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TAKING DIABETES TO HEART

Objectives

- Identify two lifestyle changes persons with diabetes can implement to prevent complications

Prediabetes

Categories of increased risk for diabetes

Fasting plasma glucose 100-125 mg/dL = IFG

or

2 hr plasma glucose with a 75 gm OGTT

140-199 mg/dL = IGT

or

A1c 5.7-6.4%

ADA. I. Classification and Diagnosis. *Diabetes Care* 2011;34(suppl 1):S13. Table 3.

Diabetes Diagnosis

A1c \geq 6.5%

or

Fasting plasma glucose

\geq 126 mg/dL

or

2 hr plasma glucose \geq 200 mg/dL with an OGTT

or

Random plasma glucose \geq 200 mg/dL

ADA. I. Classification and Diagnosis. *Diabetes Care* 2011;34(suppl 1):S13. Table 2.

Diabetes Facts

Diagnosed and undiagnosed diabetes in the United States, all ages, 2010

- Total: 25.8 million people, or 8.3% of the U.S. population, have diabetes
- Diagnosed: 18.8 million people
- Undiagnosed: 7.0 million people

Centers for Disease Control and Prevention. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011.

Prediabetes Facts

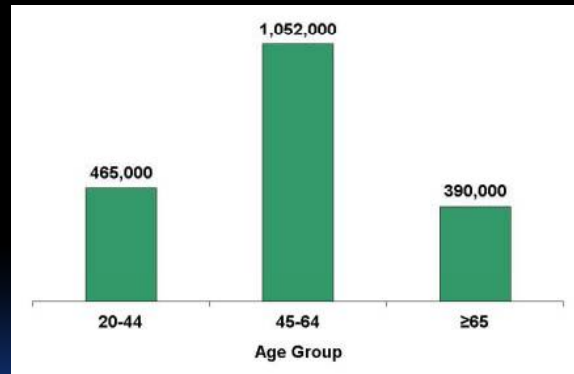
- In 2005–2008, 35% of U.S. adults aged 20 years or older had prediabetes (50% of those aged 65 years or older)
- Estimates in 2010 are 79 million Americans aged 20 years or older with prediabetes

Diabetes + Prediabetes = 43.3%!

Centers for Disease Control and Prevention. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011.

