulin Type ☐ Insulin Sensitivity/
☐ Basal Rate   Correction Factor

NUTRITION

☐ Carb. Counting
☐ Using Food Labels
☐ Insulin to Carb. Ratio
☐ Proper Snacks

BLOOD GLUCOSE TESTING

☐ Schedule
☐ A1c

EXERCISE

☐ Safety   ☐ Proper Snacks
☐ Hypoglycemia   ☐ BG Checks

HYPOGLYCEMIA

☐ Protocol/"Rule of Fifteen
☐ Glucagon

PUMP THERAPY RESOURCES

☐ User's Guide
☐ Pump School Online
☐ Websites

HYPERGLYCEMIA

☐ Protocol
☐ Ketone Testing

WHEN TO CALL YOUR DOCTOR

DKA

☐ Causes
☐ Signs and Symptoms
☐ Prevention

WHEN TO CALL 24 HOUR HELP LINE

SICK DAY MANAGEMENT

☐ Protocol
☐ Supplies

Notes:

_____

_____

_____

DETERMINING BOLUSES

Calculating Insulin Sensitivity Factor (ISF)

Also may be referred to as the Insulin Correction Factor (ICF)

The Insulin Sensitivity Factor (ISF) is the amount of blood glucose reduced by 1 unit of rapid or short acting insulin over a 2–4 hour period. Two commonly accepted formulas are used to determine the ISF: the 1800 Rule and the 1500 Rule. Endocrinologist Paul C. Davidson, MD developed the 1500 Rule. With the introduction of rapid-acting insulin, John Walsh, PA CDE modified the 1500 Rule into the 1800 Rule. Generally, the 1800 Rule is used for patients who are insulin sensitive or those who use rapid-acting insulin and the 1500 Rule for patients who are insulin resistant or those who use short-acting insulin. The Rules calculate the ISF by dividing either 1800 or 1500 by the TDD.

$$\text{Amount of Blood Glucose lowered by 1 unit of insulin (1800 Rule)}$$
$$\frac{1800}{TDD} = ISF$$

Note: 1800 currently used with Humalog or Novolog instead of 1500 (1500 Rule)

Calculating Insulin to Carb Ratio (ICR)

This method of determining the Insulin:Carbohydrate ratio is based on Total Daily Insulin Dose (TDD). The TDD is divided into 500 and the result is the amount of carbohydrate that one unit of rapid- or short-acting insulin will cover. The goal is to bring blood glucose levels into the target range 3–4 hours after the meal.

$$\text{Grams of carbs covered by 1 unit of insulin (500 Rule)}$$
$$\frac{500}{TDD} = ICR$$

TYPES OF BOLUSES

Normal Bolus—total bolus infused at onset of meal

Square Wave—total bolus infused slowly over several hours; useful in cases of gastroparesis

Dual Wave—part of bolus is infused at onset of meal, and remainder is infused slowly over several hours; useful for high fat meal, i.e., pizza, Mexican food.

Adjusting/Fine Tuning Dosage

Empower patients to evaluate and adjust their BG. Resume intensive monitoring if necessary, i.e., 8 times a day. Start with overnight basals; promote low-fat, consistent carb content meals. Introduce high fat meals after ICR has been established or corrected. When high fat meals are consumed, consider utilizing **Dual Wave** bolus. Two-hour postprandial glucose goals should be 30 +/- points above preprandial BG. Patient may require a different ICR for each meal. BG targets should be determined by the provider and the patient and depending on age of the patient, concomitant

conditions and the patients' ability and willingness to achieve tight control of their diabetes.

POSSIBLE COMPLICATIONS OF PUMP THERAPY

Hypoglycemia — fewer episodes than with MDI. Possible improvement in hypoglycemic unawareness.

Diabetic Ketoacidosis — interruption in Humalog/Novolog delivery can lead to high BG and DKA in 4 +/- hours. Patient must check BG 4–6 times a day.

Skin Infections — meticulous skin care is necessary at infusion sites, which must be rotated every 2–3 days.

Weight Gain — could be a result of improved control or if patient liberalizes diet.

Initiation of CSII should be done by a Certified Pump Trainer (CPT) who is usually provided by the insulin pump manufacturer, or a Certified Diabetes Educator (CDE), who has received specialized training in insulin pump therapy. The various features of the pump should be demonstrated/explained to the patient who should be provided with phone numbers of the insulin pump company and the provider. The patient should be encouraged to keep detailed records of BG, insulin dosage, carb intake, and other daily activities.

Table for Estimated Basal Rate and Insulin to Carbohydrate Ratio

WEIGHT IN POUNDS	BASAL INSULIN	CARBOHYDRATE RATIO
100	0.3 to 0.5	1 unit / 16 gms
110	0.3 to 0.5	1 unit / 15 gms
120	0.4 to 0.6	1 unit / 15 gms
130	0.4 to 0.6	1 unit / 14 gms
140	0.5 to 0.7	1 unit / 13 gms
150	0.5 to 0.7	1 unit / 12 gms
160	0.6 to 0.8	1 unit / 12 gms
170	0.6 to 0.8	1 unit / 11 gms
180	0.7 to 0.9	1 unit / 10 gms
190	0.8 to 1.0	1 unit / 9 gms
200	0.9 to 1.1	1 unit / 8 gms

Estimated Correction Factor

CURRENT TDD	CORRECTION FACTOR
10 units	150 points
20 units	75 points
25 units	60 points
30 units	50 points
40 units	38 points
50 units	30 points
60 units	25 points
75 units	20 points
100 units	15 points
150 units	10 points

Carbohydrate Counting

Carbohydrate counting is a meal planning approach that works well with insulin pump therapy. It is a great way to add variety and flexibility in choices of meals and snacks. Carbohydrate counting has been proven to help achieve better glucose control.

Generally carbohydrate is the main food group that increases blood sugar. Protein has a sustaining effect and fat slows absorption.

It is essential that the patient understands and practices the techniques of carbohydrate counting prior to pump initiation.

Many references such as the materials included in Chapter 5 of Diabetes Life Skills Book or the "Daily Meal Planning Guide" by Eli Lilly are used by the CDE or Registered Dietitian to teach Carbohydrate Counting.

Tools needed to count carbs:

1. Measuring cups
2. Food labels
3. Calculator
4. Carb counting book/guide

Carbohydrate containing foods include breads, pasta, rice, other grains, starchy vegetables (potatoes, corn, peas), crackers, cereals, fruit (fresh, canned, frozen, or juice), milk, yogurt & ice cream, cooked dried beans, cake, cookies, pie, sugar/honey.

One serving is considered 15 grams of carbohydrate and is contained in:

1/3 cup cooked rice, beans, or pasta

1/2 cup starchy vegetables like corn, peas, potato, or cooked cereal

1 slice bread or 1 tortilla

1 small piece of fruit, ½ small banana, or ½ cup light canned fruit

1 cup milk

Using measuring cups and reading labels are highly recommended as the patient practices at home.

THE RULE OF 500

This method of determining the Insulin:Carbohydrate ratio is based on Total Daily Insulin Dose (TDD). The TDD is divided into 500 and the result is the amount of carbohydrate that one unit of rapid- or short-acting insulin will cover. The goal is to bring blood glucose levels into the target range 3–4 hours after the meal.

Example:

TDD is 36 units
Glucose levels are within target range
500/36 = 13.8 (round up to 14 or 15)
Insulin to carbohydrate ratio is 1:15
1 unit of insulin covers 15 gm carbohydrate

Some CDEs find that dividing 450 (rather than 500) by the TDD is more accurate for short-acting insulin and/or for people who are more insulin resistant.

Insulin Sensitivity

The Insulin Sensitivity Factor (ISF) is the amount of blood glucose reduced by 1 unit of rapid or short acting insulin over a 2–4 hour period. Two commonly accepted formulas are used to determine the ISF: the 1800 Rule and the 1500 Rule. Endocrinologist Paul C. Davidson, MD developed the 1500 Rule. With the introduction of rapid-acting insulin, John Walsh, PA CDE modified the 1500 Rule into the 1800 Rule. Generally, the 1800 Rule is used for patients who are insulin sensitive or those who use rapid-acting insulin and the 1500 Rule for patients who are insulin resistant or those who use short-acting insulin. The Rules calculate the ISF by dividing either 1800 or 1500 by the TDD.

Example:

TDD is 34 units
1800/34 = 52.9
ISF is 52.9. One unit of rapid-acting insulin decreases glucose by 52.9 mg/dL
This can be rounded to 55

Another method of calculating as ISF is to use the general "safe" starting point of 1 unit: 50 mg/dL. This method may work well with most lean to average adults.

An alternative method for Insulin:Carb ratio can be figured once the person's ISF is calculated, multiplying it by 0.33 provides an insulin-to-carbohydrate ratio.

Example:

> ISF is 55 mg/dL
> 55 x 0.33 = 18.15 (round to 18)
> Insulin to carb ratio is 1:18
> 1 unit of insulin covers 18 g of carbohydrate

Verifying Insulin:Carb Ratio and Insulin Sensitivity

Prior to eating, the bolus insulin dose is partially based on the insulin to carbohydrate ratio. This ratio tells how many grams of carbohydrate are affected by one unit of insulin. The ratios can be verified with one of the methods described below:

Method 1: Food diary, insulin dose, and SMBG information

The pump user is to keep 3 days of records, including:

1. Fasting, pre-meal, and 2-hour PPG results
2. Pre-meal insulin doses
3. Amount of carbohydrate consumed at meals and other times. It is helpful if the patient consumes the same amount of carbohydrate at each breakfast for 3 days, same amount of carbohydrate at each lunch for 3 days, etc.
4. Amount of all food and beverage consumed, as fat and protein moderately affect blood sugar.

