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Auckland

Saturday, June 10, 2017

8:45 - 9:00 Coronary Ischaemia, and Strategies to Investigate Those at High Risk

Coronary Ischaemia and Strategies to Investigate Those at High Risk

Dr Chris Ellis

Cardiologist

Greenlane CVS Services,
Auckland City Hospital
& Auckland Heart Group

NZMA Rotorua 2017 CME

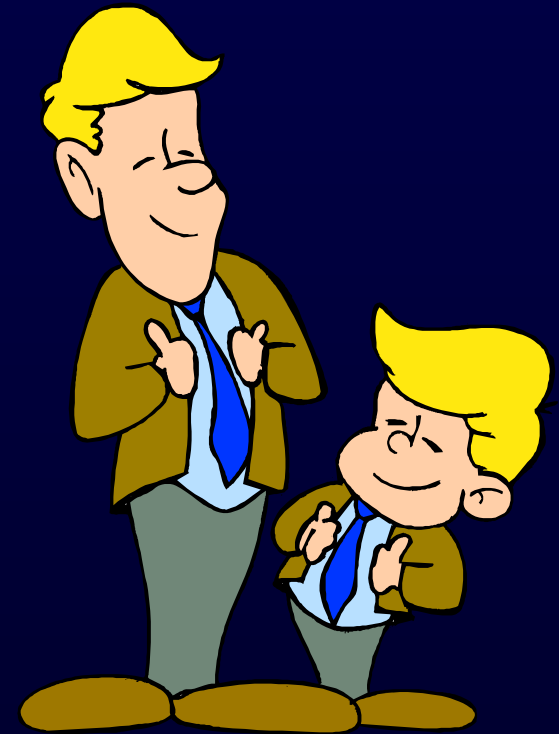
10 June 2017



Who is at High Risk?



Atherosclerosis: Is Poorly Understood A Highly Complex Ageing of the Arteries



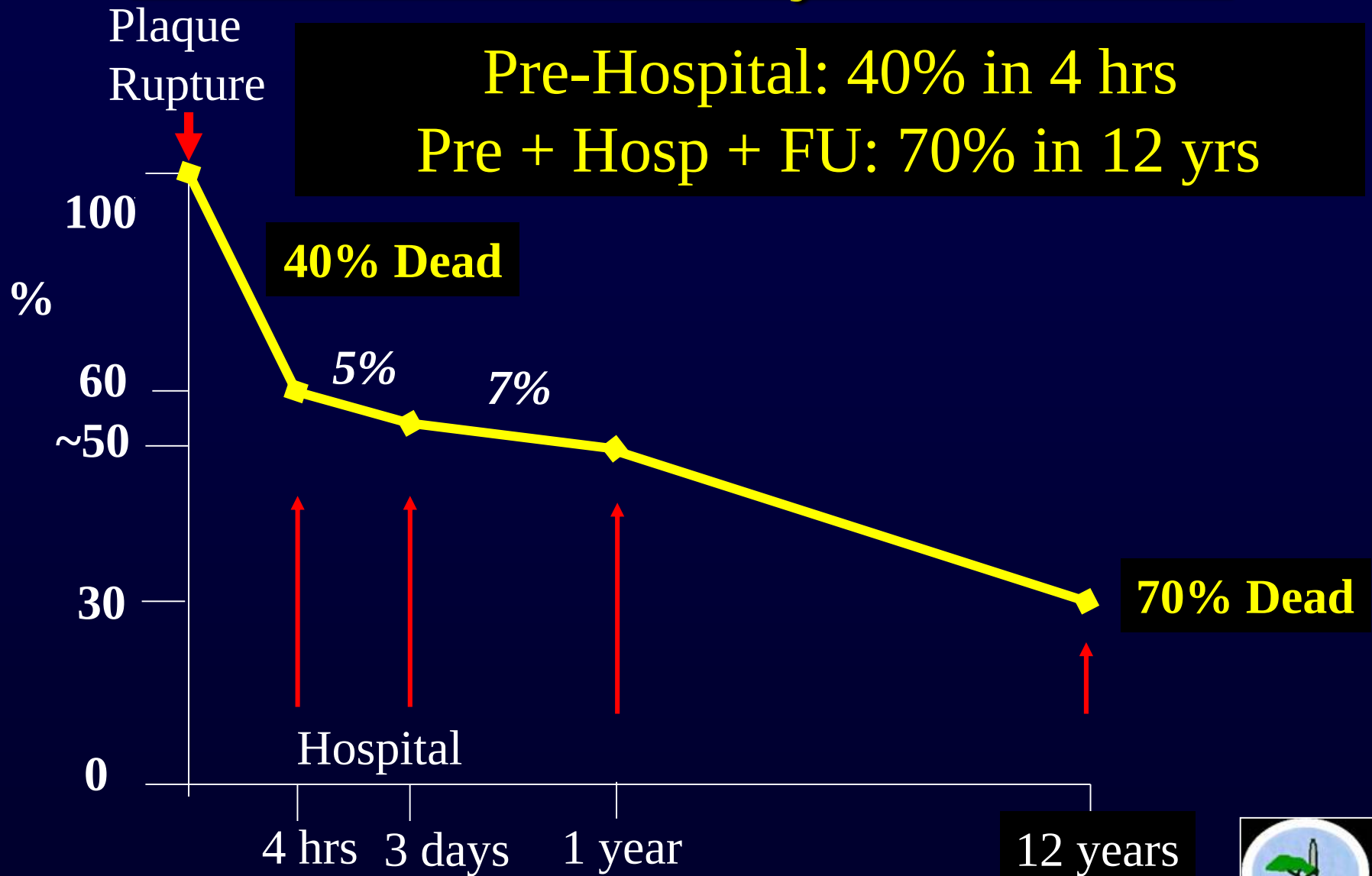
It is driven by *Lifestyle* and *Genetic* factors

