

Diabetes Management in the New Millennium

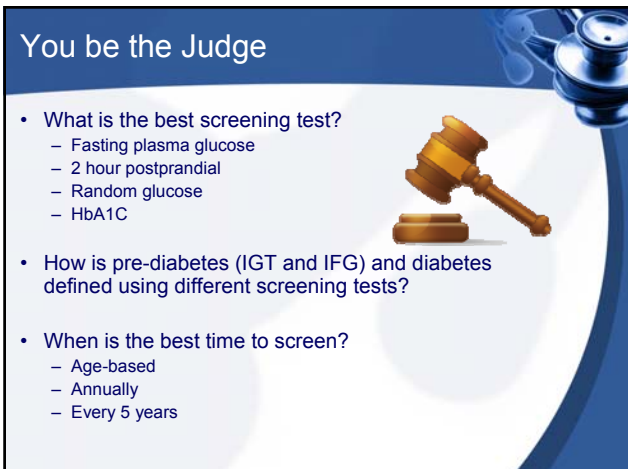
Shifting the Paradigm

Frances E. Ferguson, MD, MPH
CURE Activity March 9, 2010




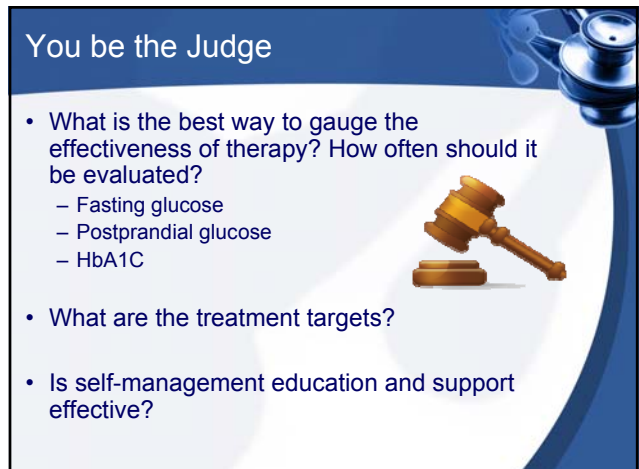
You be the Judge

- Who should be screened?
 - Symptomatic Patients Only
 - polyuria
 - polydipsia
 - polyphagia
 - Family History
 - Risk Factors
 - Obesity
 - Dyslipidemia
 - IGT and/or IFG
 - Gestational Diabetes


You be the Judge

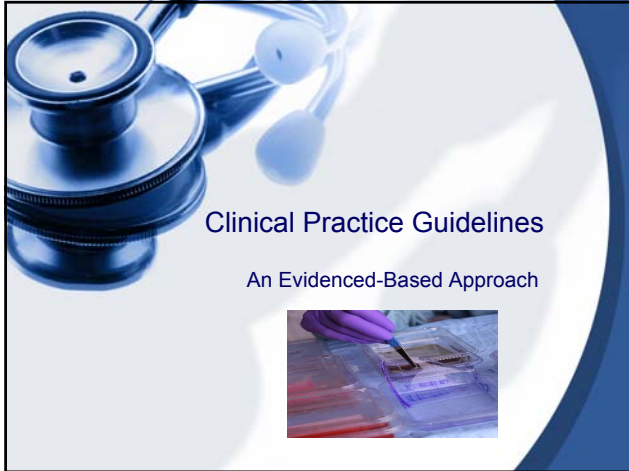
- What is the best screening test?
 - Fasting plasma glucose
 - 2 hour postprandial
 - Random glucose
 - HbA1C
- How is pre-diabetes (IGT and IFG) and diabetes defined using different screening tests?
- When is the best time to screen?
 - Age-based
 - Annually
 - Every 5 years

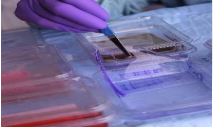
You be the Judge

- What is the best way to gauge the effectiveness of therapy? How often should it be evaluated?
 - Fasting glucose
 - Postprandial glucose
 - HbA1C
- What are the treatment targets?
- Is self-management education and support effective?