New Cases of Diagnosed Diabetes

Among people aged 20 years or older, United States, 2010



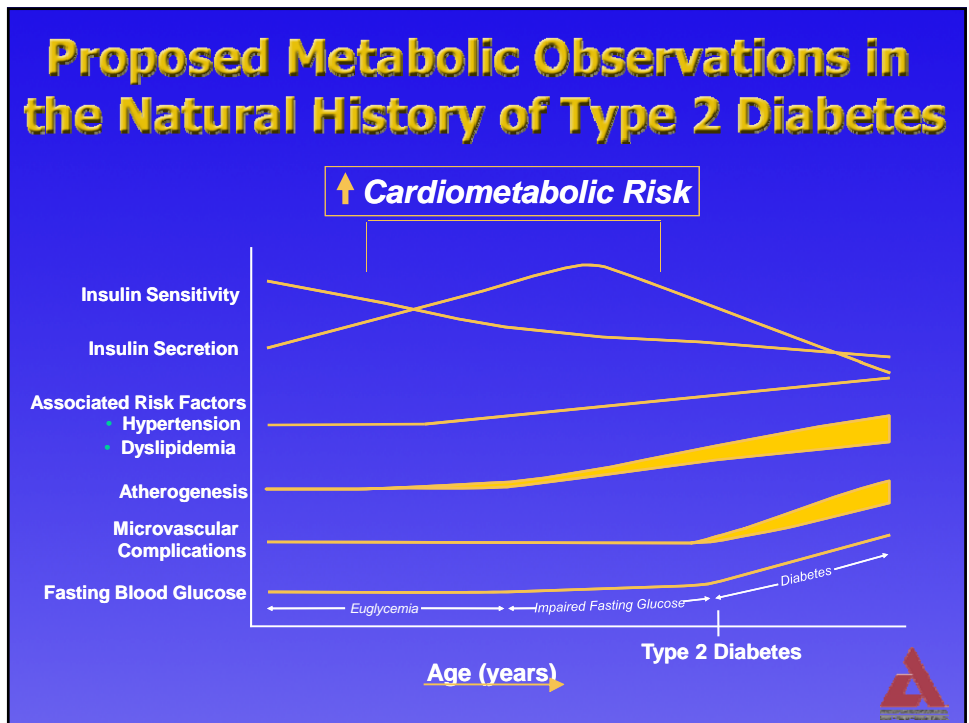
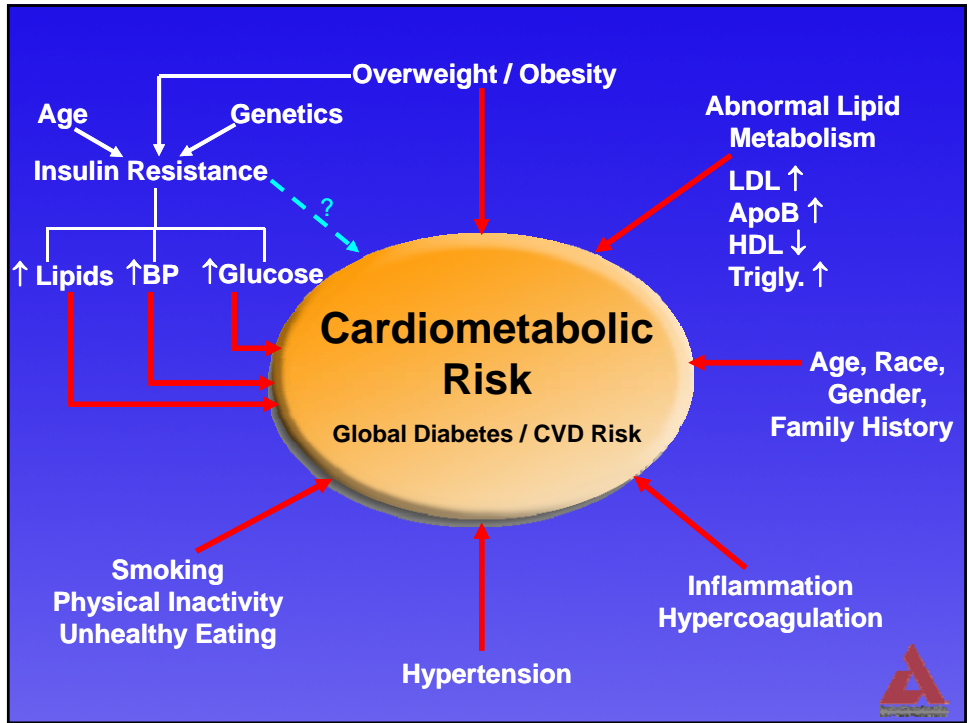
Source: 2007–2009 National Health Interview Survey estimates projected to year 2010.

Centers for Disease Control and Prevention. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011.

Diabetes and Heart Disease

- In 2004, heart disease was noted on 68% of diabetes-related death certificates among people aged 65 years or older
- Adults with diabetes have heart disease death rates about 2 to 4 times higher than adults without diabetes

Centers for Disease Control and Prevention. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, 2011.

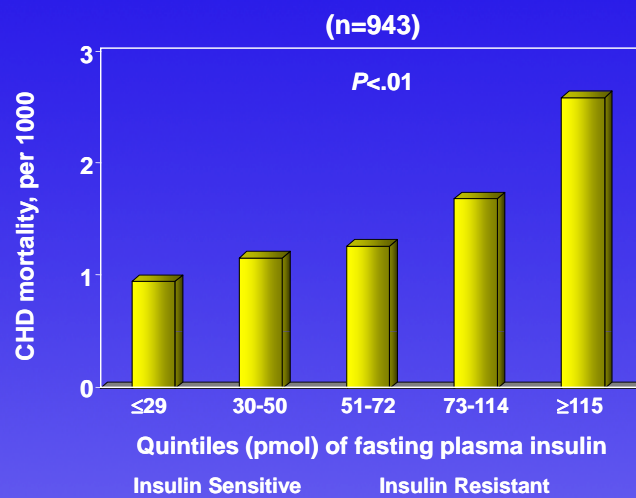


Insulin Resistance

Factors Affecting Insulin Resistance:

- Overweight/fat distribution
- Age
- Genetic predisposition
- Activity level
- Medications
- Puberty
- Pregnancy