Plaque Rupture/Erosion Causing Acute Arterial Thrombus: Well Understood Mechanism of Harm

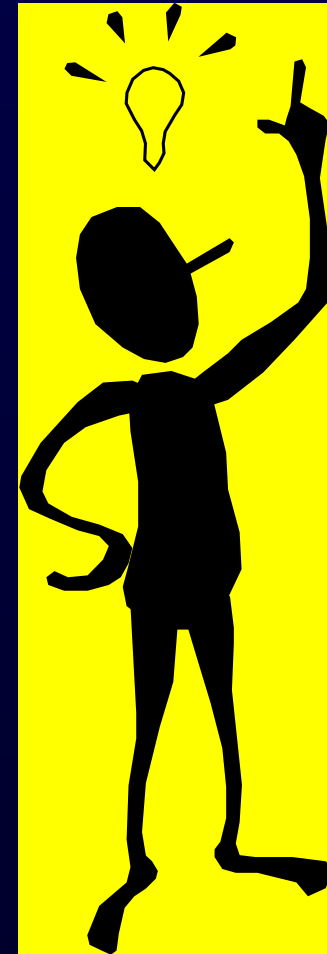
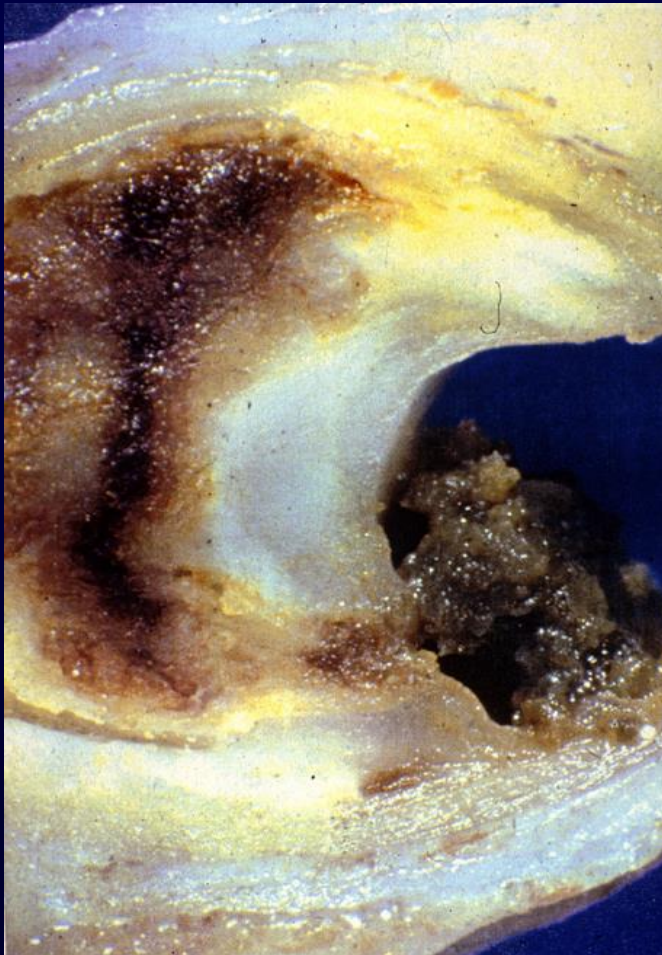
- Coronary artery
 - STEMI/NSTEMI/UAP
- Carotid or Cerebral artery
 - Stroke/TIA



What is the Mortality After a MI?



A Ruptured Plaque in a Coronary Artery is Very Serious



Atherosclerosis: A Complex Ageing/Disease Process: *How Have we Assessed CVS Risk in New Zealand?*