With these records, determine the amount of insulin the patient used to cover the carbohydrate consumed at each meal by dividing the total grams of carbohydrate by the number of units of insulin.

Example:

> Consumed 60 g carbohydrate
> Injected (bolused) 5 u rapid-acting insulin
> PPG is within 30 mg increase of pre-meal blood glucose
> 60/5 = 12
> Insulin to carbohydrate ratio = 1:12
> 1 unit of insulin covers 12 g carbohydrate

CARBOHYDRATE COUNTING FOOD LOG

Write down all food or drink you consume for at least 3 days. Be sure to include portion sizes and the time you eat or drink. Estimate the amount of carbohydrates in each meal and snack; then record the amount of insulin you took. Bring this log with you on appointments to the pump trainer or the dietitian.

DATE/TIME	BLOOD SUGAR (2 HRS PP)	FOOD	GRAMS OF CARBS	INSULIN

DATE/TIME	BLOOD SUGAR (2 HRS PP)	FOOD	GRAMS OF CARBS	INSULIN

DATE/TIME	BLOOD SUGAR (2 HRS PP)	FOOD	GRAMS OF CARBS	INSULIN

Calculating Total Grams of Carbohydrate in a Recipe

To determine the amount of carbohydrates in a recipe:

1. Make a table as noted below
2. List ALL the ingredients in the recipe
3. Using food labels or a nutrient composition book, list the total grams of carbohydrate in each ingredient (amount of fat and sodium can also be calculated)
4. Total the grams of carbohydrate from all ingredients
5. Divide the total grams of carbohydrate by the number of servings in the recipe
6. Note the total grams of carbohydrate PER SERVING on the recipe for future reference

Recipe Name: _____

Ingredient	Amount	Grams of Carbohydrate	Grams of Fat

Example:

Corn Pudding (Makes 8 Servings)

Ingredient	Amount	Grams of Carbohydrate	Grams of Fat
Cornstarch	2 Tablespoons	14	0
Egg Substitute	½ cup	2	0
Sugar	½ cup	100	0
Creamed Corn	16 oz. can	60	0
Evaporated Skim Milk	16 oz. can	60	0
TOTAL		362	0
Divide total carbohydrate by number of servings (362/8)		45	

This recipe has 45 grams of carbohydrate and zero (0) grams of fat per serving.

IDENTIFYING AND MANAGING HYPERGLYCEMIA

Sick Day Management (Refer to "Sick Day Guidelines" in TDC Tool Kit)

During periods of illness, it may be more difficult to maintain good control of blood glucose. Examples of illness or "sick days" include: dental surgery, colds, sore throat, mild infections, nausea, vomiting, diarrhea, or fever. It is important to monitor blood glucose more frequently during a sick day and to take immediate action to prevent ketoacidosis.

Guidelines to follow:

Medication

Never omit insulin. Even if unable to eat, insulin need continues and may increase.

Continue the basal dose of insulin and make additional corrections using the Correction/Sensitivity Factor as needed. Urine ketone testing can further guide the correction doses.

Blood/Urine Testing

Check blood glucose before usual mealtimes and every 2 to 4 hours, keeping a written record of results.

Check urine for ketones if blood glucose is greater than 250 mg/dL or as directed by the physician.

Fluids/Meal Planning

Consuming adequate fluids is important during illness. Drink fluids every hour while awake and during blood glucose checks at night.

If able to eat, drink non-caloric beverages.
If unable to eat, alternate non-caloric beverages with those containing carbohydrate.

Consume 10–15 grams of carbohydrate every 1–2 hours.

Severe high blood glucose and ketoacidosis (DKA) are serious medical problems that sometimes occur in diabetes. High blood glucose can exist for some time without triggering ketoacidosis. Ketoacidosis begins only after insulin levels in the body go very low. When insulin is low, glucose cannot be used as fuel Glucose is the body's first choice for energy, but if not available due to inadequate insulin levels, the body must start burning fat even though glucose is high in the blood. Ketones are the by-product of burning fat for energy and in high levels, cause nausea and vomiting. Vomiting, in combination with high blood sugars, can lead to dehydration.

Ketoacidosis can be triggered by:

1. Illness
2. Infections
3. Pump Malfunction
   · Loose Luer-lock connection

· Dislodged infusion set

· Site irritation or overuse

· Empty pump reservoir/cartridge

· Expired insulin

· Incorrect bolus calculation

· Missed bolus doses

· Inadequately programmed basal rates

A pump user needs to take a correction dosage using a syringe if spilling moderate to large ketones, then change the infusion set. Plenty of water should be consumed to help flush ketones from the body.

Call a physician for further instruction.

IDENTIFYING AND MANAGING HYPOGLYCEMIA

Causes:

Glucose levels can drop to dangerously low levels if there is not a balance between food, medication, and activity. It can occur very quickly and without warning. Not eating properly, delaying or skipping meals, an error in medication dose, or engaging in exercise that is too difficult or too strenuous are all causes of hypoglycemia.

Signs and Symptoms:

Shaking	Sweating
Weakness	Anxiety
Headache	Blurred vision
Dizziness	Fast heartbeat
Irritability	Fatigue

"Rule of 15"

1. Immediately stop activity and check glucose levels. If driving, immediately pull off the road

2. If no glucose meter is available, treat regardless

3. Consume 15 gms of a fast-acting carbohydrate

   - ½ cup juice
   - 6–7 lifesavers
   - 2 tsp. sugar

   - 5 sugar cubes
   - ½ cup regular soda
   - 8–9 jellybeans

   - 3 glucose tablets
   - 8 oz. skim milk
   - 1 tube glucose gel

4. Rest for 15–20 minutes

5. Retest glucose — if still below 70 mg/dl, repeat fast-acting carbohydrate. Or if no glucose meter is available, and symptoms are still present, repeat fast-acting carbohydrate

6. Continue steps 1 – 5 until glucose level is above 70 mg/dl

7. An extra snack consisting of a carbohydrate and protein may be needed if more than one treatment was required and no meal will be eaten within a half-hour. Examples are:

    ½ sandwich

    Cheese and crackers

    Peanut butter and crackers

8. If several hypoglycemic episodes occur at the same time over a few days, the basal rate will need to be adjusted; notify the pump trainer immediately

9. ALWAYS carry a fast-acting carbohydrate in a place that is easily accessible

10. ALWAYS wear identification stating that you have diabetes and are being treated with an insulin pump

APPENDIX
PHYSICIAN'S ORDERS FOR INSULIN PUMP START

Patient Name _____ Date _____

Certified Pump Trainer _____

These orders expire on _____

Basal rates may be adjusted by 0.05 increments for BG above _____ and/or _____ below.

Starting Basal Rate:

Profile	Time	Units per Hour
#1	12:00 a.m.	_____

Starting Bolus Doses

Insulin to Carbohydrate Ratio: 1 unit per _____ gms. carbohydrate

Insulin Sensitivity Ratio
(Correction Factor):   1 unit of insulin will lower BG by _____ mg/dl

Target Blood Glucose Levels

3:00 A.M.   _____ to _____

Fasting.   _____ to _____

Before meals.   _____ to _____

After meals.   _____ to _____

Additional Instructions: _____

_____

_____

_____

Physician's Signature _____

PATIENT INSULIN PUMP CONTRACT

Patient Name _____ Date _____

Physician _____

I understand, as the patient, it is my responsibility to:

1. Maintain open communication with my physician, dietitian, and diabetes educator. This will include recording and reporting my glucose levels, carbohydrate intake, exercise, boluses, basal rate changes, and other information requested.

2. Perform glucose testing as requested.

3. I will change my infusion set every 2 to 3 days and follow the guidelines as set forth for proper pump management.

4. If hospitalized, I will bring all the needed equipment from home to ensure I have enough supplies. If I do not have the supplies, it is my responsibility to make arrangements to obtain them.

5. I will follow the formulas for meal boluses and correction factors prescribed to me by my physician and/or diabetes educator.

6. I will respond quickly and correctly to hypoglycemia and will report these to my health care team. I understand the "Rule of 15" to treat a low glucose with 15 grams of a fast-acting carbohydrate, retest in 15 minutes, and repeat the sequence if necessary.

7. I will respond quickly to hyperglycemia and prevent DKA by following the rules for sick-day management using my correction factor. I will report to my diabetes care team as needed, increase the frequency of monitoring, and test my urine for ketones if my glucose is over 240 mg/dl for 2 consecutive glucose readings.

8. I will not disconnect from the pump for longer than an hour. If I desire a "vacation" from the pump, I will first discuss this with my diabetes care team before doing so and follow their recommendations.

9. If I am having any difficulty with either pump use or carbohydrate counting, I will immediately call my diabetes care team for the proper assistance.

10. I will make sure that I have the proper supplies on hand at all times and that it is my responsibility to reorder supplies as I need them. I will also carry "emergency supplies" with me at all times, including syringes, in case my site becomes dislodged. I will also wear identification stating that I have diabetes and wear an insulin pump. This information will also include emergency contact, my doctor's name, and telephone number.

Patient's Signature _____ Date _____

LETTER OF MEDICAL NECESSITY

Date _____

RE: Patient Name _____ Phone ( ) _____

Patient's date of birth _____ Insurance identification # _____

To whom this may concern:

This letter serves as prescription and letter of medical necessity for the above referenced patient for an insulin infusion pump as a lifetime need.

Check the following:

☐ Patient has had diabetes for _____ years

☐ Patient has the ability to regularly monitor blood glucose _____ to ___ times per day.