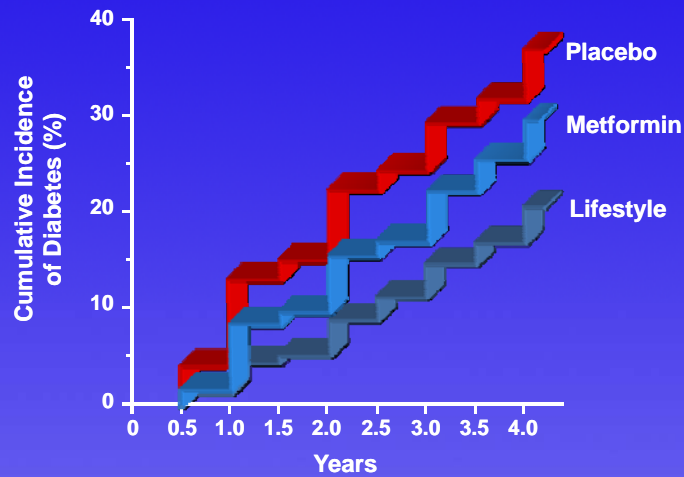
Insulin Resistance and CHD Mortality Paris Prospective Study



Fontbonne AM, et al. *Diabetes Care*. 1991;14:461-469.



Relative Effectiveness of Interventions in DPP



Knowler WC, et al. *NEJM*. 2002;346:393-403.



ADA Evidence Grade

Level of Evidence	Description
A	Clear or supportive evidence from adequately powered well-conducted, generalizable, randomized controlled trials Compelling nonexperimental evidence
B	Supportive evidence from well-conducted cohort studies or case-control study
C	Supportive evidence from poorly controlled or uncontrolled studies Conflicting evidence with the weight of evidence supporting the recommendation
E	Expert consensus or clinical experience

Prevention/Delay of Type 2 Diabetes

- Refer patients with IFG (E) and IGT(A) or A1c 5.7-6.4 (E) to support program
 - Weight loss 7% of body weight
 - At least 150 min/week moderate activity
- Follow-up counseling important (B)
- Consider metformin if multiple risk factors, especially if hyperglycemia (e.g., A1c > 6%) progresses despite lifestyle interventions (B)

ADA. IV. Prevention/Delay of Type 2 Diabetes. *Diabetes Care* 2011;34(suppl 1):S16

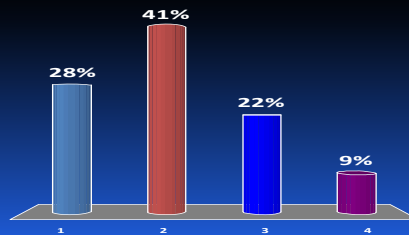
Case-Mr. Martin



- 47-year-old African American man, hasn't seen doctor in years
- Works as a truck driver, eats mostly at truck stops
- Smokes 1 pack per day
- BP = 146/86
- Lipid Profile: total cholesterol = 210
- Weight = 230 lbs; BMI = 29 kg/m²
- Family history of HTN and diabetes

What clinical management should be done for Mr. Martin?

1. Stop smoking education; dietician referral; exercise education; lipid-lowering medication
2. Stop smoking education; dietician referral; exercise education; antihypertensive medication
3. Stop smoking education; exercise education; A1c
4. Stop smoking education; dietician referral; exercise education



Testing for Diabetes: Asymptomatic

- Consider testing overweight/obese adults with one or more additional risk factors
 - In those without risk factors, begin testing at age 45 years (B)
- If tests are normal
 - Repeat testing at least at 3-year intervals (E)
- Use A1C, FPG, or 2-h 75-g OGTT (B)
- In those with increased risk for future diabetes
 - Identify and, if appropriate, treat other CVD risk factors (B)

ADA. II. Testing in Asymptomatic Patients. *Diabetes Care* 2011;34(suppl 1):S13-S14.

Testing for Diabetes: Asymptomatic

Testing should be considered in all adults who are overweight (BMI ≥ 25 kg/m^{2*}) and have additional risk factors:

- Physical inactivity
- First-degree relative with diabetes
- High-risk race/ethnicity
- Women who delivered a baby weighing >9 lb or were diagnosed with GDM
- Hypertension ($\geq 140/90$ or on therapy for hypertension)
- History of CVD
- HDL cholesterol level <35 mg/dl and/or a triglyceride level >250 mg/dl
- Women with polycystic ovarian syndrome (PCOS)
- A1C $\geq 5.7\%$, IGT, or IFG on previous testing
- Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans)

* At-risk BMI may be lower in some ethnic groups

ADA. Testing in Asymptomatic Patients. *Diabetes Care* 2011;34(suppl 1):S14. Table 4.