Patient Risk Assessment: Methods

- Epidemiology Based
 - Risk Factors
 - Complex Equation

VS

- Imaging Based
 - Look for Atheroma



Patient Risk Assessment: Methods

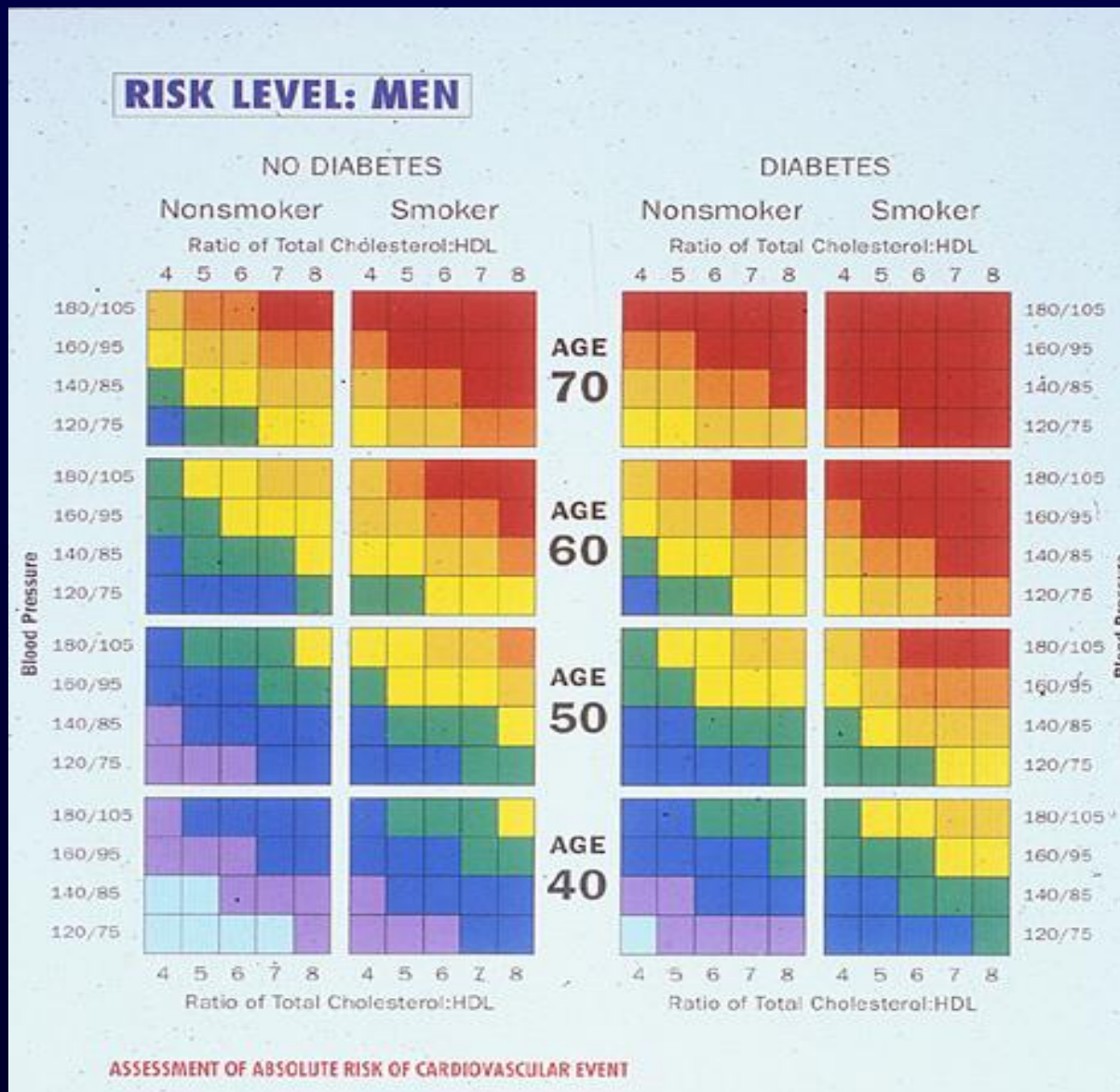
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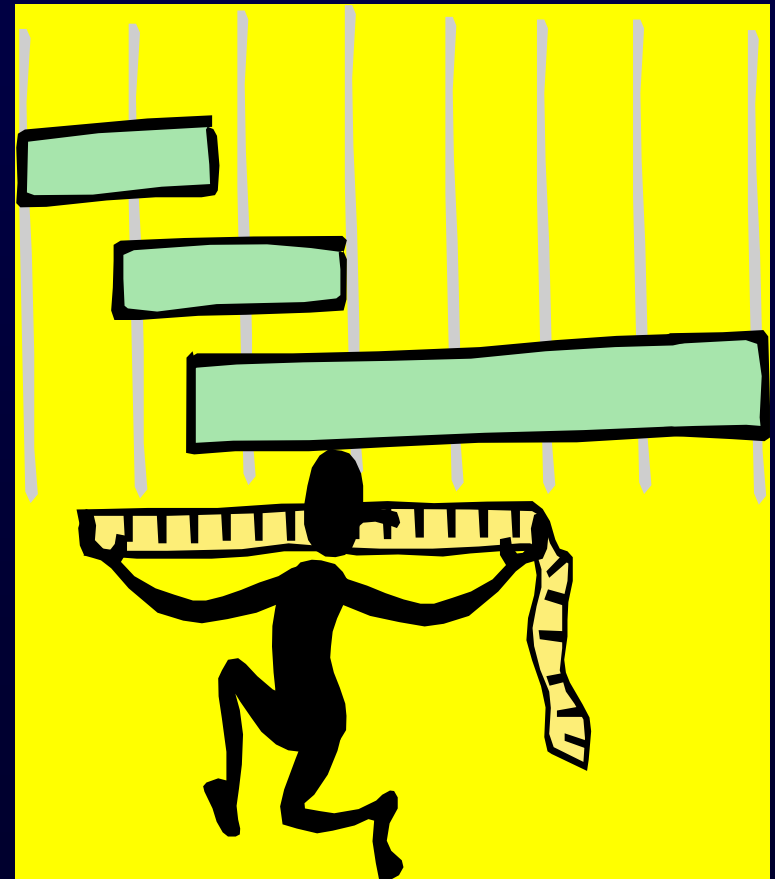