☐ Patient is motivated to achieve and maintain glycemic control and has the support needed to stay motivated.

☐ Patient demonstrates compliance with dietary regimen.

☐ Patient's insulin regimen consists of _____ to _____ injections per day.

☐ Patient has attempted several different regimens and/or has had multiple dose changes.

☐ Patient uses the following type(s) of insulin: _____.

Patient exhibits one or more of the following:

☐ A1c level ___% on ___/___/_____.

☐ History of severe glycemic excursions and/or   ☐ Nocturnal Hypoglycemia
    ☐ Hypoglycemia unawareness   ☐ Extreme insulin sensitivity or low insulin req.

☐ Widely fluctuating blood glucose levels before meals. (e.g., pre-prandial BG levels commonly exceed 140 mg/dl and/or are below 70 mg/dl. The range of these blood glucose levels is from _____ to _____.

☐ Dawn Phenomenon where fasting blood glucose often exceeds _____ mg/dl.

☐ Day to day schedule variations such as meal times, work schedules or activity level confound the degree of regimentation required to self manage glycemia with Multiple daily injections.

☐ Patient has been hospitalized or needed emergency assistance due to his/her diabetes.

☐ Patient has frequent hypoglycemic episodes, up to _____ times per week.

☐ Pregnancy or preconception with a history of poor glycemic control.

☐ Secondary complications requiring tighter glycemic control to slow or stop progression of

    ☐ Retinopathy   ☐ Neuropathy   ☐ Nephropathy   ☐ Other: _____

☐ Sub-optimal glycemic and metabolic control post-renal transplant.

☐ Patient has been fully informed of the risks and benefits of pump therapy.

PHYSICIAN NOTES

I certify that this information is complete and correct. _____

Physician's Signature

I am an endocrinologist, internist or diabetes specialist: ☐ Yes   ☐ No

---

I am prescribing an insulin infusion pump, insulin pump supplies, and diabetes supplies for the following patient. The supplies may be refilled as necessary for one year. Please dispense as written.

_____
PHYSICIAN NAME

_____
PHYSICIAN STREET

_____
PHYSICIAN CITY, STATE, ZIP

_____
PHYSICIAN SIGNATURE

_____
MEDICAL LICENSE NUMBER

_____
UPIN NUMBER

_____
PATIENT NAME

_____
PATIENT STREET

_____
PATIENT CITY, STATE, ZIP

_____
DATE

INSURANCE COVERAGE FOR INSULIN PUMP THERAPY

Private Insurance

1. Contact pump company with information about the patient

    A. Insurance information

    B. Indications that would require utilizing the insulin pump

    C. Must be on multiple insulin injections (2 or more a day)

    D. Cover type 1 and some type 2 diabetes

    E. Prescription from MD

Medicare

1. Contact pump company with patient's information

2. Must meet criteria for insulin pump therapy

    A. C-Peptide of less than 0.6 mcg/L

    B. A1c over 7%

    C. Monitoring 4 times a day

3. Medicare pays 80% for pump and supplies. Secondary insurance may cover the other 20%. If Medicare denies coverage, secondary may cover.

Medicaid

1. Contact pump company with insurance information

2. Must meet criteria for insulin pump therapy

2. Prescription from MD

4. Medicaid will cover 100%

Indications for Insulin Pump Therapy

1. Unable to normalize glucose levels

    A. Erratic glucose excursions

    B. A1c over 7%

2. Severe episodes of hypoglycemia or hypoglycemia unawareness

3. Preconception/pregnancy

4. Early chronic complications

5. Organ transplant

6. Patient desires better control

7. Prevent chronic complications

OVERVIEW FOR PUMPING INSULIN

Indications For Insulin Pump

1. Multiple episodes of severe hypoglycemia
2. Erratic glucose levels – "brittle diabetes"
3. Early complications
4. Organ transplant
5. Pregnancy

Advantages of The Pump

1. More flexible lifestyle
2. Improved overall control
3. Prevent chronic complications
4. Improve control during exercise and "growth spurts"
5. Tight control during pregnancy

Characteristics of Pump Candidate

1. Must be willing to monitor BG several times a day
2. Must be willing to count carbohydrates
3. Must have manual dexterity to use buttons on pump and have good visual acuity to see the screen
4. Good support system
5. Committed to self-care
6. Ability to problem solve
7. Good basic knowledge of diabetes
8. Reasonable expectations of what the pump can do

Time Line

1–2 months before pump start:

1. Assess patient's current knowledge about diabetes
2. Assess whether or not patient meets the criteria for a "pumper"
3. MD contacts the pump company and writes orders for the pump
4. Patient is seen by dietitian for carbohydrate counting
5. Patient is seen by the pump trainer for general assessment and education

QUESTIONNAIRE

Are you ready for pumping?

1. How motivated are you to achieve good control?

    Not very   0   1   2   3   4   5   very   _____

2. How many times do you test every day?

                   0   1   2   3   4   5   _____

3. How many injections per day?

                   0   1   2   3   4   5   _____

4. Do you keep a record?

             Yes (5 points)   No (0 points)   _____

5. Do you adjust your insulin for test results?

             Yes (5 points)   No (0 points)   _____

6. Do you adjust your insulin for meals?

             Yes (5 points)   No (0 points)   _____

7. Do you adjust insulin for "highs"?

             Yes (5 points)   No (0 points)   _____

8. Do you adjust your insulin for exercise?

             Yes (5 points)   No (0 points)   _____

9. Do you get regular A1c tests?

             Yes (5 points)   No (0 points)   _____

10. Do you call your doctor when you have a problem?

             Yes (5 points)   No (0 points)   _____

SCORING

Score	What It Means
0–9	Are you in charge or someone else?
10–19	At least you're honest!
20–29	Where can you improve?
30–39	Just a few minor changes
40–49	How soon can you start?

1–2 weeks before pump start

1. Patient watches video or DVD on pump use several times to begin familiarizing him/herself with the pump
2. May attend "Pump School" via Internet
3. Meets with pump trainer for basal, bolus, correction factor, and insulin to CHO ratio

Day before pump start

1. Discontinue use of long-acting insulin
2. Continue injections of Humalog/Novolog before meals
3. Use "correction formula" to cover for highs

Day of pump start

1. Eat breakfast and take fast-acting insulin as usual
2. Wear comfortable clothing-preferably two-piece outfits
3. Allow 3 hours for training
4. Bring with you:

   Pump

   User's Manual

   Infusion sets — at least 2

   Cartridges — at least 2

   Skin prep

   Glucose meter/strips/lancets

   Alcohol wipes

   Insulin (Novolog or Humalog)

   Carbohydrate snack

   2 Batteries

First day after beginning pump therapy

1. Call Pump Trainer with glucose readings and grams of carbohydrate
2. Begin "4 Day Plan"

Within 3–5 days after pump training

1. Come in to office for follow-up
2. Continue "4 Day Plan" until basal rates are adjusted correctly

When basal rates correct,

1. Adjust insulin to carb ratio
2. Begin "3 Day Plan"
3. Call Pump Trainer with BG readings and CHO grams

Weekly for 4 weeks

1. Call Pump Trainer with BG's and CHO grams for adjustment
2. Basals are adjusted first, then boluses

STARTING BEGINNING BASAL RATE

Total Daily Pre-pump Insulin x 75% = Total Daily Insulin per Pump
(total pre-pump dose minus 25%)

Divide the new dose by 2
Half is basal; half is boluses

For basal, divide half by 24 = basal rate per hour

Begin with 1 basal rate and adjust as needed

Example:

TDD pre-pump — 50 units

50 – 25% = 38 — new dose

38 ÷ 2 = 19 (19 units for boluses; 19 units for basal)

19 ÷ 24 = 0.79 units per hour (may round up to 0.8 units per hr.)

INSULIN TO CHO RATIO: RULE OF 500

Divide 500 by the new total daily dose:

Example:

TDD = 25 units

500 ÷ 25 = 20 — 1 unit of insulin per 20 gms of CHO

TDD = 45

500 ÷ 45 = 11 — 1 unit of insulin per 11 gms of CHO (may round down to 10 for ease)

INSULIN CORRECTION FACTOR: RULE OF 1500

Divide new TDD into 1500

Example:

TDD = 45 units

1500 ÷ 45 = 33 (amount I unit of insulin will decrease glucose level by)

If target level is 100 and glucose level 289 mg/dL – how many units to get BG level to 100?

289 – 100 = 189 (189 points above target)

189 ÷ 33 = 5.7 units of insulin

Used to correct for a high

May be added to regular mealtime bolus if high occurs right before eating a meal

MONITORING SCHEDULE

For first few days to 2 weeks (or until basals and boluses adjusted)

1. Between 2:00–3 a.m. (Dawn Phenomenon)
2. Fasting (overnight basal)   Goal 70 – 100 mg/dL
3. 2 hours after each meal   Goal 140 mg/dL or less
4. Before and after exercise
5. Before driving
6. If hypoglycemia is suspected

ADJUSTING BASALS – "4 DAY PLAN"

Overnight Basal

1. First basal to be checked
2. Eat regular dinner (no later than 7:00 p.m.), NO bedtime snack

3. BG @ bedtime should be 100-150 mg/dL

4. Test BG every 2 hours between supper and bedtime, @ Midnight, and 3:00 a.m.

5. If BGs stay within 30 mg/dl basal OK — if more than 30, adjust

6. Divide night into 3 "test windows"

    a. BEDTIME: 9:00 P.M. to midnight

    b. NIGHT: Midnight to 3:00 a.m.

    c. DAWN: 3:00 a.m. to 7:00 a.m.