Mr. Martin



Diagnosed with type 2 diabetes

▪ A1c 8.6%

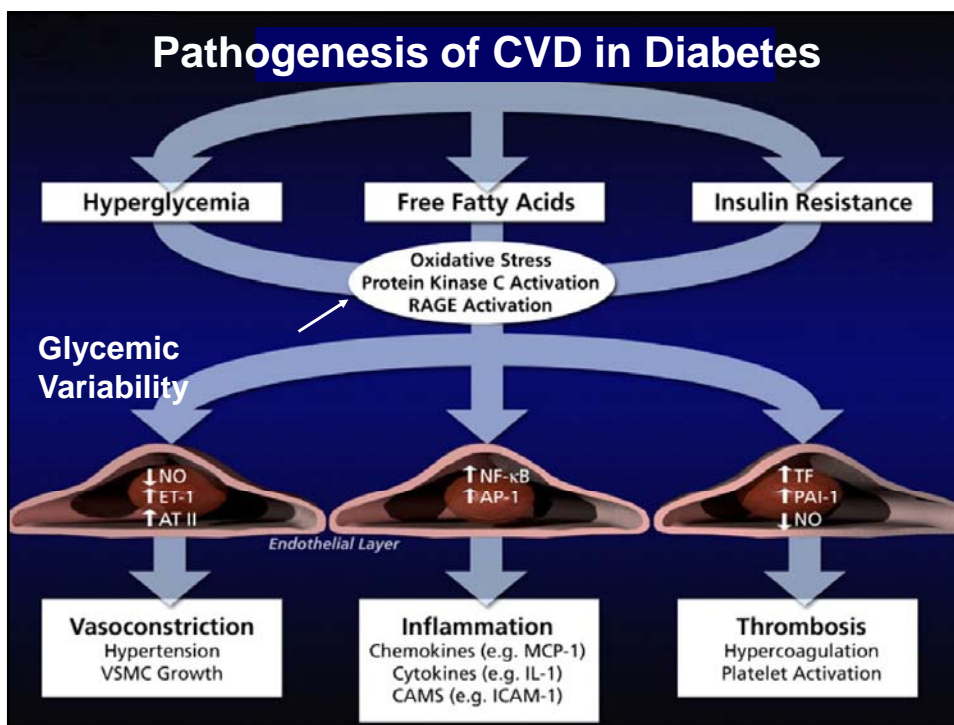
(Diagnosis of diabetes = A1c $\geq 6.5\%$)

Estimated Average Glucose

A1C (%)	Mean plasma glucose	
	mg/dl	mmol/l
6	126	7.0
7	154	8.6
8	183	10.2
9	212	11.8
10	240	13.4
11	269	14.9
12	298	16.5

These estimates are based on ADAG data of ~2,700 glucose measurements over 3 months per A1C measurement in 507 adults with type 1, type 2, and no diabetes. The correlation between A1C and average glucose was 0.92. A calculator for converting A1C results into estimated average glucose (eAG), in either mg/dl or mmol/l, is available at <http://professional.diabetes.org/GlucoseCalculator.aspx>.

ADA. V. Diabetes Care. *Diabetes Care* 2011;34(suppl 1):S18. Table 9.



Inflammation

- Proinflammatory/prothrombotic factors underlie cardiometabolic risk
- Obesity is associated with inflammation

Treatment

- Antiplatelet Agents
 - Aspirin
 - Clopidogrel

Ross R. Atherosclerosis: an inflammatory disease. *N Engl J Med.* 1999;340:115-126. Ballantyne CH, Nambi V. Markers of inflammation and their clinical significance. *Atherosclerosis suppl* 2005; 6: 21-9. McLaughlin T et al. Differentiation between obesity and insulin resistance in the association with C-reactive protein. *Circulation.* 2002;106:2908-2912.

ADA. VI. Prevention, Management of Complications. *Diabetes Care* 2011; 34(suppl 1):S31.