Clinical Practice Guidelines
An Evidenced-Based Approach



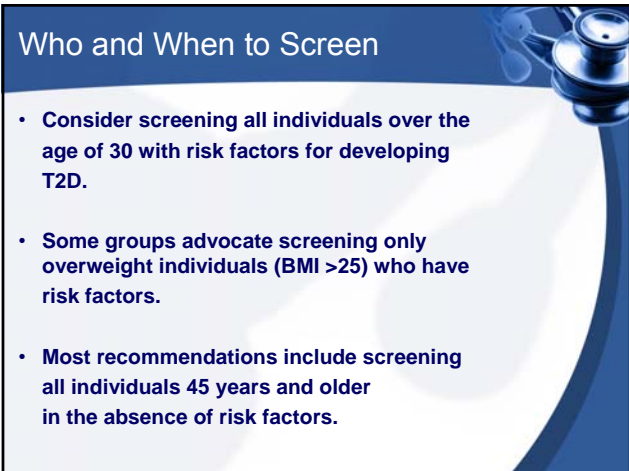

Evidence for More Aggressive Diagnosis and Management

Recent Randomized, Controlled Clinical Trials

- Prevention of Disease Onset/Prevention of Microvascular Disease Complications
 - DPP/DPPOS
 - DCCT/EDIC
 - UKPDS
- Prevention of Long-term Macrovascular Complications
 - ACCORD
 - ADVANCE
 - VADT




Screening and Diagnosis

Who and When to Screen

- **Consider screening all individuals over the age of 30 with risk factors for developing T2D.**
- **Some groups advocate screening only overweight individuals (BMI >25) who have risk factors.**
- **Most recommendations include screening all individuals 45 years and older in the absence of risk factors.**

Notable Risk Factors

- Family history
- Race/Ethnicity
- Overweight and Obesity
- Cardiovascular disease or history of PVD
- History of gestational diabetes or baby > 9 lbs
- Hypertension
- Abnormal lipid levels: HDL <35; triglycerides >250
- IGT or IFG on previous testing
- Signs of insulin resistance
 - Acanthosis nigricans or PCOS
- Inactive lifestyle

What are the Currently Recommended Diabetes Screening Assays?

- Based upon glucose criteria
 - **Fasting Plasma Glucose (FPG)**
 - Less sensitive than OGTT, particularly in the elderly
 - **75-g Oral Glucose Tolerance Test (OGTT)**
 - More sensitive; less practical than FPG
 - **Random (Casual) Glucose**
 - Acceptable only in significantly symptomatic patients

Comparison of OGTT and FPG

- **Fasting Plasma Glucose (FPG)**
 - Less sensitive than the OGTT
 - The preferred diagnostic test (over OGTT)
 - ease of use
 - acceptability to patients
 - lower cost
- **75-g Oral Glucose Tolerance Test (OGTT)**
 - More sensitive and slightly more specific than the fasting plasma glucose (FPG)
 - Not "recommended" for routine clinical use
 - poorly reproducible
 - difficult to perform in practice
 - May be useful in patients strongly suspected of having T2D with normal FPG or IFG.
 - May better define the risk of developing T2D in patients with IFG

A Shift in the Diagnosis Criteria

- In 1997, the first Expert Committee on the Diagnosis and Classification of Diabetes Mellitus revised the diagnostic criteria.
 - The key factor used to determine cutoff points for glucose levels was the association between FPG levels and presence of retinopathy.
 - Three cross-sectional epidemiologic studies were examined
 - Fundus photography or direct ophthalmoscopy
 - FPG, 2-h PG, and A1C.
 - These studies demonstrated glycemic levels
 - Lower level: little prevalent retinopathy
 - Upper level: the prevalence of retinopathy increased linearly
 - Correlations between the tests
 - Correlation between populations
- Set new diagnostic cut points for FPG and confirmed the current diagnostic value for overt diabetes in the 2-h OGTT

How are Pre-diabetes and Diabetes Now Defined by FPG and OGTT

- Values used to diagnose diabetes
- Fasting Plasma Glucose
 - <110 (100^a) Normal
 - 110-125 Increased risk for diabetes (Pre-diabetes) (IFG)
 - ≥126 Overt Diabetes
- 2hr-OGTT
 - < 140 Normal
 - 140-199 Increased risk for diabetes (Pre-diabetes) (IGT)
 - ≥ 200 Overt Diabetes
- Random Plasma Glucose
 - ≥ 200 with classic symptoms of hyperglycemia or hyperglycemic crisis
- ^aIn 2003, the ADA Expert Committee report lowered the lower FPG cut off to 100 so that the prevalence of IFG was comparable to IGT

Which is the Recommended Screening Test?

- Both the FPG and the 2-h OGTT (75-g glucose load) are generally considered appropriate to test for pre-diabetes or diabetes. (Cohort studies)
- However, the general consensus is that in the absence of overt hyperglycemia, a positive test should be confirmed on a subsequent day using the same test.
- ADA suggest repeat screening every 3 years if the screening test is normal.