Afternoon Basal

1. Eat breakfast and take bolus for food

2. NO lunch, NO bolus

3. Check BG every 2 hours between breakfast to supper

4. If BGs stay within 30 mg/dl, basal OK; if not, adjust

Morning Basal

1. NO breakfast, NO bolus

2. Test BG every 2 hrs from waking until lunch. DO NOT SLEEP IN!

3. If BGs stay within 30 mg/dl, basal OK; if not, adjust

Evening Basal

1. NO supper NO bolus

2. Test BG every 2 hrs between lunch & bedtime snack at 10:00 p.m.

3. If BGs stay within 30 mg/dl, basal OK; if not, adjust

NOTE — DO NOT "fix" a high glucose during the time you are checking your BGs every 2 hours. Correct at the next scheduled meal, using your correction factor. If you miss a day — continue the plan the next day. May need to repeat the "4 Day Plan" two or three times until the basal rates are corrected.

ADJUSTING INSULIN TO CHO RATIO

1. Check 2 hours after each meal

2. If BGs not over 140 mg/dL, ratio correct; if higher — increase, if lower — decrease

3. May have 2-3 different ratios during the day — may need 1 unit per 8 gms in a.m., 1 unit per 10 or 15 for lunch and dinner, or 1 per 8 in a.m., 1 per 10 for lunch, and 1 per 15 for dinner.

ADJUSTING CORRECTION FACTOR

1. If hypoglycemia occurs after correcting for a high, lower correction factor
2. If BG still high after 3–4 hours, increase factor.

OTHER TIPS AND SAFETY

1. Change site every 2–3 days (every other day with pregnancy). ALWAYS do site changes in the MORNING — NEVER at bedtime! Check BG 2 hours after a site change to ensure the "cath" is placed correctly and pump is functioning properly
2. Inspect site twice a day — if swelling, redness, pain, or drainage — CHANGE SITE!
3. ALWAYS carry extra supplies with you in case the catheter gets dislodged
4. ALWAYS have a supply of syringes on hand in case of pump malfunction
5. ALWAYS wear identification stating you have Diabetes and wear an insulin pump
6. If you have 2 BGs over 240 mg/dL in a row — inject insulin according to the correction factor and CHANGE SITE. Retest 2 hours after
7. NEVER NEVER NEVER go to bed with a low battery
8. If you perspire heavily, may use a solid non-fragrance antiperspirant around site or try other types of tape that are available. Skin Tac "H", Polyskin, Tegaderm, Hypafix, HyTape, Dermicell, SkinPrep, Mastasol, and toupee glue are other options to try.

GOING OFF THE PUMP

1. Be sure you check with your doctor before disconnecting from the pump for any length of time.
2. DO NOT disconnect for more than 1-2 hours unless you have the OK from MD.
3. Reasons to go off the pump may be due to pump malfunction — call 1-800-send pump — the pump manufacturer will immediately send a loan pump until yours is repaired or replaced. Another reason may be just a desire to have a "vacation" from the pump.

Time Off Pump	Action
1–1½ hrs	No action unless CHO will be eaten or BG is high
1½–5 hrs.	Before disconnecting, give a bolus to replace 80% of the basal that will be lost Inject before eating using insulin to CHO Ratio
DAYTIME ONLY	Give injection before each meal by using your insulin to CHO ratio PLUS the basal insulin needed until the next meal
3–4 Days or More	Inject fast-acting insulin before each meal using your insulin to CHO ratio and correction factor for highs. At bedtime, inject Lantus to equal 1.5 X the basal rate used for the overnight period.

TRAVELING

1. ALWAYS carry at least 1 weeks' worth of extra supplies on top of what you will normally use — if you are staying for 2 weeks, carry supplies for 3 weeks.

2. NEVER check your supplies in baggage — CARRY them with you.

3. Carry snacks with you.

4. WEAR IDENTIFICATION stating you have diabetes and wear an insulin pump.

5. Remember to change the time on your pump if you will be crossing time zones.

6. Get a letter from your doctor explaining what to do for your diabetes, listing medications and devices that you may use. The letter should also state any food or medication allergies you may have. Also get a prescription to carry with you for any medications you may need. Know the name and number of an endocrinologist in the area where you're traveling may prove useful.

7. Carry bottles of insulin IN THEIR BOXES with your name, doctor's name, your pharmacy's name, and medication on a pre-printed label.

8. Contact your airline for any specifics — different airlines have different rules regarding diabetes supplies — don't be surprised!

9. The pump can be worn through the scanner at the airport without causing it harm. Don't call attention to it.

HOSPITALIZATIONS

1. Remove pump for X-rays, MRIs.

2. Be prepared beforehand — carry a letter from your endocrinologist with orders for you to keep the pump on, check your own glucose levels and do your own adjustments.

3. If you are unable to care for the pump, have a family member do so. If you have no family with you, the pump may be removed, but ONLY after the nurses have orders for insulin coverage. DKA can occur much faster after disconnecting from the pump because there is no long-acting insulin on board.

4. The pump gives better control during and after surgery, so ask doctors to allow that it stay connected. As soon as possible after surgery, ask to have the pump reconnected if it was discontinued during the surgery.

5. Pregnant patients will need to move insertion site to the thigh area immediately after beginning labor and leave the pump connected during labor. Insulin resistance dramatically decreases after the placenta is delivered — so be prepared to decrease basal rates. Basal rates will remain lower if the mother is breast feeding also.

STANDARDS OF CARE:
DIABETES EDUCATION AND MANAGEMENT PROGRAM

Insulin Pump Education: Up to 8 Visits

A. Initial visit/s prior to pump start, CDE:

1. Data collection & review; assessment of self-management skills, readiness to learn and barriers to learning

2. Prerequisites for successful pumping:

   a. One month of multiple injection therapy with Lantus and Humalog or Novolog

   b. Many BGs showing testing at least 4 times a day for one month

   c. Knowledge of pump function through watching video or doing on online pump program

3. Intro to pumps; basal & bolus rates, insertion sites

4. Refer to RD for dietary counseling and CHO counting assessment

5. Assess glucose meter skills

6. Resources: videos, books, pamphlets, web sites

7. Goal setting

B. Initial visit/s prior to pump start, RD:

1. Data collection & review; weight, food record

2. Review of meal planning and CHO counting

3. Validate ability to count carbs at home, at work or school, at restaurants and fast-food locations

4. Goal setting

C. Follow-up visit, day of pump start, CDE (3–4 hours):

1. Pump specifics; buttons, syringe filling, priming, insertion technique

2. Initial settings

3. Problem solving, alarms

4. Restocking supplies

5. Hypoglycemia and hyperglycemia management, DKA prevention

6. Review of tasks and follow-up plan

7. Status of goals and reinforcement of positive changes

8. Resources: videos, books, pamphlets, web sites

9. Goal setting

D. The CDE will emphasize that regulating basal and bolus rates and determining insulin to carb ratios is essential until the blood sugars are within the preset goal ranges. Telephone support for emergencies is available 24 hours per day.

E. Follow up visit, within one month or more frequently if needed, CDE:

1. Data collection & review; blood sugar trends, meter download

2. Review basal & bolus rates

3. Review of site adequacy & insertion technique

4. Confirm completion of basal rate testing

5. Sick day management/DKA prevention.

6. Status of goals and reinforcement of positive changes

7. Goal setting

F. Follow-up visits with RD as needed.

1. Data collection & review; blood sugar trends, food records

2. Review of meal plan and carb counting

3. Review of food adjustments for sick days and exercise

4. Status of goals and reinforcement of positive changes

5. Goal setting

G. Follow-up visits (quarterly for first year then annually) with CDE:

1. Data collection & review; blood sugar trends, A1c results

2. Self-management review and problem solving

3. Status of goals and reinforcement of positive changes

4. Goal setting

5. If child, movement toward independence in diabetes care

INSULIN PUMP FOLLOW-UP

Patient Name _____ Date _____

Certified Pump Trainer _____

Pump Model _____ Serial # _____

BASIC REVIEW	SITE CHANGE PROTOCOL

ADDITIONAL FEATURES INSTRUCTED:	NOTES

BLOOD GLUCOSE RECORD

DATE	TIME	BG	CHO GRAMS	INSULIN

Basal Rate Changes:

From 12 Midnight to _____ : _____ units per hour

From _____ to _____ : _____ units per hour

From _____ to _____ : _____ units per hour

From _____ to _____ : _____ units per hour

Pump Trainer Signature _____ Date _____

INSULIN PUMP CONTACTS

Trainer: _____

Phone: _____

Alternate trainer: _____

Alternate phone: _____

REFERENCES

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Bolderman, KM. *Putting Your Patients on the Pump*, American Diabetes Association, 2002 Alexandria, Virginia. ISBN 1-58040-148-1

Frederickson, L, ed. In. *The Insulin Pump Therapy Book Insights From The Experts*. MiniMed Technologies. Los Angeles, California. 1995 ISBN 0-9647837-0-3

Walsh, J & Roberts, R. *Pumping Insulin Everything You Need To Know For Success With An Insulin Pump,* 3rd edition. ISBN 1-88480484-5

Amrhein, James A. MD and Hess, B, RN, BSN, CDE. *Optimizing Glycemic Control with Diabetes Technology.* AADE 29th Annual Meeting, August 7, 2002, Philadelphia, Pennsylvania.

Brooks, AM, RN, CDE. St. Marks Hospital Diabetes Center, Salt Lake City, Utah and Kulkarni, K, MS, RD, BC-ADM, CDE, St. Marks Hospital Diabetes Center, Salt Lake City, Utah. *Core Curriculum for Diabetes Education,* Fourth Edition. Diabetes Management Therapies, Chapter 6, pg. 203-225.

