This product was developed by the RWJ Diabetes Self Management Program at Community Health Center, Inc. in Middleton, CT. Support for this product was provided by a grant from the Robert Wood Johnson Foundation® in Princeton, New Jersey.
ADA CLINICAL PRACTICE RECOMMENDATIONS

Daren Anderson, MD
Medical Director
Community Health Center, Inc.
Criteria for the Diagnosis of Diabetes

1. Symptoms of diabetes (polyuria, polydipsia, unexplained weight loss) plus casual plasma glucose concentration ≥200 mg/dL (11.1 mmol/L). (Casual = any time of day without regard to time since last meal)

or

2. FPG ≥126 mg/dL (7.0 mmol/L). (Fasting = no caloric intake for at least 8 h)

or

3. 2h plasma glucose ≥200 mg/dL during an OGTT (75 g) performed as described by WHO

In the absence of unequivocal hyperglycemia with acute metabolic decompensation, these criteria should be confirmed by repeat testing on a different day. The OGTT is not recommended for routine clinical use.

Rationale for Glucose Control

- Prevent acute hyperglycemic complications (DKA, HNK)
- Relieve hyperglycemic symptoms
  - Polydipsia
  - Polyuria
  - Weight loss
  - Blurred vision
- Prevent long-term complications
Good Glycemic Control (Lower HbA$_{1c}$) Reduces Incidence of Complications

<table>
<thead>
<tr>
<th>HbA$_{1c}$</th>
<th>DCCT</th>
<th>Kumamoto</th>
<th>UKPDS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>9 → 7%</td>
<td>9 → 7%</td>
<td>8 → 7%</td>
</tr>
<tr>
<td>Retinopathy</td>
<td>63%</td>
<td>69%</td>
<td>17-21%</td>
</tr>
<tr>
<td>Nephropathy</td>
<td>54%</td>
<td>70%</td>
<td>24-33%</td>
</tr>
<tr>
<td>Neuropathy</td>
<td>60%</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Macrovascular disease</td>
<td>41%*</td>
<td>–</td>
<td>16%*</td>
</tr>
</tbody>
</table>

* not statistically significant

Assessment of Glycemic Control
Self-Monitoring of Blood Glucose

- SMBG is an integral component of diabetes therapy
- Include SMBG in management plan
- Instruct patient in SMBG and routinely
- Evaluate the patient’s technique and ability to use data to adjust therapy
**Glycated Protein Testing**

Glycated Hemoglobin (HbA1c),
%= Mean glucose

<table>
<thead>
<tr>
<th>HbA1c %</th>
<th>MBG</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0</td>
<td>81mg/d</td>
</tr>
<tr>
<td>5.1</td>
<td>84</td>
</tr>
<tr>
<td>5.2</td>
<td>87</td>
</tr>
<tr>
<td>5.3</td>
<td>90</td>
</tr>
</tbody>
</table>

---

**MBG=(HbA1c x 33.3) - 86**

<table>
<thead>
<tr>
<th>HbA1c %</th>
<th>MBG</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.9</td>
<td>210</td>
</tr>
</tbody>
</table>


GLYCOSYLATED HEMOGLOBIN

NH-Δ
BONE MARROW

1
20
40
60
120
100

2% 4% 4% 14% 14% 14%

DAYS

HYPERGLYCEMIA
Physiologic Insulin Secretion
24-Hour Profile

Insulin (µU/mL)

Glucose (mg/dL)

Time of Day

Basal Insulin

Basal Glucose
Basal – Bolus Therapy

- Physiologic
- Attainment of goal HbA1c
- Potential reduction in cardiovascular morbidity with reduction in blood glucose excursion
Nutritional Goals

- Provide meal-planning advice
- Balance food intake with drug therapy and exercise
- Maintain reasonable weight by monitoring calorie consumption
## Glycemic Control in Diabetes

<table>
<thead>
<tr>
<th>Biochemical Index</th>
<th>Normal</th>
<th>ADA Goal</th>
<th>AACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preprandial glucose</td>
<td>&lt;110</td>
<td>80–120</td>
<td>&lt;110</td>
</tr>
<tr>
<td>(mg/dL)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postprandial glucose</td>
<td></td>
<td>80–180</td>
<td>&lt;140</td>
</tr>
<tr>
<td>Bedtime glucose</td>
<td>&lt;120</td>
<td>100–140</td>
<td>&lt;140</td>
</tr>
<tr>
<td>(mg/dL)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HbA$_{1c}$ (%)</td>
<td>&lt;6</td>
<td>&lt;7</td>
<td>&lt;6.5</td>
</tr>
</tbody>
</table>

*Measurement of capillary blood glucose.