Framingham-Based Risk Tables



Framingham-Based CVS Risk Tables: Risk Factors Used in NZ

- Age (decades)
- Gender
- Diabetes Status (Y/N)
- Hypertension
- Smoker (Y/N)
- Total Cholesterol/HDL Ratio



Additional 5% CVS Risk Factors (2003/2009 NZ Guidelines)

Family history of premature CHD or ischaemic stroke:

- In a first-degree male relative before the age of 55 years or
- In a first-degree female relative before the age of 65 years

Maori

Pacific peoples or people from the Indian subcontinent

People with both diabetes and microalbuminuria

People who have had type 2 diabetes mellitus:

- For more than 10 years or
- Who have an HbA1c consistently greater than 8%

(People with the metabolic syndrome) GONE 2009

IF Total Cholesterol ≥ 8 then risk $\geq 15\%$

if Total Cholesterol/ HDL ≥ 8 then risk $\geq 15\%$

if BP consistently $\geq 170/100$ then risk $\geq 15\%$

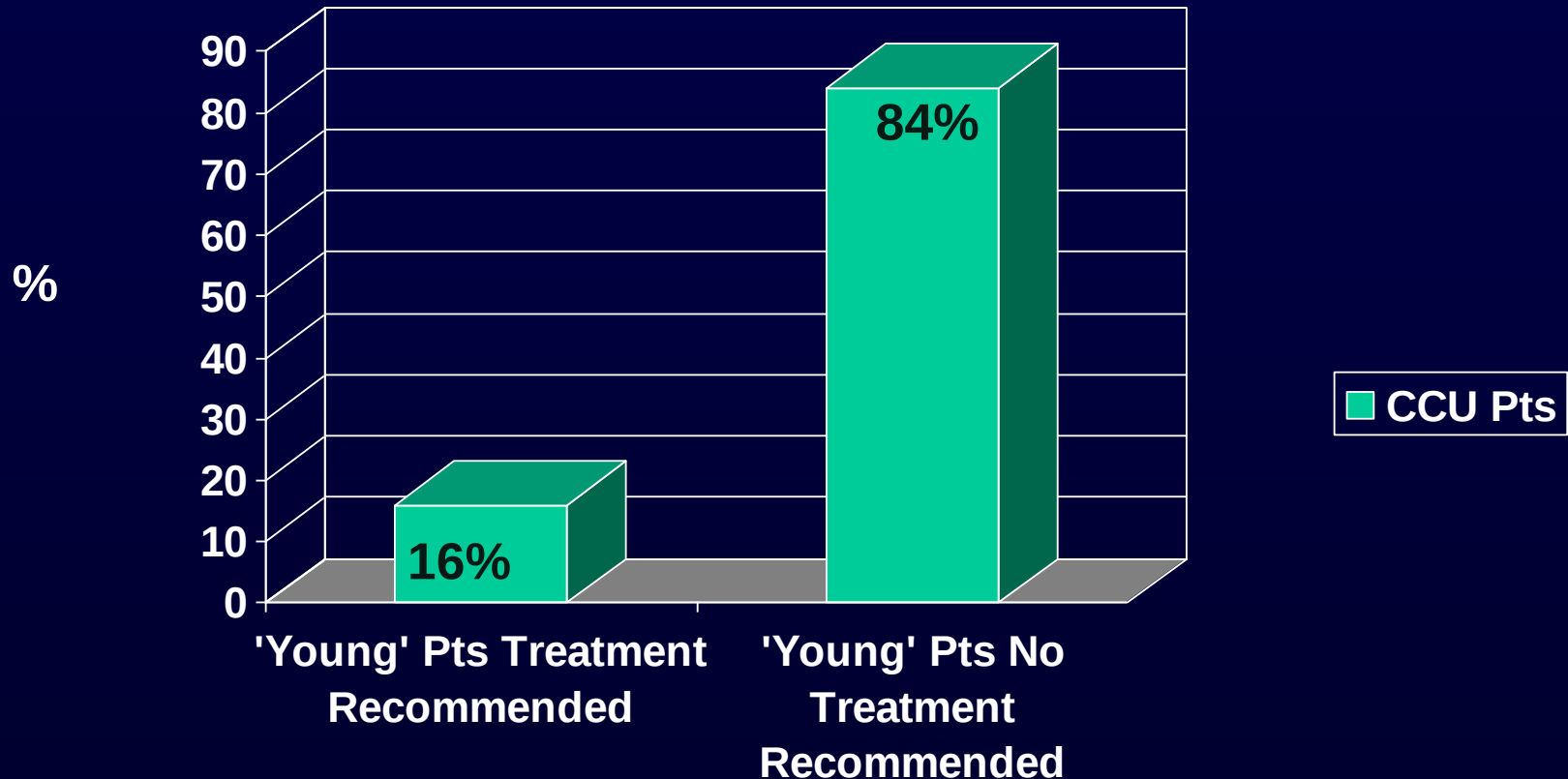
Can the USA Framingham Tables Really Predict CVS Risk: in Acute Coronary Syndrome Patients in NZ?