Foot Screening Mapping Examples
Touch-Test™ Sensory Evaluators

North Coast Medical, Inc.
18305 Sutter Boulevard
Morgan Hill, CA 95037-2845
800-821-9519
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

DORSAL   PLANTAR

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.
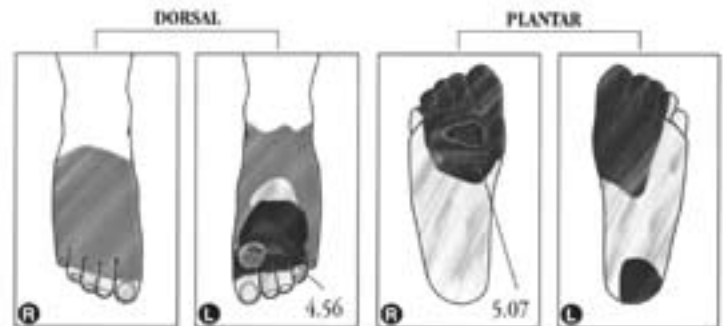
Re-evaluation - Visit #2

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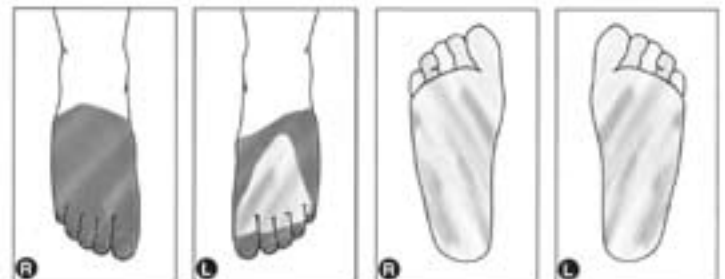
LEFT FOOT: Improved to diminished protective sensation proximal to the first dorsal web space.

Re-evaluation - Visit #4

RIGHT FOOT: Normal throughout.

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

Foot Screening Forms (NC12749)

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*Diabetic Foot Screen**

*performed every primary care visit (for complete foot exam details, see page 8.5)

	NO	YES	
Acute swelling and/or Acute deformity	☐	○ →	**Page 8.5**
Skin breakdown (ulcer)	☐	○ →	**Page 8.5**
Callus – with deeper color changes	☐	○ →	**Page 8.5**
Digital Deformity.. or chronic midfoot/rearfoot prominence	☐	○ →	**Page 8.5**
History of amputation and/or ulceration	☐	○ →	**Page 8.5**
Dystrophic Nails &/or Dry Skin	☐	○ →	**Page 8.5**
Neuropathy: using 10-gram nylon monofilament .... performed yearly 4 out of 10 sites imperceptible = "yes"	☐	○ →	**Page 8.5**

Assign Risk Category:

No Present Risk		
____ 0	No loss of protective sensation, no deformity.	
Impending Risk		
____ 1	No loss of protective sensation. Deformity present.	
High Risk		
____ 2	Loss of Protective sensation with or without weakness, deformity, callus, pre-ulcer or history of ulceration.	

Adapted from the National Foot Treatment Center LEAP Program

FOOT PULSES:		**PALPABLE**	**NONPALPABLE**	
Right:	Dorsalis Pedis	☐	○ →	
	Posterior Tibialis	☐	○ →	**Ankle Brachial Index (ABI) Page 8.5**
Left:	Dorsalis Pedis	☐	○ →	
	Posterior Tibialis	☐	○ →	

TEXAS Department of State Health Services

Stock #45-12000

TEXAS DIABETES COUNCIL

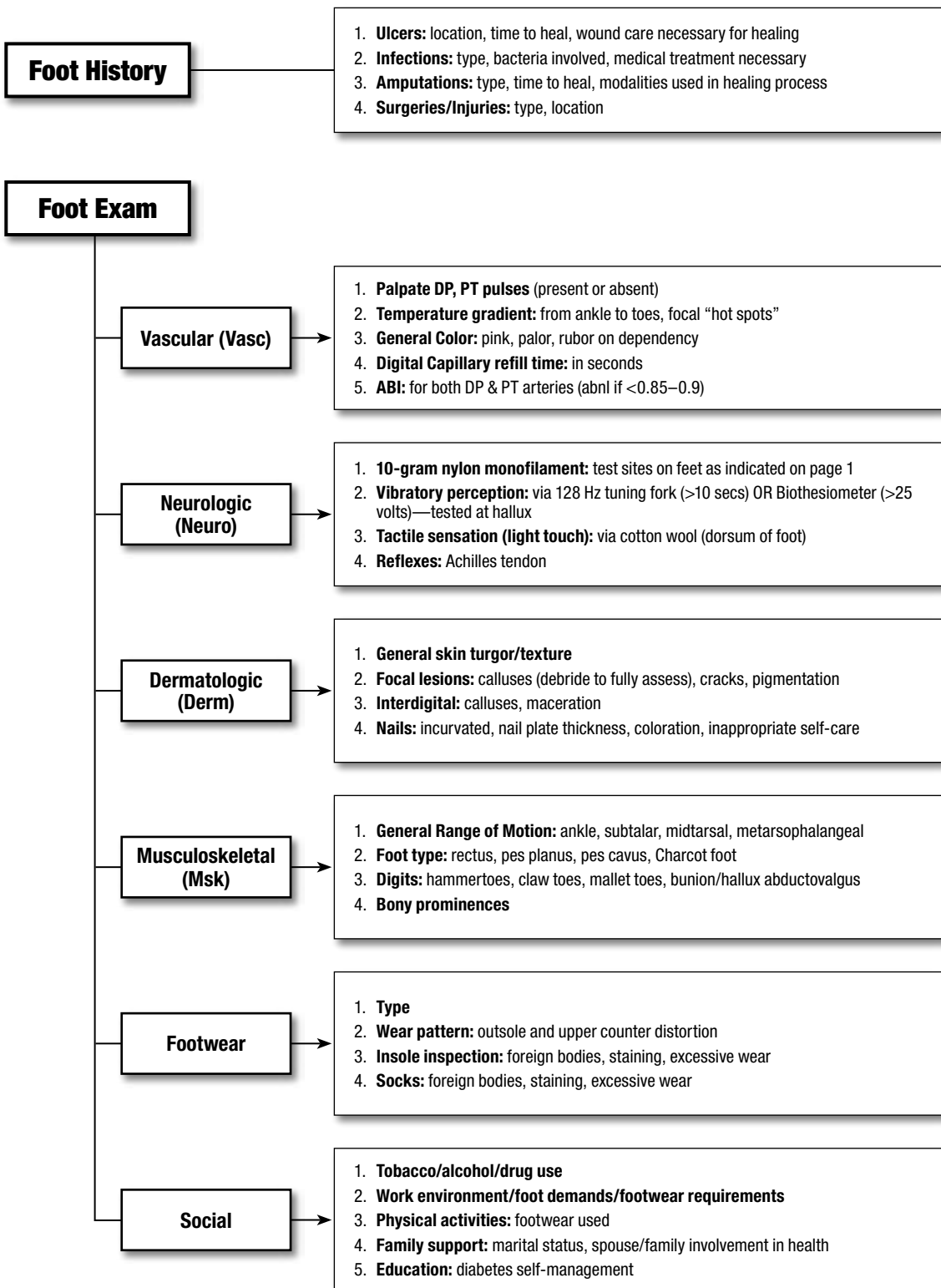Approved 04-23-04

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

Resources & References:

1. International Consensus on the Diabetic Foot, 2003. International Working Group on the Diabetic Foot (consultative section of the International Diabetes Federation)

