Definition, Diagnosis and Pathophysiology
Peggy Odegard, PharmD, BCPS, CDE

What face does “diabetes” bring to mind?

Significance of DM
- 20.8 million people with diabetes in the US
  - 7% of the population (up from 5.9% in 1992)
  - 20.9% (10.3 million) 60 years and older!
- 14.6 million diagnosed
- 6.2 million undiagnosed
- 41 million people estimated to have “pre-diabetes”
- 2002 costs = 132 billion
Total Per Capita Healthcare Costs: Patients With and Without Diabetes

Total (direct and indirect): $132 billion

Diabetes: $13,243
Without Diabetes: $2,560

Itemized Per Capita Health Care Costs: Patients With and Without Diabetes

What is Diabetes?
- Diabetes is a chronic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both.
- Insulin is the hormone necessary for normal metabolism of protein, carbohydrates, and fat.
So how does this work?

1) Stomach digests food
2) Liver stores glucose, then releases it later
3) Pancreas makes insulin

Insulin Action at the Cellular Level

Insulin Release from β-Cell

Glucose, nateglinide, repaglinide and sulfonylureas
Human Insulin Structure
- Active insulin requires connecting peptide (C-peptide) on proinsulin to be broken off from "A" and "B" chains
- Free insulin half-life 5.2 +/- 0.7 min
- Normal daily insulin secretion is 0.5 to 0.7 u/kg/d

Insulin Effects
Enhances
- Fat storage (lipogenesis)
- Liver and muscle storage of glucose as glycogen (glycogenesis)

Inhibits
- Fat mobilization for energy (lipolysis and ketogenesis)
- Glucose release from the liver and muscle (glycogenolysis)
- Glucose formation from amino acids (gluconeogenesis)

Formation of Ketones in the Absence of Insulin
- Fat → FFAs
- FFAs → Glycerol
- Glycerol → Liver
- Liver → Glycogen
- Muscle → Proteins
- Insulin → Hyperglycemia
- Hyperglycemia → Ketoacidosis
- Ketones
Normal Pattern of Insulin Secretion Following IV Glucose Infusion

<table>
<thead>
<tr>
<th>Time</th>
<th>Basal or Steady State</th>
<th>1st Phase</th>
<th>2nd Phase</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulin Output</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

What is a normal blood glucose level?

<table>
<thead>
<tr>
<th>Blood Glucose Level</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;126 mg/dl</td>
<td>Diabetes</td>
</tr>
<tr>
<td>&gt;100 mg/dl</td>
<td>Pre-Diabetes</td>
</tr>
<tr>
<td>70-100 mg/dl</td>
<td>Normal</td>
</tr>
<tr>
<td>IFG = Impaired Fasting Glucose; IGT = Impaired Glucose Tolerance</td>
<td></td>
</tr>
</tbody>
</table>

Glycemic Control Defined

<table>
<thead>
<tr>
<th>Condition</th>
<th>FPG</th>
<th>2-h OGGT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;100 mg/dl</td>
<td>&lt;140 mg/dl</td>
</tr>
<tr>
<td>IFG</td>
<td>100-125 mg/dl</td>
<td>NA</td>
</tr>
<tr>
<td>IGT</td>
<td>NA</td>
<td>140-199 mg/dl</td>
</tr>
<tr>
<td>Diabetes</td>
<td>&gt;126 mg/dl</td>
<td>&gt;200 mg/dl</td>
</tr>
</tbody>
</table>

ADA, Diabetes Care 28:54-63, 2005; Diabetes Care 28:537-542, 2005
Diagnosis of Diabetes

- Fasting plasma glucose >126 mg/dl on 2 occasions
- Fasting plasma glucose <126 mg/dl
  Two elevated glucose values during oral glucose tolerance test
  • >200 mg/dl 2 hours after glucose challenge
  • One intervening level >200 mg/dl during 75 g carbohydrate load
- Nonfasting plasma glucose >200 mg/dl with symptoms (polyuria, polydipsia, unexplained weight loss)

What are the symptoms of high blood glucose?

- Weakness and tiredness (fatigue)
- Extreme hunger (polyphagia)
- Frequent urination (polyuria) and thirst (polydipsia)
- Dry, itchy skin
- Non-healing skin infections
- Blurred vision
- Tingling or numbness in hands or feet

So what... why is elevated blood glucose a problem?