The Hemoglobin A1C

Screening, Diagnosis, and Management

Use of the A1C as a Diagnostic Tool

- **Unofficial Endorsement**
 - ADA, European Association for the Study of Diabetes, International Diabetes Federation Expert Committee July 2009 (Diabetes Care 2009;32:1327-34)
- **Official Endorsements**
 - ADA January 2010
 - Standards of Medical Care in Diabetes-2010
http://care.diabetesjournals.org/content/33/Supplement_1/S11.full.pdf+html
 - AACE February 1, 2010
 - "AACE/ACE Statement on the Use of A1c for the Diagnosis of Diabetes"
<http://www.aace.com/pub/pdf/guidelines/AACEpositionA1cfeb2010.pdf>

The Hemoglobin A1C as a Diagnostic Tool

- A measure of the amount of glucose attached to hemoglobin
- The higher the glucose levels over a period of 2-3 months, the higher the A1C
- Use of the A1C for diagnosis had not previously endorsed because of lack of standardization of the assays
- The A1C test used for diagnosis must be performed using a method certified by the National Glycohemoglobin Standardization Program (NGSP)
<http://www.ngsp.org/ngsp.html>
- Should be standardized or traceable to the Diabetes Control and Complications Trial (DCCT) reference assay.
- Point-of-care A1C assays are not sufficiently accurate to use for diagnostic purposes.

A1C Diagnostic Criteria for Diabetes

- 5.7–6.4% Categories of increased risk
- $\geq 6.5\%$ Overt diabetes
($>7\%$ ADA)

Pros for Using the A1C for Diagnosis

- Epidemiologic data shows correlation between A1C levels and retinopathy similar to FPG and OGTT.
- Very little retinopathy noted below an A1C of 6.5%
- Fasting is not required
- More convenient
- Less day to day variation during periods of stress and illness compared to standard tests.
- A1C levels in whole blood are more stable than glucose levels when stored at room temperature. Glucose levels may fall.

Cons Against Using the A1C

- Limited availability in some areas.
- Slightly more costly depending upon laboratory
- Incomplete correlation between A1C and glucose in some individuals
- Can not be used for diagnosis in pregnant women
- May not be elevated in rapid onset diabetes
- The A1C cut point of $\geq 6.5\%$ picks up 1/3 fewer cases of diabetes than a FBG at the cut point of $\geq 126\text{mg/dl}$
- Certain hemoglobinopathies and anemias such as Sickle Cell Trait can lead to falsely high or low A1cs leading to under or over-treatment.
 - National Glycohemoglobin Standardization Program
<http://www.ngsp.org/program/index3.html>
 - <http://diabetes.niddk.nih.gov/dm/pubs/hemovari-A1C/index.htm>

Hemoglobinopathies Affecting the A1C

- Hemoglobin S
 - African Americans
 - Hispanic Americans/Latinos
 - East India, the Mediterranean, and the Middle East
- Hemoglobin C
 - African Americans
 - People of West African descent
- Hemoglobin SC
 - African Americans and people of West African descent
 - East India, the Mediterranean, and the Middle East
- Hemoglobin E
 - Asian Americans, especially Southeastern Asia descent
 - Cambodia, Indonesia, Laos, Malaysia, Thailand, and Vietnam. Also southern China, India, the Philippines, and Turkey
- Hemoglobin F
 - Hereditary persistence of fetal hemoglobin, sickle cell anemia, severe anemias and leukemia

What Other Conditions Affect the A1C

- Recent acute blood loss (Low)
- Hemolytic anemia (Low)
- Large amounts of vitamin C or vitamin E (Low or High)
- Iron deficiency anemia (High)