2. University of Texas Health Science Center-San Antonio Texas-Department of Orthopedics-Division of Podiatry

3. Scott & White Clinic / Texas A&M University System Health Science Center-Department of Surgery, Division of Podiatry

4. American Diabetes Association: Clinical Practice Recommendations. *Diabetes Care.* 2004; 27[S1]:63-64.

*Diabetic Foot Exam***

**Performed Initially at Diagnosis, Annually in Primary Care

Foot History

1. **Ulcers:** location, time to heal, wound care necessary for healing
2. **Infections:** type, bacteria involved, medical treatment necessary
3. **Amputations:** type, time to heal, modalities used in healing process
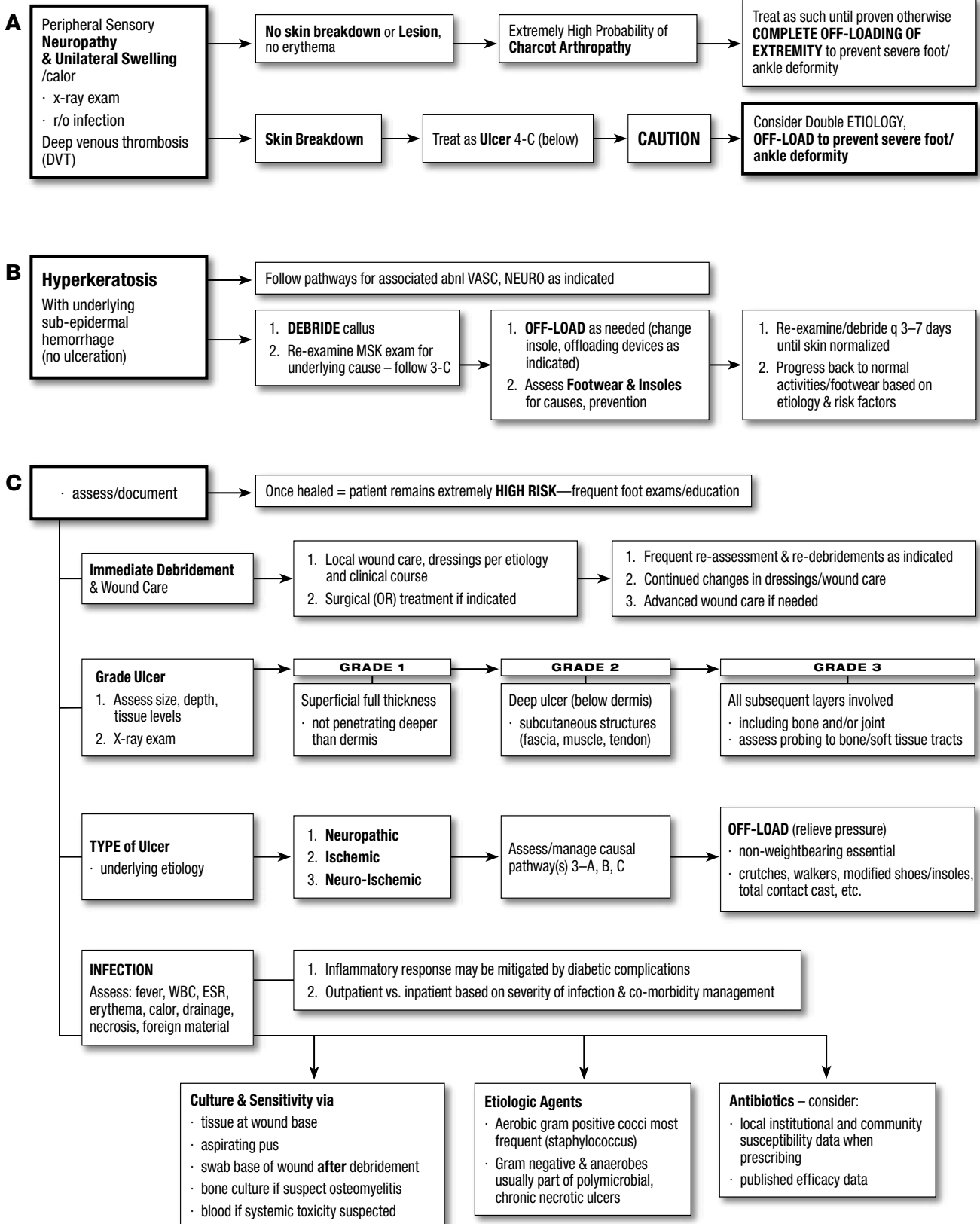4. **Surgeries/Injuries:** type, location

Foot Exam

Vascular (Vasc)

1. **Palpate DP, PT pulses** (present or absent)
2. **Temperature gradient:** from ankle to toes, focal "hot spots"
3. **General Color:** pink, palor, rubor on dependency
4. **Digital Capillary refill time:** in seconds
5. **ABI:** for both DP & PT arteries (abnl if <0.85–0.9)

Neurologic (Neuro)

1. **10-gram nylon monofilament:** test sites on feet as indicated on page 1
2. **Vibratory perception:** via 128 Hz tuning fork (>10 secs) OR Biothesiometer (>25 volts)—tested at hallux
3. **Tactile sensation (light touch):** via cotton wool (dorsum of foot)
4. **Reflexes:** Achilles tendon

Dermatologic (Derm)

1. **General skin turgor/texture**
2. **Focal lesions:** calluses (debride to fully assess), cracks, pigmentation
3. **Interdigital:** calluses, maceration
4. **Nails:** incurvated, nail plate thickness, coloration, inappropriate self-care

Musculoskeletal (Msk)

1. **General Range of Motion:** ankle, subtalar, midtarsal, metarsophalangeal
2. **Foot type:** rectus, pes planus, pes cavus, Charcot foot
3. **Digits:** hammertoes, claw toes, mallet toes, bunion/hallux abductovalgus
4. **Bony prominences**

Footwear

1. **Type**
2. **Wear pattern:** outsole and upper counter distortion
3. **Insole inspection:** foreign bodies, staining, excessive wear
4. **Socks:** foreign bodies, staining, excessive wear

Social

1. **Tobacco/alcohol/drug use**
2. **Work environment/foot demands/footwear requirements**
3. **Physical activities:** footwear used
4. **Family support:** marital status, spouse/family involvement in health
5. **Education:** diabetes self-management

Diabetic Foot Care/Referral Algorithm

Complete Diabetic Foot Exam** (see page 8.5)

ABBREVIATIONS:

MD	medical doctor	**ABI**	ankle/brachial index
DO	doctor of osteopathy	**TCPO2**	transcutaneous oxygen
DPM	doctor of podiatric		pressure
	medicine (Podiatrist)	**NCV**	nerve conduction
NL	normal		velocities
ABNL	abnormal	**PSSD**	pressure specified
			sensory device

Normal (NL) Exam

MD/DO/DPM (or physician extender)

NL vasc
NL neuro
NL msk
NL derm

DM FOOT EDUCATION
· patient/family (Diabetes Self-Management Education)
· verbal/written
· websites
· clinic phone numbers

REPEAT Diabetic Foot Screen*
per MD, DO, physician extender visits or DPM exam
REPEAT EVERY VISIT

Abnormal (ABNL)

NORMAL testing-repeat per change in exam or onset symptoms

A

ABNL VASC
NL neuro
NL msk
NL derm

VASCULAR CONSULT/TESTING
Consider: PVR, Seg. pres., ABI, TCPO2
· peripheral arteriogram as indicated
· intervention as indicated to re-establish blood flow

Documentation of vascular disease
OR
Post intervention with improvement

· EDUCATION: signs/symptoms
· HIGH RISK foot status
· Foot screen every MD/DO/DPM, or physician extender visit

B

NL vasc
ABNL NEURO
NL msk
NL derm

NEURO or PM&R CONSULT
Consider: NCV, PSSD
· other causes: consider and rule out as indicated
· if painful consider pharmaceutical vs. surgical treatment

· EDUCATION: signs/symptoms
· HIGH RISK foot status
· Foot screen every MD/DO/DPM, or physician extender visit, **PRN**

C

NL vasc
NL neuro
ABNL MSK
NL derm

COMPLETE BIOMECHANICAL EXAM
(Podiatrist, Orthopedist)
· discuss clinical significance
· Treatment options: surgical, non-surgical

· EDUCATION: signs/symptoms
· Intervention: surgery→healed = low risk
· Biomech: shoes, orthoses, phys.medicine
· Follow up DPM per modality needed
· Foot screen: every MD/DO/ physician extender visit

D

NL vasc
NL neuro
NL msk
ABNL DERM

Dystrophic (thick, discolored) toenails

· Debride/reduce
· Culture as needed
· Educate on condition management
· Referral as needed (podiatrist, dermatologist)

Dry skin, fissures

· Diagnostic tests as indicated, e.g., for fungus
· Topicals as indicated
· Referral as indicated

Ingrown toenail

· Instruct on proper nail care
· Matrixectomy if NL vasc exam

High Risk Scenario and Ulcer Management

A | Peripheral Sensory **Neuropathy & Unilateral Swelling** /calor
· x-ray exam
· r/o infection
Deep venous thrombosis (DVT)

→ **No skin breakdown** or **Lesion**, no erythema → Extremely High Probability of **Charcot Arthropathy** → Treat as such until proven otherwise **COMPLETE OFF-LOADING OF EXTREMITY** to prevent severe foot/ankle deformity

→ **Skin Breakdown** → Treat as **Ulcer** 4-C (below) → **CAUTION** → Consider Double ETIOLOGY, **OFF-LOAD to prevent severe foot/ankle deformity**

B | **Hyperkeratosis**
With underlying sub-epidermal hemorrhage (no ulceration)

→ Follow pathways for associated abnl VASC, NEURO as indicated

→ 1. **DEBRIDE** callus
2. Re-examine MSK exam for underlying cause – follow 3-C

→ 1. **OFF-LOAD** as needed (change insole, offloading devices as indicated)
2. Assess **Footwear & Insoles** for causes, prevention

→ 1. Re-examine/debride q 3–7 days until skin normalized
2. Progress back to normal activities/footwear based on etiology & risk factors

C | · assess/document → Once healed = patient remains extremely **HIGH RISK**—frequent foot exams/education

Immediate Debridement & Wound Care → 1. Local wound care, dressings per etiology and clinical course
2. Surgical (OR) treatment if indicated

→ 1. Frequent re-assessment & re-debridements as indicated
2. Continued changes in dressings/wound care
3. Advanced wound care if needed

Grade Ulcer
1. Assess size, depth, tissue levels
2. X-ray exam

GRADE 1	GRADE 2	GRADE 3
Superficial full thickness · not penetrating deeper than dermis	Deep ulcer (below dermis) · subcutaneous structures (fascia, muscle, tendon)	All subsequent layers involved · including bone and/or joint · assess probing to bone/soft tissue tracts

TYPE of Ulcer
· underlying etiology → 1. **Neuropathic** 2. **Ischemic** 3. **Neuro-Ischemic** → Assess/manage causal pathway(s) 3–A, B, C → **OFF-LOAD** (relieve pressure)
· non-weightbearing essential
· crutches, walkers, modified shoes/insoles, total contact cast, etc.