Overall, the risk for death among people with diabetes is about 2 times that of people without diabetes.
Diabetes Complications: Coronary Heart Disease

- 65% of diabetes deaths are due to heart disease and stroke
- Compared to patients without diabetes:
  - 2–4 fold increased risk of stroke and CHD
  - In patients with cardiac disease, diabetes increases the death rate by 2–4 times
- 73% of adults with diabetes have BP >130/80 mm Hg or take drugs for hypertension


A1C Determines Risk of Microvascular Complications

Low A1C High A1C

Glucose Red Blood Cell


Diabetes Complications: Blindness

- #1 cause of new blindness among adults aged 20-74 years
  - 12,000 to 24,000 new cases each year
- Strongly related to duration of diabetes
  - After 20 years nearly all patients with Type 1 and >60% with Type 2
- NEI: 90% of lost vision is preventable

Diabetes Complications: Kidney Disease
- #1 cause of end-stage renal disease (ESRD) – 44% of new cases
  - 42,813 patients were treated for ESRD in 2001
  - 142,963 underwent chronic dialysis or kidney transplantation in 2001
- $22.8 billion in public and private funds to treat patients with kidney failure in 2001
- 26% of Medicare patients with ESRD
- 40% Type 1 patients eventually develop nephropathy leading to ESRD
- NIDDK: most ESRD is probably preventable


Diabetes Complications: Nerve Damage
- 60%-70% of all patients experience nerve disease
- Peripheral neuropathy
  - Carpal tunnel syndrome
  - Severe pain, burning or numbness in the hands and feet
  - “Stocking and Glove” distribution
- Autonomic neuropathy
  - Decreased or slowed GI motility
  - Arrhythmias


Diabetes Complications: Nerve Damage and Amputations
- #1 cause of nontraumatic lower extremity amputations
- 82,000 limbs lost/yr – nearly 225/day in 2001
  - more than 60% due to diabetes
- 15 – 40 fold increased risk versus population
- ADA / CDC: >85% of limb loss is preventable
- Patients with diabetes are more susceptible to many other illnesses and often have worse prognoses.

Diabetes Complications: Dental Disease

- Young adults have twice the risk of periodontal (gum) disease as those without diabetes
- 33% have severe periodontal diseases with loss of gum attachment to the teeth measuring >5 millimeters


Diabetes Complications: Pregnancy

- Poor glycemic control before conception and during the first trimester of pregnancy can cause serious complications:
  - 5% to 10% with major birth defects
  - 15% to 20% spontaneous abortions
- Poor control during the second and third trimesters can result in excessively large babies, posing a risk to the mother and child.


ACTIVITY: Do these patients have diabetes?

- AB – He complains of urinating often (3-4 times each morning before lunch), feels worn out and has a random blood glucose of 214 mg/dl
- CD – She feels fine but has a fasting glucose of 118 mg/dl


Etiologic Classification of Diabetes Mellitus

<table>
<thead>
<tr>
<th>Classification</th>
<th>Pathophysiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>β-cell destruction with lack of insulin</td>
</tr>
<tr>
<td>Type 2</td>
<td>Insulin resistance with insulin deficiency</td>
</tr>
<tr>
<td>Gestational</td>
<td>Insulin resistance with β-cell dysfunction</td>
</tr>
<tr>
<td>Other specific types</td>
<td>Genetic defects in β-cell function, exocrine pancreas diseases, endocrinopathies, drug- or chemical-induced, and other rare forms</td>
</tr>
</tbody>
</table>


What are the differences between the two main types of diabetes?