Current Suggested Guidelines

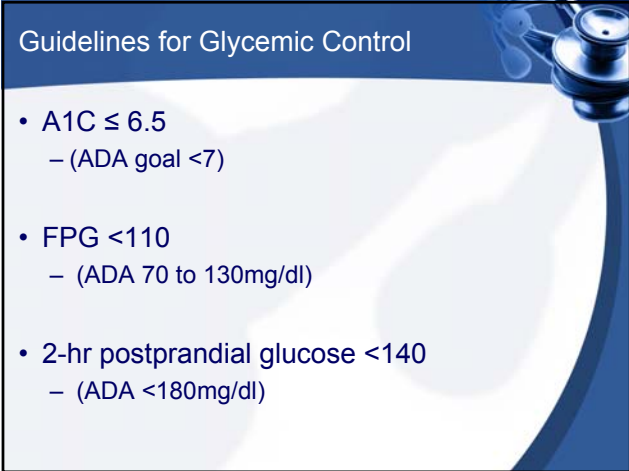
- Positive A1C test should be repeated on a different day for confirmation just as the standard tests.
- If two different tests have conflicting results, the test above the diagnostic cut point should be repeated.
- When a test whose result was above the diagnostic threshold is repeated, the second value may be below the diagnostic cut point.
 - Least likely for A1C
 - Somewhat more likely for FPG
 - Most likely for the 2-h PG
- If no laboratory error, the patient should be followed clinically and the test repeated in 3 to 6 months.

AACE/ACE Statement

- Supports the use of the A1C as a diagnostic tool only as an optional additional tool, not as the primary tool. It recommends using the traditional criterion when feasible.
- Does not recognize the criterion “categories of increased risk for diabetes” especially if that triggers the measurement of the FBG and OGTT to confirm the diagnosis.
- <http://www.aace.com/pub/guidelines/>

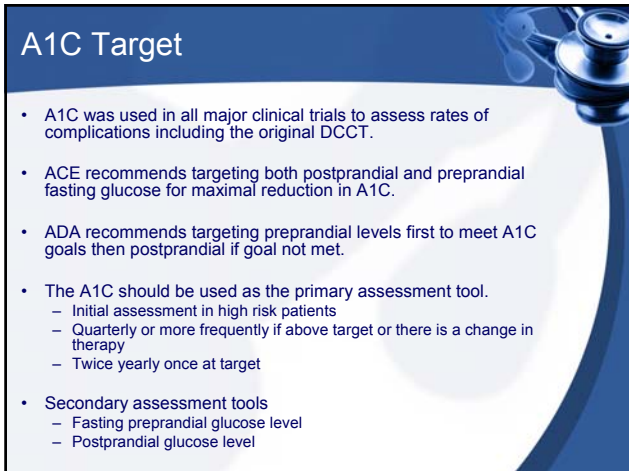


Management and Follow-Up



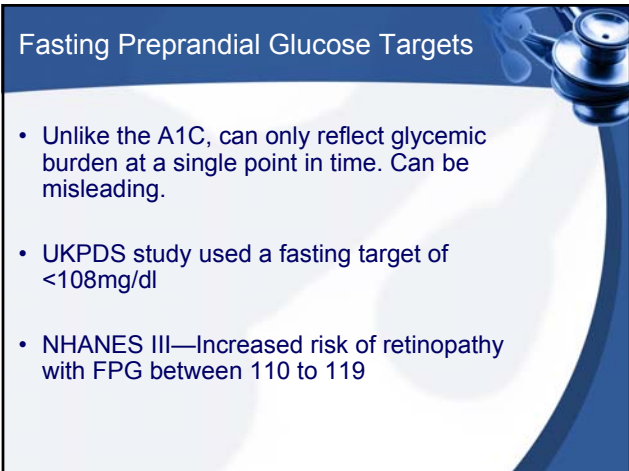
Guidelines for Glycemic Control

- A1C \leq 6.5
 - (ADA goal $<$ 7)
- FPG $<$ 110
 - (ADA 70 to 130mg/dl)
- 2-hr postprandial glucose $<$ 140
 - (ADA $<$ 180mg/dl)



A1C Target

- A1C was used in all major clinical trials to assess rates of complications including the original DCCT.
- ACE recommends targeting both postprandial and preprandial fasting glucose for maximal reduction in A1C.
- ADA recommends targeting preprandial levels first to meet A1C goals then postprandial if goal not met.
- The A1C should be used as the primary assessment tool.
 - Initial assessment in high risk patients
 - Quarterly or more frequently if above target or there is a change in therapy
 - Twice yearly once at target
- Secondary assessment tools
 - Fasting preprandial glucose level
 - Postprandial glucose level



Fasting Preprandial Glucose Targets

- Unlike the A1C, can only reflect glycemic burden at a single point in time. Can be misleading.
- UKPDS study used a fasting target of $<$ 108mg/dl
- NHANES III—Increased risk of retinopathy with FPG between 110 to 119

Fasting Preprandial Glucose Targets

- Some evidence of significant cardiovascular risk with FPG >110.
- Same target maybe useful for patient to do self-monitoring, but these values may not accurately reflect plasma glucose.