INFECTION
Assess: fever, WBC, ESR, erythema, calor, drainage, necrosis, foreign material → 1. Inflammatory response may be mitigated by diabetic complications
2. Outpatient vs. inpatient based on severity of infection & co-morbidity management

Culture & Sensitivity via
· tissue at wound base
· aspirating pus
· swab base of wound **after** debridement
· bone culture if suspect osteomyelitis
· blood if systemic toxicity suspected

Etiologic Agents
· Aerobic gram positive cocci most frequent (staphylococcus)
· Gram negative & anaerobes usually part of polymicrobial, chronic necrotic ulcers

Antibiotics – consider:
· local institutional and community susceptibility data when prescribing
· published efficacy data

Recommendations for Treatment of Painful Peripheral Diabetic Neuropathy in Adults

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Evaluate for and treat secondary causes of peripheral neuropathy:

- Glucose control
- Macrocytic anemia, B12, Folic acid or Vitamin D deficiency
- Lifestyle changes-alcohol & smoking cessation
- Radiculopathy
- Electrophysiology assessment recommended if glucose control does not improve pain due to other potential etiologies

---

No treatment has been shown to result in superior pain control compared to another agent

Choice of agent should be based on:

- Side effects
- Comorbidities
- Cost
- Concomitant Medications
- Realistic expectations: Goal pain relief /partial relief

Glycemic control goals should be met, if possible, prior to the start of pain medications

→

Select any of the agents to initiate at low dose and titrate to minimal effective dose [1]

→

At least 2 months at minimum effective dose [1]

→

OR

Change to a different agent if initial therapy is not effective

- Refer to Specialist
- Consider low dose combination therapy if partial pain relief with any agent
- Consider other therapeutic agents with reported efficacy
- Consider surgical intervention/referral if other modalities fail

---

Medications Listed *Alphabetically*

Duloxetine [1]

Pros:
- May also treat depression

Cons:
- May cause nausea, dizzy/drowsy
- Use with caution with other antidepression medication

Minimum Effective Dose
60 mg daily

Gabapentin [1]

Pros:
- Generic

Cons:
- Saturable absorption gives lower absorption with increasing doses
- Example: absorption at 900mg/day: 60% 3600mg/day: 33%
- Some risk of dizzy/drowsiness/weight gain
- Renal adjustment of dose may be needed

Minimum Effective Dose
100-600 mg tid

Pregabalin [1]

Pros:
- No saturable absorption issues as with gabapentin

Cons:
- Similar mechanism of action to gabapentin
- Some risk of dizzy/drowsiness/weight gain
- Renal adjustment of dose may be needed

Minimum Effective Dose
50 mg tid or 150 mg hs

Tramadol [1]

Pros:
- Generic

Cons:
- Nausea
- Dizziness

Cautions
- Contraindicated in known seizure disorder or with MAO Inhibitors
- Caution with use with other serotonergic agents
- Avoid abrupt withdrawal

Minimum Effective Dose
50 mg bid

Tricyclic antidepressants [1] (TCA's)

Pros:
- Generic

Cons:
- Anticholinergic side effects

Cautions
- Caution with use with other antidepressants
- Dose-related QTc prolongation
- Caution with other medications that inhibit CYP450 significantly

Minimum Effective Dose
12.5–50 mg at bedtime

Other therapeutic agents with reported efficacy:
Topical capsaicin, topical lidocaine, venlafaxine, bupropion, opioid derivatives, alpha–lipoic acid, MIRE therapy (Anodyne);
Consider surgical intervention if other modalities fail.

---

[1] Refer to prescribing information for titration recommendations
Argoff CE et al. Mayo Clin. Proc. 2006 Apr; 81(4 Suppl): S12-25.

Considerations for Elderly Persons with Diabetes

Diabetes continues to be a disease that disproportionately affects the elderly. In Texas, approximately 16.3% of people over age 65 have been diagnosed with diabetes, compared to approximately 8.1% of the overall population (BRFSS, 2003). Older adults with diabetes are more likely to experience complications from diabetes, thus, elderly patients with diabetes generate most of the costs of treating complications.

In particular the goals for treatment of the elderly person with diabetes should include:

1. Improving or maintaining health and functional status of the elderly with diabetes by maximizing glucose control.

2. Early detection and treatment of the complications of diabetes through organized, pro-active screening efforts.

3. Aggressive treatment of co-morbid risk factors, specifically hypertension and dyslipidemia.

4. Careful monitoring of therapy to avoid common problems in the elderly: polypharmacy, adverse drug events and inappropriate medication use.

Given that these goals are similar to those for treatment of diabetes in any age group, the patient's stage in the disease process and their co-morbid conditions rather than age alone are most important in determining the appropriate course of treatment. The Council supports the basic recommendations summarized in the *Minimum Practice Recommendations* flow sheet with modifications that consider issues for elderly populations.

Health care providers and payers, including managed care organizations, should adopt the Texas Diabetes Council's *Minimum Practice Recommendations* as the basis for managing diabetes in elderly patients.

Clinicians should strive to achieve the same levels of glycemic control (blood glucose, A1c), blood pressure and lipid control in elderly patients with diabetes as in younger ones. Targets may be modified in light of advanced complications, life-limiting co-morbid illness, or severe cognitive or functional impairments.

Given the high risk of secondary complications among elderly patients with diabetes, such as cardiovascular disease and lower extremity complications, clinicians should screen aggressively for and treat secondary complications.

Foot screening conducted at every visit includes not only visual inspection for lesions, infections, and calluses, but also assessment of pulses and use of monofilaments to further screen for neuropathy.

At each office visit, the clinician should specifically inquire about and consider comorbidities and the risks associated with polypharmacy, common problems in the elderly. Increased attention may be necessary in selecting and monitoring drug therapy in the elderly; for example, metformin may be contraindicated because of renal disease or heart failure.

Diabetes self-management education for the elderly should take into account special

instructional needs:

A) Elderly patients should be encouraged to include their caregiver or a family member in all educational sessions

B) Educational materials and methods should consider vision impairment, mobility, dexterity, mental state, functional status, and financial resources.

C) Elderly patients should be educated about possible effects of multiple medications and how concurrent illnesses may affect their treatment, self-care, and disease progression.

D) Preventing long-term complications of diabetes should be stressed.

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 1–2 mg/dl and the 2-hour postprandial glucose increases on average 8–20 mg/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 and Goals

The diagnostic criteria and goals of therapy remain the same throughout the lifespan.

- Maintain quality of life by minimizing impacts of this disease
- Preserve functional capacity by preventing complications
- Minimize risk of hypoglycemia
- Meet realistic weight goals
- Avoid glucose readings > 200mg/dl
- For frail elderly, aim for fasting or bedtime glucose > 100mg/dl
- Safety precautions are imperative to prevent falls

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
- Hypoglycemia related to sulfonylurea or insulin treatment, especially with declining renal function

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
- 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 a 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. Saturated fat should consist of less than 7% of the total calories*.
- Unless medically contradicted, encourage drinking 2 quarts of water per day.

* Diabetes Care, 2007 Jan; 30 Suppl 1 S11

- 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
  - otential 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
- Gastointestinal — 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

Guidelines for Management of the Elderly with Diabetes in Long-Term Care Facilities

Introduction

High Risk for Diabetes-related Complications

The elderly in long-term care facilities such as nursing homes or assisted living centers are at high risk for developing diabetes-related complications such as infections, non-healing wounds, amputations, myocardial infarction, strokes, and particularly, electrolyte depletion and dehydration that lead to high hospitalization rates in this population.

The elderly are often unable to detect and report problems due to age-related factors such as decreased cognition, sensation, mobility, communication, thirst response, that are typically associated with aging. Diabetes-related complications appear differently in the elderly, especially the frail. Often symptoms such as urinary frequency, nocturia or incontinence, volume depletion or dehydration, excessive skin alterations (ulcers), infections, or delayed wound healing, dental caries, periodontal disease, burning mouth, foot ulcers or deformities, and increased pain perception, rapid weight alteration, urinary frequency are symptoms that can be attributed to the aging process or noted as insignificant are often not associated with symptoms of complications secondary to diabetes.

	GUIDELINES FOR DIABETES MANAGEMENT	INDIVIDUALIZE CARE ACCORDING TO: PREFERENCES, FUNCTIONAL AND MEDICAL STATUS, AND PROGNOSIS OF PATIENT
	Adapted from American Medical Directors Association (2002), British Diabetic Association Report (1999) & Pandya, AMDA Clinical Practice Guidelines Steering Committee	
Evaluation Diabetes-Related of Complications	**Glycemic Control**	Pre-prandial and post-prandial glucose levels, A1c
	Assess Cardiovascular Disease Risk Factors or Conditions	Assess and treat atherosclerotic heart & cerebrovascular disease and/or cardiovascular complications Order electrocardiogram, echocardiogram, chest X-ray, arterial doppler studies of the legs, cognitive testing, computed tomography (CT), and brain magnetic resonance imaging (MRI) Consider prescribing: enteric-coated aspirin, clopidogrel or aspirin/extended release dipyridamole, beta-blockers

	GUIDELINES FOR DIABETES MANAGEMENT	INDIVIDUALIZE CARE ACCORDING TO: PREFERENCES, FUNCTIONAL AND MEDICAL STATUS, AND PROGNOSIS OF PATIENT
	Assess Peripheral or Autonomic Neuropathy	Foot deformity, gait impairment
	Psychological Assessment	Unrecognized depression, cognitive impairment
	Determine Severity of Complications	CBC, basic serum chemistry, renal and hepatic function, careful review of facility glucose logs (Not necessary to do A1c for treatment regimen change)
	Obtain History	Recent hospital records, community physicians & family members
Health Care Provider	**Guidelines to notify health care provider should be established within institution and for patient**	Glucose <60mg/dl or <75mg/dl with symptomatology of hypoglycemia (See "Hypoglycemia" in Diabetes Tool Kit) Marked changes in glucose: If >250mg/dl along with change in status, condition Glucose >300mg/dl for 3 consecutive days (Unless represents improvement to status or orders note method of management) Difficulty with oral intake for > 2 days or more accompanied with fever, lethargy, abdominal pain, hypotension, respiratory distress, etc.