**Type 1**
- 10% of people with diabetes
- May start at any age (usually <30 years of age)
- Rapid symptom onset
- Usually thin or lean
- Inability to produce insulin (caused by destruction of insulin producing cells)

**Type 2**
- 90% of people with diabetes
- Usually starts after age 30
- Insidious onset
- 75% of patients are obese
- Caused by insulin resistance or a relatively low amount of insulin
Differential Diagnosis of Type 1A Diabetes

<table>
<thead>
<tr>
<th>Diabetes</th>
<th>Autoantibody</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Type 1A  | Positive >90%| Children:  
|          |              | 90% non-Hispanic white  
|          |              | 50% African American  
|          |              | 50% Hispanic American  
| Type 1B  | Negative     | Rare in non-Hispanic white  
| Type 2   | Negative     | If antibody positive, likely latent autoimmune diabetes in adults (LADA) with HLA similar to type 1A  
| Other forms | Negative | |

Characteristics of Latent Autoimmune Diabetes in Adults (LADA)

- Adult age at diagnosis (usually over 25 years of age)
- Initial presentation masquerades as non-obese type 2 diabetes (does not present as diabetic ketoacidosis)
- Initially can be controlled with meal planning with or without diabetes pills
- Insulin dependency gradually occurs, frequently within months
- Positive antibodies
  - Islet cell autoantibodies (ICA)
  - Insulin autoantibodies (IAA)
  - Glutamic acid decarboxylase autoantibodies (GAD)
- Low C-peptide levels
- Unlikely to have a family history of type 2 diabetes.

Cellular Defects That May Lead to Diabetes
Type 1 Diabetes: Pathophysiology

Progression of Type 1 Diabetes

Possible Causes of Autoimmune β-cell Destruction

- Environmental factors
  - Viruses
    - coxsakie
    - rubella
  - Chemical agents
    - nitrosorourea compounds
    - bovine milk protein (?)
- Genetic susceptibility
Genetic Susceptibility to Type 1A Diabetes

<table>
<thead>
<tr>
<th>Family Relationship</th>
<th>% Childhood Diabetes (incidence/year)</th>
<th>% Islet Autoantibody</th>
</tr>
</thead>
<tbody>
<tr>
<td>General population (US)</td>
<td>0.3% (15 – 25/100,000)</td>
<td>3% single Ab 0.3% multiple Ab</td>
</tr>
<tr>
<td>Offspring</td>
<td>1%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Sibling</td>
<td>3.2%, 6% lifetime</td>
<td>7.4%</td>
</tr>
<tr>
<td>Dizygotic twin</td>
<td>6%</td>
<td>10%</td>
</tr>
<tr>
<td>Mother</td>
<td>2%</td>
<td>5%</td>
</tr>
<tr>
<td>Father</td>
<td>4.6%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Father and Mother</td>
<td>10%-25%</td>
<td></td>
</tr>
<tr>
<td>Monozygotic twin</td>
<td>50%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Type 2 Diabetes: Pathophysiology

What came first?

- Impaired Insulin Secretion
- Insulin Resistance
Role of Glucose Toxicity in Type 2 Diabetes

- Impaired Insulin Secretion
- Insulin Resistance
- Glucose Toxicity
- Hyperglycemia of Type 2 Diabetes

Insulin Sensitivity: Relationship to Body Size


Insulin Sensitivity Index (x 10^-5 min^-1/pM)

- Body Mass Index (kg/m²)

- Males
- Females

- r = .26
- P = .35

Insulin Sensitivity: Relationship to Body Size and Intra-abdominal Fat


- Insulin Sensitivity Index (x 10^-5 min^-1/pM)

- Body Mass Index (kg/m²)

- Intra-abdominal Fat Area (cm²)

- r = .59
- P < .05
Visceral Fat Distribution: Normal vs Type 2 Diabetes

- Normal
- Type 2 Diabetes

Role of FFAs in Hyperglycemia

- ADIPOSE
- ↑ Lipolysis
- ↑ FFA Mobilization
- MUSCLE
- ↑ FFA Oxidation
- ↓ Glucose Utilization
- LIVER
- ↑ FFA Oxidation
- ↑ Gluconeogenesis
- Hyperglycemia

Hypothetical Relationship Between Insulin Sensitivity and Insulin Secretion

- High
- Low
- Normal glucose tolerance
- IGT
- Type 2 Diabetes

Insulin Sensitivity and Insulin Secretion: Relationship in High–Risk Groups

Acute Insulin Response to Glucose (pM)

Insulin Sensitivity Index (x 10^5 μM^-1/pM)

- 700
- 600
- 500
- 400
- 300
- 200
- 100
- 0

012345 7

PCO
women

25th

75th

25th

5th

Older

subjects

Former

GDM

Relatives,
type 2 diabetes

Type 2 diabetes

IGT


Plasma Insulin (μU/mL)

Time (min)

300–30

20

60

80

100

Normal Type 2 Diabetes

Glucose

Time of Peak Insulin Response
After Oral Glucose Load

NGT

Peak

Insulin

Response

Type 2

Diabetes

Frequency distribution by percentage of peak insulin after an oral glucose load
Study sample subdivided by glucose tolerance status
Bengtsson BW et al. J Clin Endocrinol Metab. 1990;71:1447
Insulin and Glucose Patterns:
Normal and Type 2 Diabetes


Disease Progression and Decline in β-Cell Function

Every patient with type 2 diabetes eventually requires insulin.