Hypertension

Goal

- Blood Pressure <130/80

Treatment

- Lifestyle therapy
 - Weight loss if overweight
 - DASH-style dietary pattern including reducing sodium, increasing potassium intake
 - Moderation of alcohol intake
 - Increased physical activity (B)
- Pharmacological agents

ADA. VI. Prevention, Management of Complications. *Diabetes Care* 2011;34(suppl 1):S31. Table 12.

Physical Activity

Goal

- Increased activity

Treatment

- Advise people with diabetes to perform at least 150 min/week of moderate-intensity aerobic physical activity (50-70% of maximum heart rate) (A)
- In absence of contraindications, people with type 2 diabetes should be encouraged to perform resistance training three times per week (A)

ADA. V. Diabetes Care. Diabetes Care 2011;34(suppl 1):S24

Physical Activity

Goal

- Increased activity

Treatment

- Advise people with diabetes to perform at least 150 min/week of moderate-intensity aerobic physical activity (50-70% of maximum heart rate) (A)
- In absence of contraindications, people with type 2 diabetes should be encouraged to perform resistance training three times per week (A)

Dyslipidemia

Goal

- Lipids
 - LDL cholesterol <100 mg/dL

Treatment

- Lifestyle modification (A)
 - Reduction of saturated fat, trans fat, cholesterol intake
 - Increased n-3 fatty acids, viscous fiber, plant stanols/sterols
 - Weight loss (if indicated)
 - Increased physical activity
- Pharmacological agents

ADA. VI. Prevention, Management of Complications. *Diabetes Care* 2011;34(suppl 1):S29.

Smoking

Goal

- Smoking Cessation

Treatment

- Advise all patients not to smoke (A)
- Include smoking cessation counseling and other forms of treatment as a routine component of diabetes care (B)

ADA. VI. Prevention, Management of Complications. *Diabetes Care* 2011;34(suppl 1):S32.

Glucose

Goal

■ Glucose Control

A1c	<7.0%
Preprandial capillary plasma glucose	70-130 mg/dL
Peak postprandial capillary plasma glucose	<180 mg/dL

Treatment

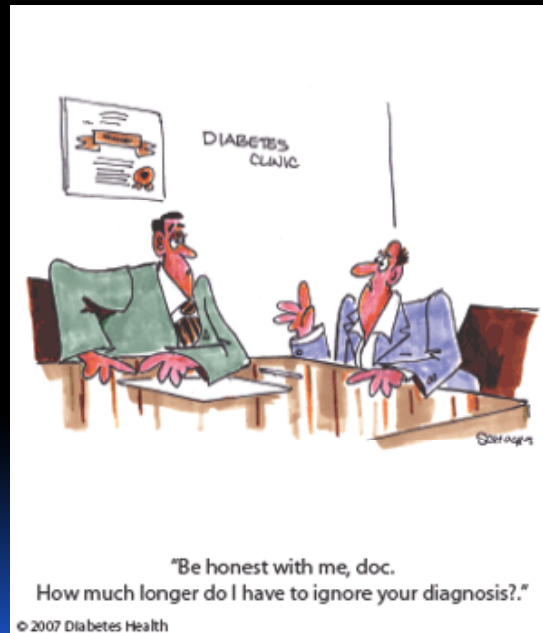
■ Diabetes self-management education (DSME)

ADA. V. Diabetes Care. *Diabetes Care* 2011;34(suppl 1):S21. Table 10.

DSME

- Diabetes disease process
- Medical nutrition therapy
- Physical Activity
- Medications
- Blood glucose monitoring
- Acute complications
- Chronic complications
- Personal strategies

ADA. V. Diabetes Care. *Diabetes Care* 2011;34(suppl 1):S91.



Medical Nutrition Therapy

- Individuals who have prediabetes or diabetes should receive individualized MNT as needed to achieve treatment goals (A)



ADA. V. Diabetes Care. *Diabetes Care* 2011;34(suppl 1):S22.

Glucose Monitoring

- Self-monitoring of blood glucose should be carried out 3+ times daily for patients using multiple insulin injections or insulin pump therapy (A)
- For patients using less frequent insulin injections, noninsulin therapy, or medical nutrition therapy alone
 - SMBG may be useful as a guide to success of therapy (E)
 - However, several recent trials have called into question clinical utility, cost-effectiveness, of routine SMBG in non-insulin-treated patients

ADA. V. Diabetes Care. *Diabetes Care* 2011;34(suppl 1):S17.