GUIDELINES FOR DIABETES MANAGEMENT	INDIVIDUALIZE CARE ACCORDING TO: PREFERENCES, FUNCTIONAL AND MEDICAL STATUS, AND PROGNOSIS OF PATIENT
See Algorithms: **Glycemic Control for Type 2 Diabetes in Children & Adults** **Insulin for Type 1 Diabetes in Children and Adults** **Insulin for Type 2 Diabetes in Children and Adults** **Initiation of Insulin Therapy for Type 2 Diabetes in Children and Adults: A Simplified Approach** **IV Insulin Infusion Protocol for Critically Ill Adult Patients in the ICU Setting** **ICU Insulin Orders** **Insulin Pump Therapy**	**Anti-Diabetes Agents** **Metformin:** Consider if obese, not recommended over age 80, use only with normal liver, renal function, do not use with CHF, acute illness **Secretagogues, Sulfonylureas:** Consider for non-obese or mildly obese Consider for insulin resistance, obese patient **Thiazolidinediones:** Not used with Class III, IV CHF Normal liver function **Alpha-Glucosidase Inhibitors:** For patients near A1c goal (milder diabetes) and/or post-prandial hyperglycemia **Incretins:** No information at this time for use in the elderly population

	GUIDELINES FOR DIABETES MANAGEMENT	INDIVIDUALIZE CARE ACCORDING TO: PREFERENCES, FUNCTIONAL AND MEDICAL STATUS, AND PROGNOSIS OF PATIENT
Prevention & Treatment of Complications	**Hypoglycemia** (See "Hypoglycemia," Section, 8.1, in Diabetes Tool Kit, TDC) **Elderly (particularly frail) may exhibit atypical symptoms of hypoglycemia such as: disorientation, incoordination, altered personality, falls for unknown cause.** **Morbidity is heightened with nocturnal hypoglycemia, cognitive and communication problems, chronic cardiac and liver disease, and adrenal or pituitary insufficiency.**	Treat with carbohydrate in the form of glucose, sucrose tablet or juice combined with light snack containing protein: Oral glucose paste, intramuscular glucagon, intravenous 50% dextrose Consider and assess for risks of hypoglycemia High doses, rapid acting insulin (with delayed meal consumption) Inconsistent calorie intake, hypoglycemia unawareness **Insulin & Hypoglycemia:** To decrease risk of hypoglycemia: Avoid prolonged use of "sliding-scale insulin" (graded increases in short- or rapid-acting insulin for every 50 to 100 mg/dl rise in blood glucose, usually administered before meals and at bedtime); increases morbidity, nursing time, not shown to improve metabolic control Sliding scale should be reserved for short-term glucose control post illness or surgery Fixed daily doses of insulin are recommended once daily insulin requirements are noted Endocrinologist consultant recommended for labile diabetes or for those on insulin pump

GUIDELINES FOR DIABETES MANAGEMENT	INDIVIDUALIZE CARE ACCORDING TO: PREFERENCES, FUNCTIONAL AND MEDICAL STATUS, AND PROGNOSIS OF PATIENT
Foot Care **See Foot Care Materials:** **Foot Screening Mapping Examples** **Diabetic Foot Screen** **Diabetic Foot Exam** **Diabetic Foot Care/Referral** **High Risk Scenario & Ulcer Management** **Recommendations for Treatment of Painful Peripheral Diabetic Neuropathy**	Assess skin and soft-tissue for alterations, sensation, color, temperature, circulation, presence of neuropathy, foot deformity, gait Order protective footwear with accommodating insoles Assure that feet are examined during all scheduled visits Teach preventive foot care to patients, families, nursing assistants If foot at risk: Order Routine Podiatric care; daily foot care by patient and caregivers With mild infection or ulcer consider local dressings; baseline X-ray for bone integrity or osteomyelitis; podiatry or wound care referral as needed (so that wounds are treated, reassessed, and debrided on site if at all possible). Limb-threatening ulcer or infection: consider hospitalization; referral to podiatry or vascular surgery

	GUIDELINES FOR DIABETES MANAGEMENT	INDIVIDUALIZE CARE ACCORDING TO: PREFERENCES, FUNCTIONAL AND MEDICAL STATUS, AND PROGNOSIS OF PATIENT
	Eye Disease	Assessment of pain, infections, visual disturbance
	(See Chronic complications sections in Diabetes Tool Kit, TDC, Section, 9.1)	Annual dilated eye examination if appropriate
	Oral care	Diabetes, hypertension, and proteinuria control prevention
	See Diabetes and Gum Disease, H9.13	Evaluate oral cavity for pain, signs of infection, eating, swallowing disorders.
	Hypertension	Consider dietitian consult, prophylactic antibiotics, and/or dental services
	See Algorithm: Hypertension for Diabetes in Adults	Consider angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs)
	Diabetic nephropathy	Consider dietitian & nephrologist consultation
		Consider protein-restricted diet
	Dyslipidemia	Utilize multiple methods to control of blood glucose and hypertension: angiotensin-converting enzyme inhibitors, angiotensin receptor blockers
	See Algorithm: Lipid Treatment for Type 1 and Type 2 Diabetes in Adults	Consider dietitian consult
	Macrovascular Risk Reduction in Diabetes: Antiplatelet Therapy	Important to maintain control of lipids, blood pressure, blood glucose
		Utilized lipid-lowering medication as applicable and appropriate
		Note: Dietary restriction is not recommended in frail elderly patients
	Immunization	Consider influenza & pneumococcal vaccine
An Interdisciplinary Approach	Health Care Provider Assessment and Team Intervention to evaluate functional and medical status, and rehabilitation needs	Team members needed include: consultations from dietitian, pharmacist, physical therapist, activity therapist, podiatrist, mental health professional as needed

	GUIDELINES FOR DIABETES MANAGEMENT	INDIVIDUALIZE CARE ACCORDING TO: PREFERENCES, FUNCTIONAL AND MEDICAL STATUS, AND PROGNOSIS OF PATIENT
Medical Nutrition Therapy	**Dietitian Consult & Assessment Warranted** **No "ADA" diet recommended; Assess for common problems such as, chewing difficulty, decreased appetite, undernourished, anorexia, depression, dependency, chewing difficulty, and chronic gastrointestinal complaints.** **See Algorithm: Nutrition Recommendations and Interventions for Diabetes** **Diabetes Medical Nutrition Therapy & Prevention**	"No concentrated sweets": or "no added sugar" diets are inappropriate and do not contribute to good outcomes (*J Am Dietetic Assoc* 2001;101:1463-1466) and affect quality of life. Avoid calorie restricted diets particularly in those with major infections, major surgical procedures with multiple complications incurred Avoid fat and sugar-free restriction, except for obese and/or dyslipidemic residents: decreases palatability of food Meals should be prepared considering cultural, religious themes (Consider eating habits, food preferences, and food brought in by family members) Balanced meals and snacks with consistent carbohydrate content should be consumed at consistent times of the day Lean meats, nuts, eggs, fish, (6–8 servings/oz., 1 oz. Meat, fish, poultry, cheese Low & Non Fat Milk , Yogurt (2–3 servings, 1 cup milk, yogurt Dark, bright colored vegetables (6 servings ½ cooked, 1 cup raw) Dark Colored Fresh fruit (2 servings- small, size of tennis ball) Whole enriched fortified grains, beans and strachy vegetables (5–6 servings) Exercise regimens should be individualized with attention to diabetes related complications, preventing worsening of glycemic status, hypoglycemia and adjusting oral medication and/or insulin therapy according to optimize glucose and prevent hypoglycemia Special formulas are expensive, often unnecessary; the health care provider should pay close attention to glucose logs while making periodic pharmacological regimen adjustments

	GUIDELINES FOR DIABETES MANAGEMENT	INDIVIDUALIZE CARE ACCORDING TO: PREFERENCES, FUNCTIONAL AND MEDICAL STATUS, AND PROGNOSIS OF PATIENT
Personal Care	Personal hygiene, skin, oral & foot care 20-40% Have neuropathy, peripheral vascular disease, or both	Caregivers are needed for basic daily, mobility, toileting care to prevent ulcers or infected feet
	References	American Medical Directors Association. (2002). Managing diabetes in the long-term care setting, Columbia (MD): American Medical Directors Association (AMDA); Pandya, N. (2003) Long-term care guidelines for diabetes management, Clinical Practice Guidelines Steering Committee, Albuquerque, NM, AMDA, Caring for the Ages, 4(2). British Diabetic Association Report. (1999). Guidelines of practice for residents with diabetes in care homes, A report prepared by a Working Party of the British Diabetic Association on behalf of the Diabetes Care Advisory Committee.

Key Points About Diabetes in LTC

- Diabetes management must be individualized: patients' preferences, medical and functional status, and prognosis should be taken into consideration.
- Strict dietary restrictions should be replaced with a diet plan that incorporates eating habits and food preferences.
- Weight loss and increased activity may not be possible for many patients, and attempts to implement this may delay proper treatment.
- The physician is responsible for controlling blood glucose with pharmacological means if possible, to match food consumption.
- A thorough clinical evaluation of the patient is essential to determine the burden of diabetes and to formulate a treatment plan.
- An interdisciplinary effort is required to manage this complex disease.
- Daily attention to oral care and skin care may prevent complications overall. Specifically nutritional problems, pressure sores, foot ulcerations, and deep infections may be eliminated.
- Patient-specific treatment goals and reasons for not following recommended treatments should be documented in the medical record.
- Glycemic goals should be liberalized for the patient at risk of frequent hypoglycemia and for the patient who is at end of life.