Plasma Insulin After Oral Glucose:
Effects of Obesity and Diabetes

Drug Induced Hyperglycemia

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typical antipsychotics</td>
<td>Increase insulin resistance by altering receptor-binding characteristics</td>
</tr>
<tr>
<td>Beta-blockers</td>
<td>Inhibit insulin secretion (especially nonselective agents)</td>
</tr>
<tr>
<td>Beta-2 agonists</td>
<td>Increase glycogenolysis and lipolysis</td>
</tr>
<tr>
<td>Calcium-channel blockers</td>
<td>Inhibit insulin secretion due to inhibition of beta-cell cytosolic calcium</td>
</tr>
<tr>
<td>Corticosteroids</td>
<td>Cause peripheral insulin resistance and gluconeogenesis</td>
</tr>
<tr>
<td>Fluoroquinolones</td>
<td>Inhibit insulin secretion due to blockade of adenylate triphosphate (ATP)-sensitive potassium channels</td>
</tr>
<tr>
<td>Nicotinic</td>
<td>Increases insulin resistance due to increased free fatty acid mobilization</td>
</tr>
<tr>
<td>Phenothiazines</td>
<td>Inhibit insulin secretion</td>
</tr>
<tr>
<td>Probenecid</td>
<td>Suppress conversion of proinsulin to insulin via calcium-dependent endopeptidases</td>
</tr>
<tr>
<td>Thiazide diuretics</td>
<td>1) Inhibit insulin secretion due to hypokalemia 2) Increased insulin resistance due to free fatty acids</td>
</tr>
</tbody>
</table>

Pathogenesis of Type 2 Diabetes: Impaired Insulin Secretion and Insulin Resistance

- Genes
- Lifestyle
- Impaired Insulin Secretion
- Insulin Resistance
- IGT
- Type 2 Diabetes
- Progressive Hyperglycemia and High FFA

ACTIVITY: What type of diabetes does EF have?
- EF — 22–year–old Non-Hispanic white female is admitted to the hospital through the emergency department after her roommate discovers her lying on the floor of their apartment Sunday morning. EF is still wearing her work clothes from Friday. EF has been boasting that she has been losing weight and that she now wears clothes from high school. Her blood glucose upon arrival to the hospital is 375 mg/dl and she has ketones in her urine.
ACTIVITY: What type of diabetes does GH have?

- GH – 12-year-old overweight Hispanic male presents with his mother to the pediatrician complaining of frequent bed wetting. His mother reports that he often has to go to the bathroom at school and eats all of the time. At home all he wants to do is sit on the couch and play video games. His blood glucose upon arrival to the office is 215 mg/dl and his weight is up 5 pounds since the last visit 6 months ago.

Who should you screen?

- There is a difference between screening and testing for diagnosis.
- Diagnostic tests – performed in patients with symptoms or signs of the disease
- Screening – identifies asymptomatic individuals likely to have diabetes

ADA. Diabetes Care 28:S4-S36, 2005; Diabetes Care 28:S37-S42, 2005

General Conditions to Justify Disease Screening

- Important health problem with significant population burden
- Disease natural history is understood
- Recognizable preclinical (asymptomatic) stage
- Treatment after early detection yields superior benefits compared to delayed treatment
- Acceptable reliable tests are available to detect preclinical disease
- Screening and early treatment costs favorably compare to health expenditures as a whole
- Screening is a systematic ongoing process

ADA. Diabetes Care 28:S4-S36, 2005; Diabetes Care 28:S37-S42, 2005
Diagnosed and Undiagnosed Diabetes
Estimated Adult Cases, United States, 2002

![Chart showing the number of diagnosed and undiagnosed diabetes cases.]