Auckland City Hosp CCU Pts 1 June 06 to 30 June 07

J Looi, CJ Ellis et al CSANZ 2008

Pts with NZ Framingham CVS Risk > 15% over 5 Years

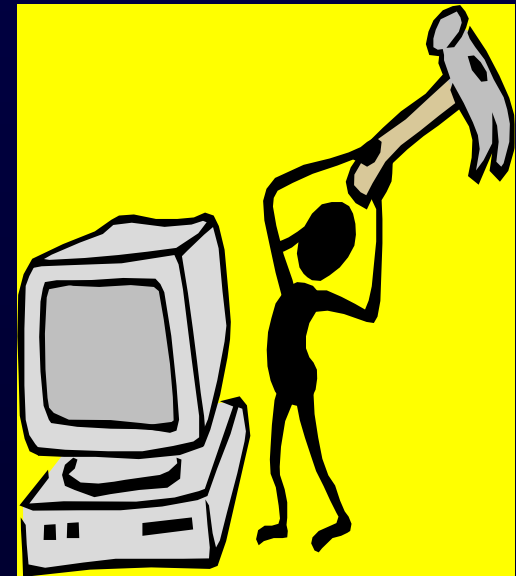


229 pts: 'Young' (male<55, female<65 years), no prior CVS disease



Gradual Realisation over time.....

- Even the best Epidemiological models of CVS risk assessment are inaccurate
- NZ Model is changing (again)
 - Epidemiological focus (most Guidelines)
- Certainly a reasonable way to start:
 - Focus on risk factors, can be addressed
 - Smoking, obesity, diabetes
 - High BP, high cholesterol
- BUT is it really good enough....?



Patient Risk Assessment: Methods

- Epidemiology Based
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VS

- Imaging Based
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Calcified Coronary Arteries

- Intuitive for CVS Risk
 - *Look for disease*
 - Concept used elsewhere
 - Mammography, Colonoscopy
- Calcified Atherosclerosis
 - The ‘End Product’ of all CVS risk factors [known or unknown]
 - The *extent* of coronary atherosclerosis is the strongest predictor of CVS events



Image-Based Assessment of CVS Risk : CT Calcium Score Test

X-Ray ‘slices’ of the heart

3mm Intervals

About 50 cardiac slices per scan



Score relates to volume and density of calcium in the coronary arteries

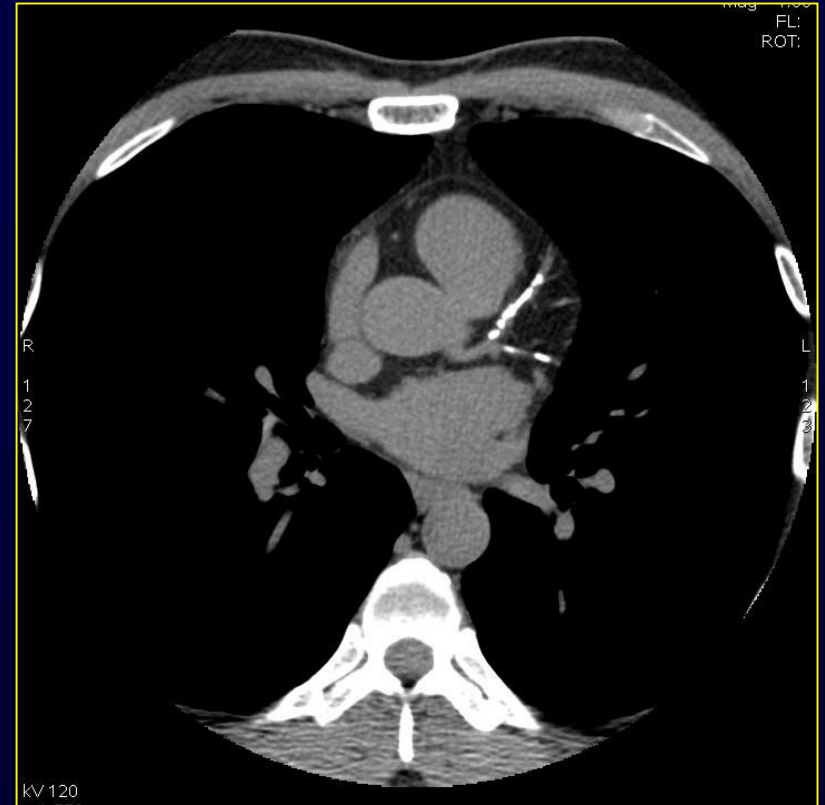
“Agatston” Units

Use for *asymptomatic* People

Images from a CT Calcium Score Test



No calcium



Heavy calcium

GE MEDICAL SYSTEMS
LightSpeed VCT
Ex:
Se: 2
Im: 1
SN 1100.00 Ax
DFOV 25.0cm
STND

A 133

TS1
M46Y
AW148002216.937.1305529664
Mar 08 2010
02:40:45 PM
SEGM512 X 512

Mag = 1.00
FL:
ROT:

