



Is Blood Glucose a Significant Missing Variable from The Cardiovascular Core Measures?

Destination Getaway: Bridging the Gaps
October 8, 2011
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The goal of diabetes management is . . .
To manage blood glucose.

The purpose of blood glucose management is . . .
To prevent complications



Framingham Study 1978

- > Originator of the term "Risk Factors"
- > Included >5000 men and women > 10 years)

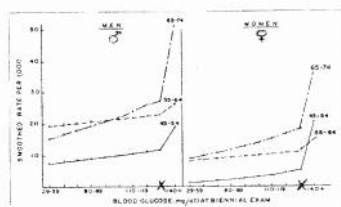


Figure 6. Average annual incidence of coronary heart disease according to blood glucose level. Seven-year follow-up. men and women 40 to 74 years of age.
1978 Framingham Heart Study

The Association of Mealtime Glucose Spikes and Risk of CVD & Mortality

Diabetes Intervention Study, 1996	➡	Post-meal, but not fasting glucose, is associated with CHD
The Rancho-Bernardo Study, 1998	➡	2-hr post-challenge hyperglycemia more than doubles the risk of fatal CVD/heart disease in older adults.
Funagata Diabetes Study, 1999 ³	➡	IGT, but not IFG, is a risk factor for CVD
Whitehall, Paris, Helsinki 1999	➡	Men in upper 2.5% of 2-hr post-meal glucose Study, 1998 ⁴ distribution had significantly higher CHD mortality
Pacific and Indian Ocean, 1999 ²	➡	Isolated 2-hr hyperglycemia doubles the risk of mortality
DECODE, 1999 ¹	➡	High 2-hr post-load blood glucose is associated with increased risk of death independent of FPG

1. DECODE Study Group. *Lancet* 1999;354:617-621
 2. Shaw JE et al. *Diabetologia* 1999;42:1050-1054
 3. Tomianga M et al. *Diabetes Care* 1999;22:920-92
 4. Balkau B et al. *Diabetes Care* 1998;21:360-367
 5. Hansfield M et al. *Diabetologia* 1996;39:1577-1583
 6. Barrett-Connor E et al. *Diabetes Care* 1998;21:1236-1239

Proven Results

American Stroke Association | American Heart Association

Scandinavian Simvastatin Survival Study (4S)

Nov 1998 10.1056/a-04444

Decrease in recurrent events/mortality: 34% risk reduction for recurrent events
 42% risk reduction in CVD mortality

UCLA CHAMP Study

1999 Multicenter

Decrease in recurrent events/mortality: Risk down to 6.4% from 14.8%
 Improvement in preventive treatments:
 use of Statins up to 86% from 6%
 use of Beta-Blockers up to 61% from 12%
 use of ACE Inhibitors up to 56% from 4%

Brown University Study

Improvement in preventive treatments:
 89% given aspirin, up from 75%
 85% given Beta-Blockers, up from 62%

New England Pilot Program

Improvement in preventive treatments:
 86% smoking cessation, up from 48%
 88% lipid treatment, up from 54%
 74% rehabilitation referral, up from 34%

Fonarow GC, Gawlinski A, Cardin S et al. Improved treatment of cardiovascular disease by implementation of a cardiac hospitalization atherosclerosis management program: CHAMP. *Am J Cardiol* 2001;87:819-22.

Get With The Guidelines Initially launched February 2002

Does the AHA's GWTG Program Improve the Quality of Cardiovascular Care in Hospitalized Patients with Diabetes?

Fonarow, Gregg C. et al. *Circulation*, 2004; 110: III-800

Metric	Baseline	Q1	Q4
Early ASA with Diabetes	68.2%	79.6%	84.2%
Early BB with Diabetes	63.0%	71.1%	79.2%
Smoking with Diabetes	52.2%	65.2%	75.4%
ACE-I with Diabetes	66.9%	71.7%	72.7%
Lipid Rx with Diabetes	60.7%	67.6%	83.3%

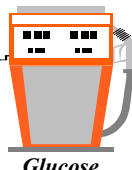
180 mg/dl

80 mg/dl

\uparrow BG $\xrightarrow{\text{Fluid}}$ \uparrow BP $\xrightarrow{\text{Fluid}}$ \uparrow i

\uparrow Urination

- Thirsty
- Tired
- Dry Skin
- Slow healing
- Blurry vision



Glucose

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\uparrow Glucose \rightarrow \uparrow BP

Did you know . . .

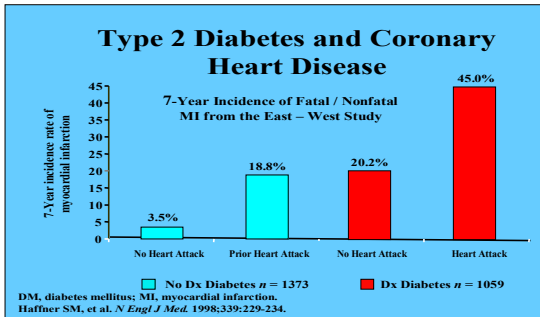
Blood glucose levels > 180 mg/dL lead to:

- **Thickened blood – more prone to clotting**
- Higher Blood Pressure
- More work for the heart
- Sluggish flow through kidneys - delays effect of medications
- Dehydration – compensatory diverted fluid shifts
- Increased risk for Stroke, P.A.D. or M.I.
- Increased risk for skin to break down
- Greater chance of infection
- Poor healing wounds



Type 2 Diabetes and Coronary Heart Disease

7-Year Incidence of Fatal / Nonfatal MI from the East – West Study



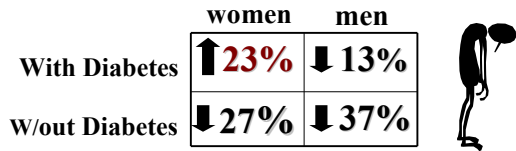
Group	7-Year incidence rate of myocardial infarction
No Dx Diabetes, No Heart Attack	3.5%
No Dx Diabetes, Prior Heart Attack	18.8%
Dx Diabetes, No Heart Attack	20.2%
Dx Diabetes, Heart Attack	45.0%

■ No Dx Diabetes n = 1373 ■ Dx Diabetes n = 1059
 DM, diabetes mellitus; MI, myocardial infarction.
 Haffner SM, et al. *N Engl J Med.* 1998;339:229-234.