Age Distribution at Diabetes Diagnosis
Adults Aged 18-79 Years, United States, 2003

![Chart showing the age distribution at diabetes diagnosis.]


Diabetes Prevalence by Race/Ethnicity

<table>
<thead>
<tr>
<th>Race / Ethnicity</th>
<th>Number of Patients</th>
<th>Percent of Patients in Ethnic Group</th>
<th>Relative Prevalence to Non-Hispanic Whites of Similar Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic Whites</td>
<td>12.5 million</td>
<td>8.4%</td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic Blacks</td>
<td>2.7 million</td>
<td>11.4%</td>
<td>1.6 times more likely</td>
</tr>
<tr>
<td>Hispanic/Latino Americans</td>
<td>2.0 million</td>
<td>8.2%</td>
<td>1.8 times more likely*</td>
</tr>
<tr>
<td>American Indians</td>
<td>110,814</td>
<td>14.9%</td>
<td>2.2 times as likely</td>
</tr>
<tr>
<td>Asian Americans</td>
<td></td>
<td></td>
<td>2 times as likely</td>
</tr>
</tbody>
</table>

* Mexican Americans are 2 times more likely; residents of Puerto Rico are 1.8 times more likely to develop diabetes than Non-Hispanic Whites.

Stages of Type 2 Diabetes

<table>
<thead>
<tr>
<th>Year From Diagnosis</th>
<th>β-Cell Function (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-12 to -10</td>
<td>100</td>
</tr>
<tr>
<td>-10 to -6</td>
<td>75</td>
</tr>
<tr>
<td>-6 to 0</td>
<td>50</td>
</tr>
<tr>
<td>0 to 2</td>
<td>25</td>
</tr>
<tr>
<td>2 to 6</td>
<td>0</td>
</tr>
<tr>
<td>6 to 10</td>
<td>-12</td>
</tr>
<tr>
<td>10 to 14</td>
<td>-20</td>
</tr>
</tbody>
</table>

Adapted from Lebovitz H. Diabetes Reviews. 1999;7:139

Common Soil Between Diabetes and Cardiovascular Disease

Metabolic Syndrome Criteria:

World Health Organization (WHO)

- Diabetes or IGT or IFG or insulin resistance together with ≥2 of the following

1. Central obesity: BMI >30 kg/m² and/or Waist to Hip Ratio (WHR)
   - Men >0.90
   - Women >0.85
2. BP ≥160/90 mm Hg
3. Dyslipidemia
   - TG ≥150 mg/dL and/or HDL-C
   - Men <35 mg/dL
   - Women <39 mg/dL
4. Microalbuminuria: AER ≥20 μg/min or Albumin:Creatinine ratio ≥20 mg/g

Alberti KGMM, Zimmet PZ, for the WHO Consultation. Diabet Med. 1998;15:539
Waist Measurement

Metabolic Syndrome Criteria: NCEP-ATP III
- Diagnosis of metabolic syndrome is made if ≥3 of following are present

1. Fasting glucose ≥110 mg/dL
2. Waist circumference
   Men >40 in
   Women >35 in
3. TG ≥150 mg/dL
4. HDL-C
   Men <40 mg/dL
   Women <50 mg/dL
5. BP ≥130/85 mm Hg

Screening: Now, who would you screen?
Screening for Autoantibodies Related to Type 1 Diabetes Is Not Recommended

- Cut-off values for immune markers (autoantibodies) have not been completely established
- No consensus as to what action should be taken in the event of a positive result
- Testing healthy children may only identify a small number (<0.5%)

ADA. Diabetes Care 28:S4-S36, 2005; Diabetes Care 28:S37-S42, 2005

Criteria to Screen for Diabetes in Asymptomatic Adult Individuals

1. Consider all individuals ≥45 years old
   - particularly in those with BMI ≥25 kg/m²
   - if normal, repeated at 3-year intervals
2. Consider testing younger individuals who are overweight (BMI ≥ 25 kg/m²) and have additional risk factors

ADA. Diabetes Care 28:S4-S36, 2005; Diabetes Care 28:S37-S42, 2005

Additional Screening Risk Factors for Young Overweight (BMI >25 kg/m²) Individuals