Hypoglycemia

- Glucose (15-20 g) is preferred treatment for conscious individual with hypoglycemia (E)
- Glucagon should be prescribed for all individuals at significant risk of severe hypoglycemia, and caregivers/family members instructed in administration (E)
- Those with hypoglycemia unawareness or one or more episodes of severe hypoglycemia should raise glycemic targets to reduce risk of future episodes (B)

ADA. V. Diabetes Care. *Diabetes Care* 2011;34(suppl 1):S25.

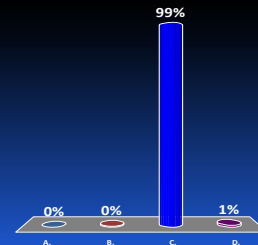
Hypoglycemia Associated with Cardiovascular Complications

- Tachycardia and high blood pressure
- Myocardial ischemia
 - Silent ischemia, angina, infarction
- Cardiac arrhythmias
 - Transiently prolonged corrected QT interval,
 - Increased QT dispersion
- Sudden death

Wright RJ, Frier BM. *Diabetes Metab Res Rev* 2008; 24: 353–363

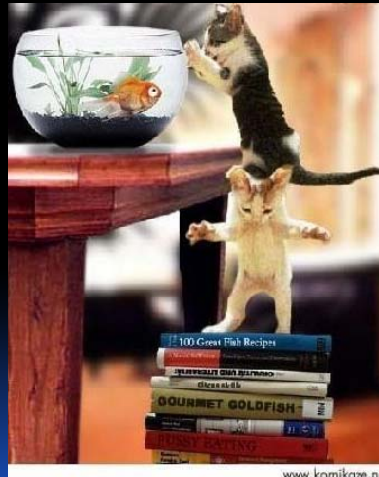
Mr. Martin: “I am not going to test my blood sugars.” How would you respond to Mr. Martin?

- “You have diabetes, you must test your blood sugars.”
- “Mr. Martin, it is just a small finger prick.”
- “What are your concerns about testing your blood sugars?”
- “The meters now are small and convenient to use.”



Working Together

- Empowerment
- Motivational Interviewing
- Stages of Change



AADE 7-Self-Care Behaviors

1. Healthy eating
2. Being active
3. Monitoring
4. Taking medication
5. Problem solving
6. Reducing risks
7. Healthy coping

<http://www.diabeteseducator.org/ProfessionalResources/AADE7>. Retrieved 9/8/2011.

Behavior Change Techniques

- Open ended questions (examples):
 - **Tell me** what concerns you the most about your diabetes
 - **What** is the most difficult thing about changing your eating habits?
 - **How** do you feel when your blood glucose is over 200 most of the time?

Always start with an open ended question!

Listen

- Reflective
- Rephrasing
- Reframing



Roll with Resistance

Resistance

- Does not mean patient is noncompliant or does not want to change
- Means provider (you) may need to try another approach

Look AHEAD (Action for Health in Diabetes)

- Intensive lifestyle intervention resulted in¹
 - Average 8.6% weight loss
 - Significant reduction of A1C
 - Reduction in several CVD risk factors
- Benefits sustained at 4 years²
- Final results of Look AHEAD to provide insight into effects of long-term weight loss on important clinical outcomes


1. Look AHEAD Research Group. *Diabetes Care*. 2007;30:1374-1383;
2. Look AHEAD Research Group. *Arch Intern Med*. 2010;170:1566-1575.

2011 NHLBI Guidelines

Cardiovascular Risk Reduction in Adults

- Who is at risk?
 - Global risk calculators
 - Inclusion of non-lipid markers
 - C-reactive protein (CRP)
 - Lipoprotein-associated phospholipase A2 (LpPLA2)
 - Apolipoprotein B (ApoB)/ Non-HDL
- How low is too low?
- When should therapy start?
 - Lifetime risk
 - 10-year vs. 30-year risk
- What drug combinations are best?

Risk Tools: ATP III

 NATIONAL CHOLESTEROL EDUCATION PROGRAM
Third Report of the Expert Panel on
Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III)

Risk Assessment Tool for Estimating 10-year Risk of Developing Hard CHD (Myocardial Infarction and Coronary Death)

The [risk assessment tool](#) below uses recent data from the Framingham Heart Study to estimate 10-year risk for "hard" coronary heart disease outcomes (myocardial infarction and coronary death). This tool is designed to estimate risk in adults aged 20 and older who do not have heart disease or diabetes. Use the calculator below to estimate 10-year risk.