Physical Activity
- Tennis: 420 Cal./Hr.
- Cycling: 2-600 Cal./Hr.
- Walking: 900 Cal./Hr.
- Walking with dog: 2-300 Cal./Hr.
- Sitting and smoking: 80 Cal./Hr.
Cardiovascular Disease: Risk Factor Management

- Blood pressure control
- Glucoregulation
- Lipid management
- Anti-platelet treatment
- Smoking cessation
Lipid and Blood Pressure Goals

<table>
<thead>
<tr>
<th>Blood Pressure (mmHg)</th>
<th>Lipids (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systolic &lt;130</td>
<td>Cholesterol &lt;200</td>
</tr>
<tr>
<td>Diastolic &lt;80</td>
<td>LDL-C &lt;100</td>
</tr>
<tr>
<td></td>
<td>HDL-C M&gt;45 W&gt;55</td>
</tr>
<tr>
<td></td>
<td>Triglycerides &lt;150</td>
</tr>
</tbody>
</table>
The Metabolic Syndrome of Insulin Resistance

- Complex Dyslipidemia
  - Inc TG, sdLDL
  - Dec HDL
- Endothelial Dysfunction
- Systemic Inflammation
- Dyslipidemia
  - Inc TG, sdLDL
  - Dec HDL
- Disordered Fibrinolysis
- Hypertension
- Type II Diabetes
- Visceral Obesity
- Atherosclerosis

Diabetes Care 1998;21:310-314
Pradham AD et al. JAMA 2001;286:327-334
Patterns of Body Fat Distribution

Abdominal (android)

Lower body (gynoid)
Age-Adjusted Prevalence of the Metabolic Syndrome by Race/Ethnicity Among US Adults

- Hispanic Americans: 31.9%
- Whites: 23.8%
- African Americans: 21.6%
- Other: 20.3%

Approximately 47 million US adults have the metabolic syndrome.

## Working Definition of the Metabolic Syndrome

≥3 of the following:

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Defining Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal obesity (waist circumference*)</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>&gt;102 cm (&gt;40 in)</td>
</tr>
<tr>
<td>Women</td>
<td>&gt; 88 cm (&gt;35 in)</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>≥150 mg/dL</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>&lt;40 mg/dL</td>
</tr>
<tr>
<td>Women</td>
<td>&lt;50 mg/dL</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>≥130/≥85 mm Hg</td>
</tr>
<tr>
<td>Fasting glucose</td>
<td>≥110 mg/dL</td>
</tr>
</tbody>
</table>
Diabetic Nephropathy

Albuminuria:

- Predictive of renal failure
- Marker of increased CV morbidity and mortality
# Definitions of Albuminuria

<table>
<thead>
<tr>
<th>Category</th>
<th>24h Collect. (mg/24h)</th>
<th>Timed Collect. (mcg/min)</th>
<th>Spot Collect. (mcg/mg creatinine)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;30</td>
<td>&lt;20</td>
<td>&lt;30</td>
</tr>
<tr>
<td>Microalbuminuria</td>
<td>30-299</td>
<td>20-199</td>
<td>30-299</td>
</tr>
<tr>
<td>Clinical albuminuria</td>
<td>&gt;300</td>
<td>&gt;200</td>
<td>&gt;300</td>
</tr>
</tbody>
</table>
Progression of Untreated Diabetic Nephropathy

<table>
<thead>
<tr>
<th>Blood Pressure</th>
<th>100/80</th>
<th>140/90</th>
<th>180/100</th>
</tr>
</thead>
</table>