R
1
0
8

L
1
4
2

kV 120
mA 200

SFOV 32.0cm
2.500mm /8i 32 row
Tilt: 0.0
0.4s /CI/00.00

WW: 400WL: 40

P117



GE MEDICAL SYSTEMS
LightSpeed VCT
Ex:
Se: 2
Im: 1
SN 1100.00 Ax
DFOV 25.0cm
STND

A 133

TS1
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AW148002216.937.1305529664
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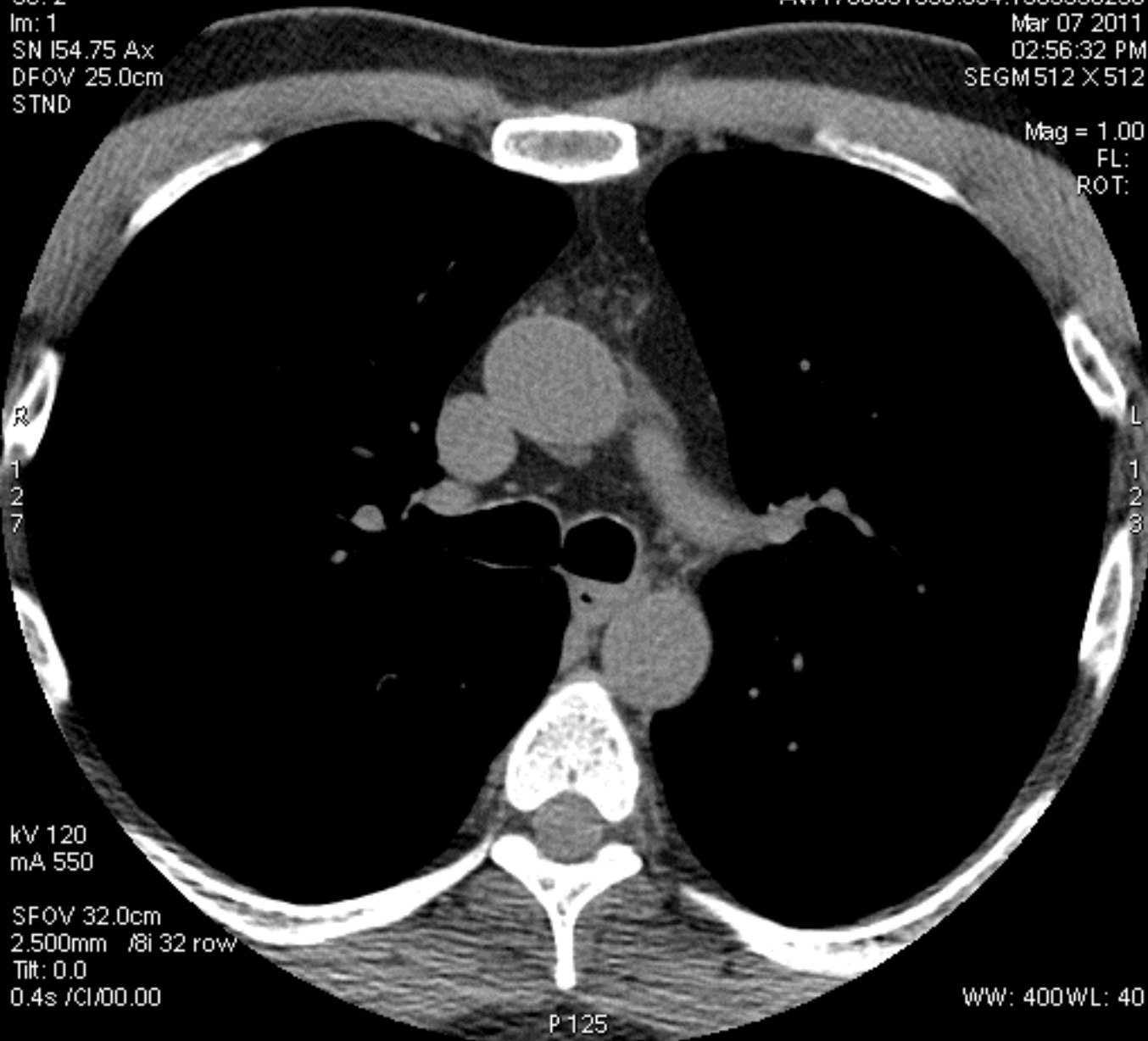