- High-risk ethnic population (e.g., African American, Latino, Native American, Asian American, Pacific Islander)
- First-degree relative with diabetes
- Other clinical conditions associated with insulin resistance (acanthosis nigricans)
- Polycystic ovary syndrome (PCOS)
- Habitually physically inactive
- Hypertensive (140/90 mm Hg)
- HDL-C < 35 mg/dl and/or TG > 250 mg/dl
- History of vascular disease
- History of IGT or IFG on previous testing
- History of GDM or delivered a baby weighing 9 lb

ADA. Diabetes Care 28:S4-S36, 2005; Diabetes Care 28:S37-S42, 2005
Criteria to Screen for Diabetes in Asymptomatic Children

- Overweight
  - BMI >85th percentile for age and sex
  - weight >85th percentile for height or >120% IBW
- Plus any two of the following:
  - FH of type 2 diabetes in 1st- or 2nd-degree relative
  - Race/ethnicity at high risk
  - Signs or conditions associated with insulin resistance (acanthosis nigricans, dyslipidemia, or PCOS)
- Testing Specifics
  - Age of initiation: age 10 years or at onset of puberty
  - Test: FPG preferred
  - Frequency: every 2 years

Screening for Type 2 Diabetes in Community Setting Not Recommended

- Poorly targeted populations
  - Fail to reach high-risk groups
  - Inappropriately test low risk “worried well” or already diagnosed
- Screening failure due to:
  - Patients with positive screen less likely to seek and obtain follow-up
  - Patients with negative screen less likely to repeat test at appropriate interval
  - Results not discussed with primary care provider
  - Low compliance with treatment recommendations

Gestational Diabetes Mellitus (GDM)

- Hyperglycemia first recognized during pregnancy
- Complicates 4%–5% of all pregnancies
  - Prevalence 1%–14% of pregnancies or about 135,000 cases annually
- Hormonally induced
- Usually occurs in women who have insulin resistance and a relative impairment of insulin secretion
- May remit after delivery; however, 40%–80% eventually progress to type 2 diabetes
Screening for Gestational Diabetes in Low–Risk Women

- Low-risk group – Pregnant women who fulfill all of these criteria need not be screened for GDM
  - <25 years of age
  - a normal body weight
  - no family history (i.e., first-degree relative) of diabetes
  - no history of abnormal glucose metabolism
  - no history of poor obstetric outcome
  - not members of an ethnic/racial group with a high prevalence of diabetes (e.g., Hispanic American, Native American, Asian American, African–American, Pacific Islander)

ADA. Diabetes Care 28:S4-S36, 2005; Diabetes Care 28:S37-S42, 2005

Screening for Gestational Diabetes in High–Risk Women

- High-risk group – Pregnant women who fulfill any of these criteria should be screened
  - marked obesity
  - personal history of GDM
  - glycosuria
  - strong family history of diabetes

- Risk assessment for GDM should be undertaken at the first prenatal visit
- High-risk women without GDM at the initial screening should be re-tested between 24 and 28 weeks of gestation

ADA. Diabetes Care 28:S4-S36, 2005; Diabetes Care 28:S37-S42, 2005

OGTT for Gestational Diabetes in High–Risk Women

- One-step approach
  - Perform a diagnostic 100g glucose OGTT without prior plasma or serum glucose screening

- Two-step approach
  1. Perform an initial plasma or serum glucose screening
  2. Perform a diagnostic 100g OGTT on women exceeding the initial glucose threshold value
  3. Results >140 mg/dl are 80% sensitive for GDM; >120 mg/dl are 90% sensitive for GDM

100g OGTT

<table>
<thead>
<tr>
<th>Time</th>
<th>Glucose mg/dl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fasting</td>
<td>96</td>
</tr>
<tr>
<td>1-h</td>
<td>180</td>
</tr>
<tr>
<td>2-h</td>
<td>156</td>
</tr>
<tr>
<td>3-h</td>
<td>140</td>
</tr>
</tbody>
</table>

ADA. Diabetes Care 28:S4-S36, 2005; Diabetes Care 28:S37-S42, 2005
ACTIVITY: Screening Tool

- A physician in your area asks you to develop a diabetes screening tool to increase the number of positive blood glucose tests performed.
- What information would you include?
- What data sources could you use to find the information?