Graph showing the progression of blood pressure over time.
Effect of ACEI on Proteinuria and Serum Creatinine

Proteinuria (mg/24 h)

Placebo

Enalapril

% of initial value of 100/Cr

Placebo

Enalapril

## Ophthalmomologic Exam

<table>
<thead>
<tr>
<th>Patient group</th>
<th>Recommended first exam</th>
<th>Follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type1</td>
<td>within 3-5 yrs after diag.</td>
<td>Yearly</td>
</tr>
<tr>
<td></td>
<td>once patient is 10yrs or &gt;</td>
<td></td>
</tr>
<tr>
<td>Type2</td>
<td>time of diag.</td>
<td>Yearly</td>
</tr>
<tr>
<td>Preg. In preexisting diabetes</td>
<td>during first trimester</td>
<td></td>
</tr>
</tbody>
</table>
Prevention of Neuropathy and Amputation

- Glycemic control
- Foot examination
  - Deformity
  - Vibratory sensation
  - Ankle jerks
  - Pressure sensation with standard nylon filament
- Immediate and thorough attention to any foot trauma or "superficial" infection
- Corrective shoes and surgery
- Teach patient daily self-examination of feet
The Diabetic Foot

• Vascular vs. neuropathic foot ulcers
• Supine and dependent pedal pulses important
• Patients should examine feet frequently
• Gross observation for deformity
• Detect insensate foot
II. Continuing Care

- Review every 3-6 months*
- Assess progress in achieving treatment goals
  - Symptoms
  - Weight goals
  - Glycemic, lipid, and blood pressure goals

- Assess complications
  - Microvascular
  - Retinopathy (as assessed by qualified eye care provider at diagnosis and yearly thereafter)
  - Nephropathy
  - Neuropathy
  - Foot care
  - Macrovascular

*Frequency will depend on whether patient is meeting goals of therapy
# Recommendations for Adults with Diabetes Mellitus

## Glycemic control

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td>&lt; 7%</td>
</tr>
<tr>
<td>Preprandial blood glucose</td>
<td>80-120mg/dl</td>
</tr>
<tr>
<td>Bedtime blood glucose</td>
<td>90-130mg/dl</td>
</tr>
</tbody>
</table>

## Blood pressure

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 130/80mmHg</td>
</tr>
</tbody>
</table>

## Lipids

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDL</td>
<td>&lt;100mg/dl</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>&lt;150mg/dl</td>
</tr>
<tr>
<td>HDL</td>
<td>&gt; 40mg/dl</td>
</tr>
</tbody>
</table>
Key Tests / Exams

Glycated hemoglobin-Quarterly if Rx change
At least 2x’s/yr if stable

Dilated eye exam -Yearly

Comprehensive foot exam -Yearly(at risk often)

Lipid profile -Yearly

Microalbumin -Yearly

Blood pressure -Each visit

Weight -Each visit
Self Management

- What is self management?
- What forums do we have to teach self management?
- Who should be involved?
- Who can set self management goals?
- How are they tracked?
Diabetes at CHC

- 1500 DM patients in past 6 mo.
- DEMS program used at 4 sites
- RWJ Self Management program
  - Part time CDE in 4 sites
- Participation in BPH collaborative
- Peer review on DM outcomes
Diabetes in Middletown

- 212 patients seen in past 6 mo.
- 222 in DEMS
- Avg. HbA1C: 9.2
- LDL < 100 26%
- SM goal set: 16%
- %BP < 130/80: 66%
Key Measures

- Key measures are the quality measures tracked and reported on quarterly
- Based on ADA standards of care
- Mix of process and outcome measures
- DM key measure report issued by provider each quarter
Key Measures

- # patients in DEMS
- Avg. HbA1C
- %BP<130/80
- %LDL<100
- % with SM goal
- % with foot exam
- #% pts. with 2 A1C/yr
- % on ASA
- % on ACE/ARB
- % with eye exam
- % dental exam
The Diabetes Team

Patient

Family

PCP
CDE
Nurses
MA’s
Podiatrist
Ophthalmologist
Dentist
Wendy Madore