Age: years

Gender: Female Male

[Total Cholesterol:](#) mg/dL

[HDL Cholesterol:](#) mg/dL

[Smoker:](#) No Yes

[Systolic Blood Pressure:](#) mm/Hg

Currently on any medication to treat high blood pressure. No Yes

END POINT=CHD (MI and CHD death)

ACCF/AHA Task Force on Practice Guidelines. *Circulation*. 2010;122:e584-e636.
NCEP ATP-III Risk Assessment Tool. Available at hp2010.nhlbi.nih.net/atpiii/calculator.asp?usertype=prof Accessed 9/8/11.

Risk Tools: HeartScore

END POINT=FATAL CHD

ACCF/AHA Task Force on Practice Guidelines. *Circulation*. 2010;122:e584-e636.
Heart Score. Available at www.heartscore.org/Pages/welcome.aspx. Accessed 9/8/11.

Risk Tools: PROCAM

END POINT=Fatal or Nonfatal MI, or sudden cardiac death (CHD and CVD combined)

ACCF/AHA Task Force on Practice Guidelines. *Circulation*. 2010;122:e584-e636.
PROCAM Coronary Risk Assessment. Available at http://www.chd-taskforce.com/procam_interactive.html Accessed 9/8/11.

Mr. Smith

INTERNATIONAL TASK FORCE FOR PREVENTION OF CORONARY HEART DISEASE

Home | **Coronary Risk Assessment** | CHD prevention | Events | About us

You are here: Home > Coronary Risk Assessment > PROCAM interactive

Important note!
If you suffered a heart attack or stroke in the past, or do now suffer from angina (angina pectoris), you already have a high risk for a heart attack.

PROCAM Quick Check | **PROCAM Health Check**

Risk Factors

Age (20-75 years): 47

Gender: Male Female

Known diabetes mellitus or fasting blood glucose levels ≥ 120 mg/dl: No Yes ? [usa](#)

Current nicotine consumption: No Yes

Positive family anamnesis: No Yes ? [usa](#)

Systolic blood pressure (100-225 mmHg): 146

Weight (40-120 kg): 104

Body height (140-210 cm): 178

Antihypertensive therapy: No Yes

MI risk: 63.35%*

* 9.73-fold increased compared to the risk of an average person at the same age (6.51% in 10 years).

Risk Tools: Reynolds

Reynolds Risk Score
Calculating Heart and Stroke Risk for Women and Men

Home | Calculator | FAQ

If you are healthy and without diabetes, the Reynolds Risk Score is designed to predict your risk of having a future heart attack, stroke, or other major heart disease in the next 10 years.

In addition to your age, blood pressure, cholesterol levels and whether you currently smoke, the Reynolds Risk Score uses information from two other risk factors, a blood test called hsCRP (a measure of inflammation) and whether or not either of your parents had a heart attack before they reached age 60 (a measure of genetic risk). To calculate your risk, fill in the information below with your most recent values. [Click here](#) for help filling the information.

Gender: Male Female

Age: _____ Years (Maximum age must be 80)

Do you currently smoke? Yes No

Systolic Blood Pressure (SBP): _____ mm/Hg

Total Cholesterol: _____ mg/DL (or) _____ mmol/L

HDL or "Good" Cholesterol: _____ mg/DL (or) _____ mmol/L

High Sensitivity C-Reactive Protein (hsCRP): _____ mg/L

Did your Mother or Father have a heart attack before age 60? Yes No

END POINT=MI, ischemic stroke, coronary revascularization, cardiovascular death (CHD and CVD combined)

ACCF/AHA Task Force on Practice Guidelines. *Circulation*. 2010;122:e584-e636. Reynolds Risk Score. Available at www.reynoldsriskscore.org. Accessed 9/8/11.

Summary

- CVD prevention starts before the diagnosis of diabetes
- Prediabetes is an important risk factor for future diabetes and CVD
- Recent studies have shown that lifestyle modification can reduce—
 - the rate of progression from prediabetes to diabetes
 - several CVD risk factors
- Behavior change requires the patient and YOU working together!