GE MEDICAL SYSTEMS
LightSpeed VCT
Ex:
Se: 2
Im: 1
SN 154.75 Ax
DFOV 25.0cm
STND

A 125

VS
M48Y
AW1700651958.994.1305536230
Mar 07 2011
02:56:32 PM
SEGM512 X 512

Mag = 1.00
FL:
ROT:



kV 120
mA 550

SFOV 32.0cm
2.500mm /8i 32 row
Tilt: 0.0
0.4s /CI/00.00

WW: 400WL: 40

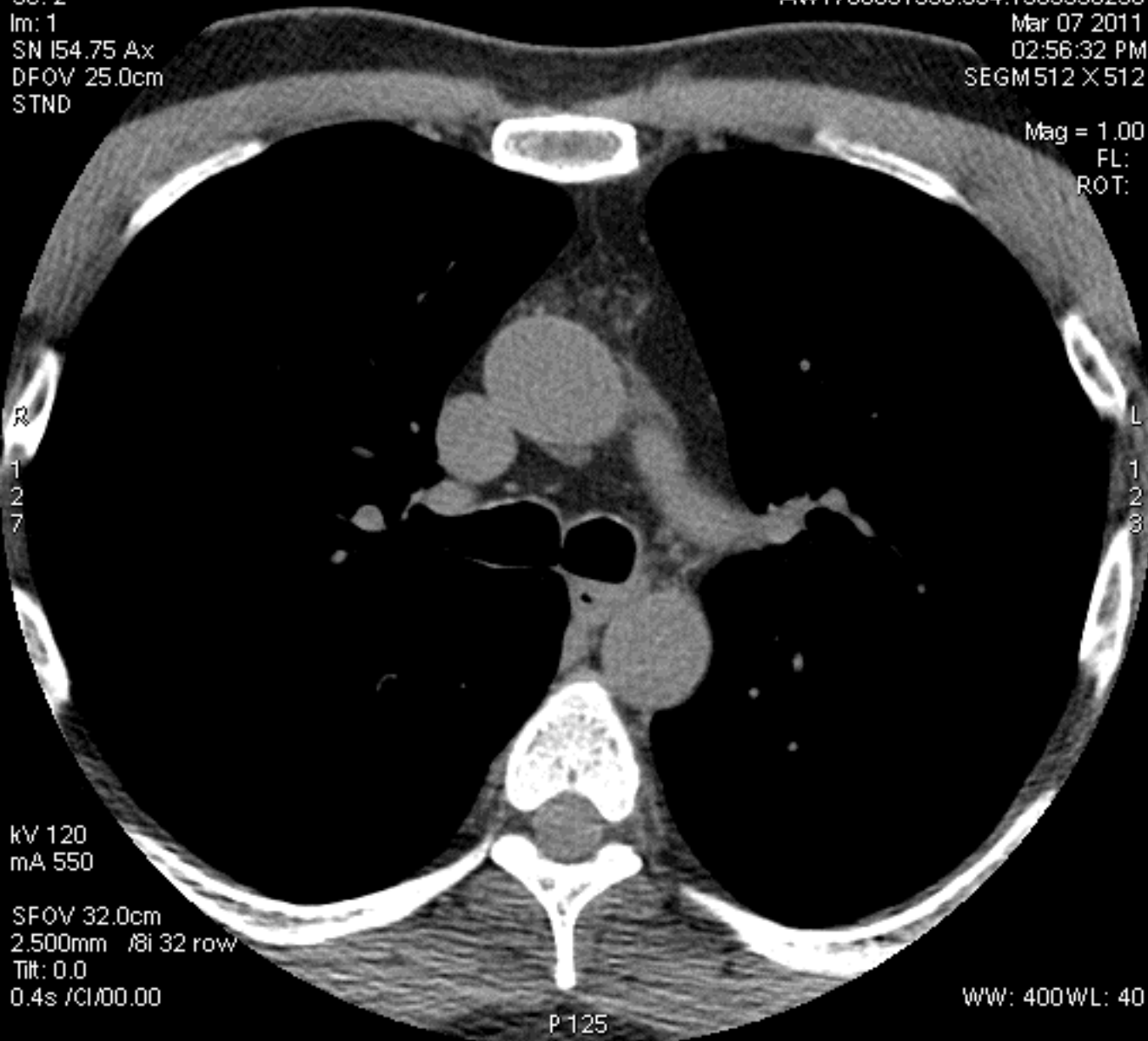
P 125