Postprandial Glucose Targets

- Less published evidence in the literature
- Many epidemiologic studies mostly using postchallenge glucose testing, but no interventional trials with outcome data use postprandial glucose.
- There have been a number of studies suggesting that there is an association between postchallenge or postprandial glucose and cardiovascular risk i.e. DECODE: *Lancet*. 1999;354:617-621
- One study has suggested that postprandial glucose is more closely tied with atherosclerosis than FPG and may have a direct effect on the endothelium: *Atherosclerosis* 1999;144:229-235
- Some investigators have shown that postprandial glucose correlates better with A1C levels. *Diabetes Care*. 2000;1236-1241

Additional Guidelines

- Referral for comprehensive diabetes and nutrition education
- Initiate Self-monitoring of glucose (Somewhat controversial)
- Aggressive management of HTN and Dyslipidemia
 - Target B/P goal of <130/80mm Hg
 - LDL-C <100mg/dl (<70mg/dl if h/o CAD)
 - HDL-C >40mg/dl in men and >50mg/dl in women
- Smoking cessation
- Lifestyle Modifications


Other Guidelines

- Screen all patients annually for CKD
 - Begin 5 years after diagnosis for T1D and upon diagnosis for T2D
 - Albumin-to-creatinine ratio in a spot urine
 - eGFR
- Refer for annual dilated retinal exam beginning at the time of diagnosis
- Inspect feet at every visit




Reaching Targets and Sticking to the New Guidelines

Are Group Visits Helpful?




Where's the Evidence?

- Concept originated in managed care organizations for more efficient delivery of care to elderly patients with chronic diseases such as COPD, CHF and Hypertension.
- Currently only 7% of diabetic patients reach the combined goals of achieving HbA1c of less than 7%, systolic blood pressure of less than 130 mm Hg, and LDL cholesterol of less than 100 mg/dL.



Where's the Evidence?

- Alternative to one-on-one office visits is clearly needed. Group visits have been shown to be effective for Diabetes management as well.
- Over a dozen articles in the literature, but only 6 randomized controlled trials.
- Only one randomized controlled study targeting disadvantaged populations.
Diabetes Care. 2003;26:2032-6



There is Some Evidence That:

- Group visits shift the focus to education and self-management leaving medical attention to one-on-one visits.
- Group care is more effective in promoting healthier lifestyles, increasing knowledge and ultimately helping patients to achieve better glycemic control.
- Group settings maybe more effective in adding motivation, experience and peer identification than one-on-one visits.
- Use of additional time and resources is minimal.

Potential Structure of the Group Visit

- Group visits occur monthly to every three months
- Involve 10 to 15 patients
- Group Visit may replace some routine visits
- Limited to diabetes care and education, not comorbidities or acute problems.
- Nurses, midlevels, nutritionists, diabetic educators may be involved.
- Can be conducted during regular office hours.

GV Focus

- Main focus is education. Each session has a particular topic.
- Physical exam limited to vitals, foot exams, etc. Preventive screenings, vaccinations can be done.
- Select patients may receive limited one-on-one time with provider to discuss labs, management guidelines etc. if necessary after the group session.
- Labs can be drawn during or prior to the GV, prescriptions written, referrals made etc.

Charges

- Billable visits at the 99213 or 99214 for established patients with adequate documentation and depending upon patient complexity.
- One study of uninsured patients showed that although GV increased cost of out patient visits, costs related to ED and subspecialty care decreased. *AM. J. of Managed Care*. Vol. 14, No.1
- http://www.improvingchroniccare.org/downloads/group_visit_starter_kit_copy1.doc

Recap of the Latest Evidence in Diabetes Diagnosis and Management

- There is currently an overall 50% prevalence of associated complications of diabetes at the time of diagnosis with the earlier screening guidelines i.e diabetes is present long before we are making the diagnosis.
- Diabetes is being diagnosed in much younger people now. Recent CDC data indicates a greater than 76% increase in the prevalence of diabetes in adults 30 to 39.
- Many large randomized interventional trials have proven that achieving and maintaining tight glycemic control reduces risk of microvascular complications and even macrovascular complications.
- Although most patients in these trials did not often reach the target A1C, any degree of reduction in A1C has been shown to be beneficial in reducing complications.

Goals for the New Millennium

SCREEN EARLY

SCREEN OFTEN

TREAT AGGRESSIVELY

TRY EVERYTHING!

QUESTIONS?

Evaluation

<http://www.surveymonkey.com/s/CURE2>