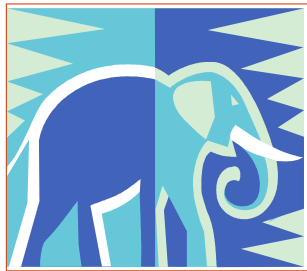
This slide shows the chance of having a heart attack over the next seven years, for a person with and/or without the diagnosis of Diabetes.



**Death from cardiovascular disease
Over the past 30 years . . .**



Source: 2007 National Health and Nutrition Examination Study (NHANES)



**“Diabetes doesn’t kill patients . . .
Poor glycemic management does.”**

*Experience
Based
Practice*




*Evidence
Based
Practice*

Headline “Endocrine Today, March 2006”
“Tight Glycemic Control, the underlying theme of the December, 2003 consensus conference”
 Inpatient Glycemic Management Clinical Practice Recommendations.
 AACE along with representation of 11 other professional organizations.

American Heart Association
Learn and Live... May 26, 2006

Diabetes and Cardiovascular Disease



the HEART of DIABETES

Cardiovascular disease: The leading cause of diabetic-related death
 People with diabetes are two to four times more likely to develop cardiovascular disease due to a variety of risk factors, including:

- High blood pressure
- High cholesterol
- High LDL and cholesterol
- High triglycerides
- Low HDL cholesterol
- Smoking
- Obesity
- Lack of physical activity


Another emerging risk factor is insulin resistance, a core metabolic dysfunction of type 2 diabetes.

Where's the mention of blood glucose management?



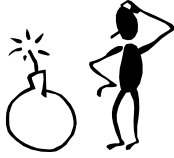
Is suboptimal blood glucose management in cardiovascular patients correlated with poor clinical and financial outcomes?

"The evidence is the goodness of fit between what we did and what we got."
 Tim Porter O'Grady RN DM EdD, ScD(H), FAAN
 Source: Nursing Spectrum 2010 Florence Nightingale edition pg 49



"It takes an average of 17 years for new knowledge to be incorporated into practice."
 Sources:
 Institute of Medicine (IOM) *Shaping the Future for Health*, 2001
 "To Err is Human" 1999
 Balas E and Boren S 2000 *Managing Clinical Knowledge for Healthcare Improvements* pgs 65-70 Germany: Schattauer Publishing
 Melnick B, Fineout-Overholt E. 2005 *Evidence-Based Practice in Nursing and Healthcare, A Guide to Best Practices* pgs 4 and 214

Insanity =
"To do things the same way and expecting to get different results."
Albert Einstein



**“The American Heart Association and the Million Hearts Initiative:
A Presidential Advisory From The American Heart Association**

“The Million Hearts Initiative is aligned with Healthy People 2020 heart disease and stroke targets, which have been set on the basis of achieving a 10% to 20% improvement in cardiovascular prevention over a 10-year period.” . . .

“Strategies will include the ABCS through clinical preventive services . . .

- **A**spirin
- **B**lood Pressure
- **C**holesterol”



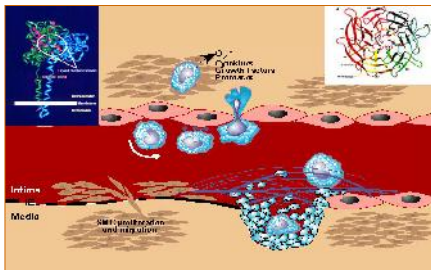
Source: Tomaselli et al; published online September 13, 2011
Circulation, Journal of the American Heart Association



- **A**_{1c}
- blood Pressure
- cholesterol
- Total Cholesterol, LDL, HDL & Triglycerides



Vascular Response



Vascular Inflammation

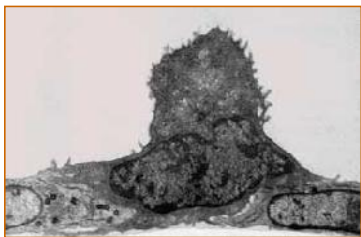


What is different when blood glucose is poorly managed?

The angry platelet



Platelet Aggregation



Platelet Aggregation



"Patients have a 10 to 15 fold higher likelihood of adhering to recommended prevention therapy when it is started in the hospital."
Physicians' Weekly, June 21, 2004
from American Heart Association's "Get With the Guidelines" 2006 presentation

Persons with diabetes have 2-4 times the risk of heart attack, stroke or VTE.
Blood pressure control reduces the risk of cardiovascular disease among people with diabetes by 33% to 50%.
Reducing the diastolic blood pressure from 90 mmhg to 80 mmhg in people with diabetes reduces the risk of major cardiovascular events by 50%
Improved control of LDL cholesterol can reduce cardiovascular complications 20-50%
Source: CDC report, National Diabetes Fact Sheet 2011

Reference: <http://circ.ahajournals.org/cgi/content/full/115/18/e436>
Zarich, s., Nesto, R. 2007 Implications and Treatment of Acute Hyperglycemia in the Setting of Acute Myocardial Infarction Circulation e436-e439

"Never doubt that a small group of committed people can't change the world. Indeed it is the only thing that ever has." Margaret Mead