GE MEDICAL SYSTEMS
LightSpeed VCT
Ex:
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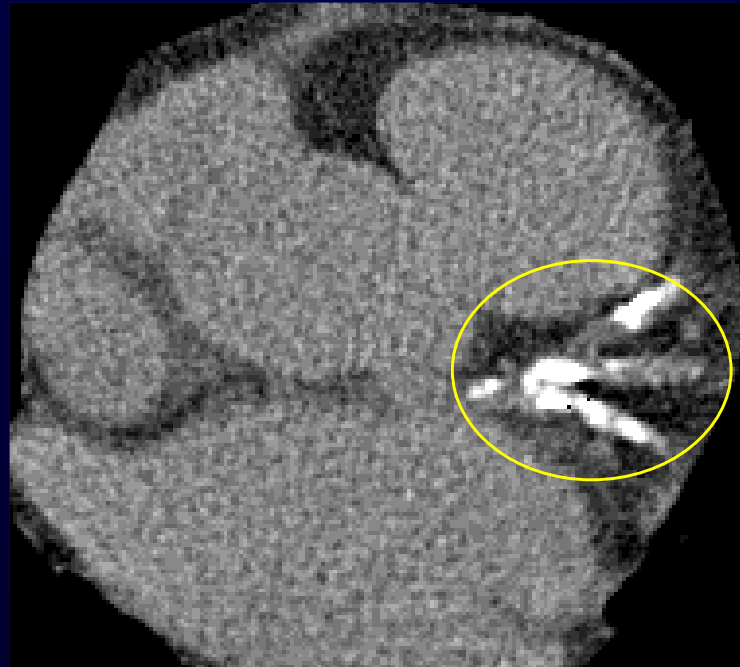
kV 120
mA 550

SFOV 32.0cm
2.500mm /8i 32 row
Tilt: 0.0
0.4s /CI/00.00

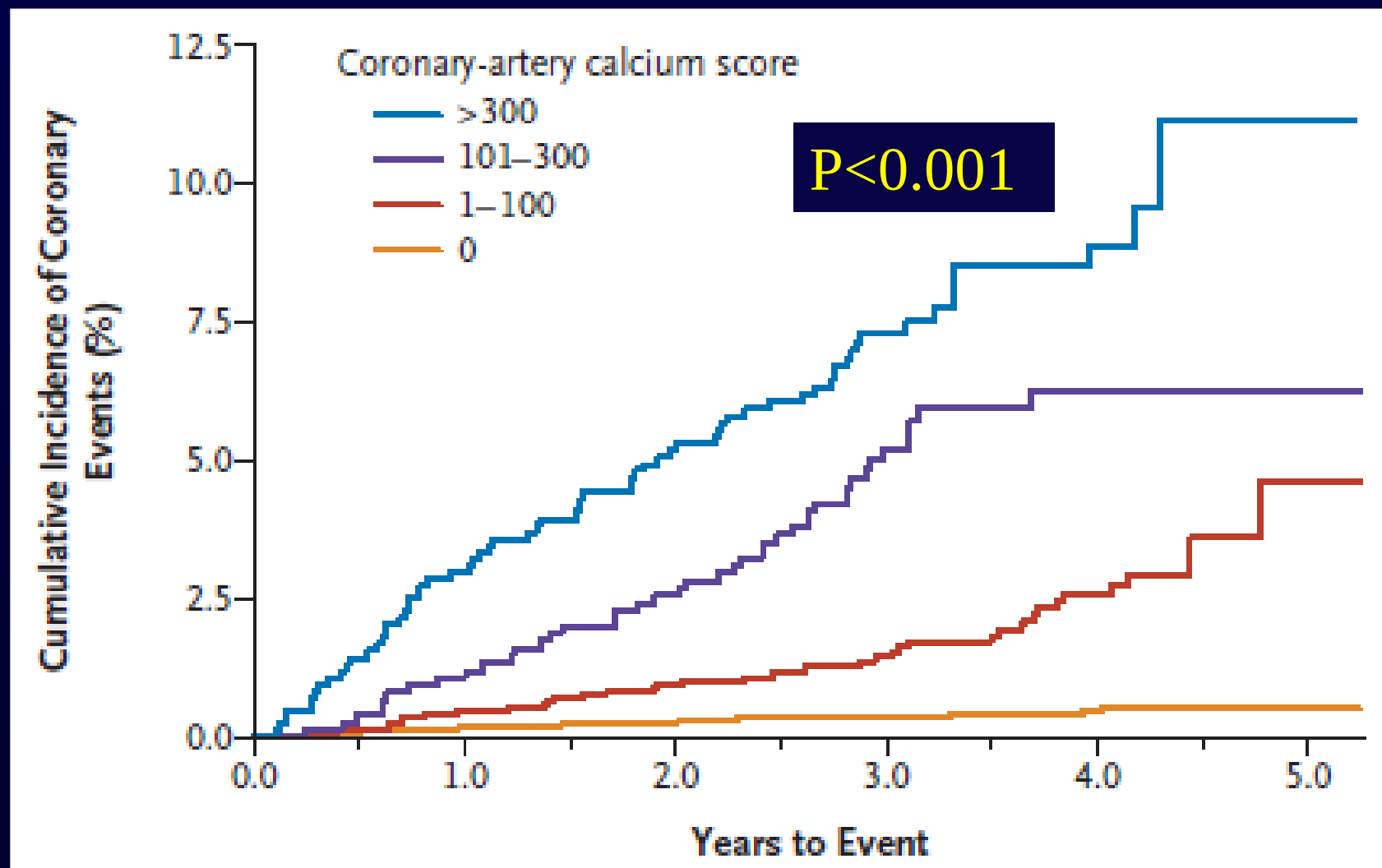
WW: 400WL: 40

P 125

What is the Science to show that Calcium Scores Predict CVS Risk?



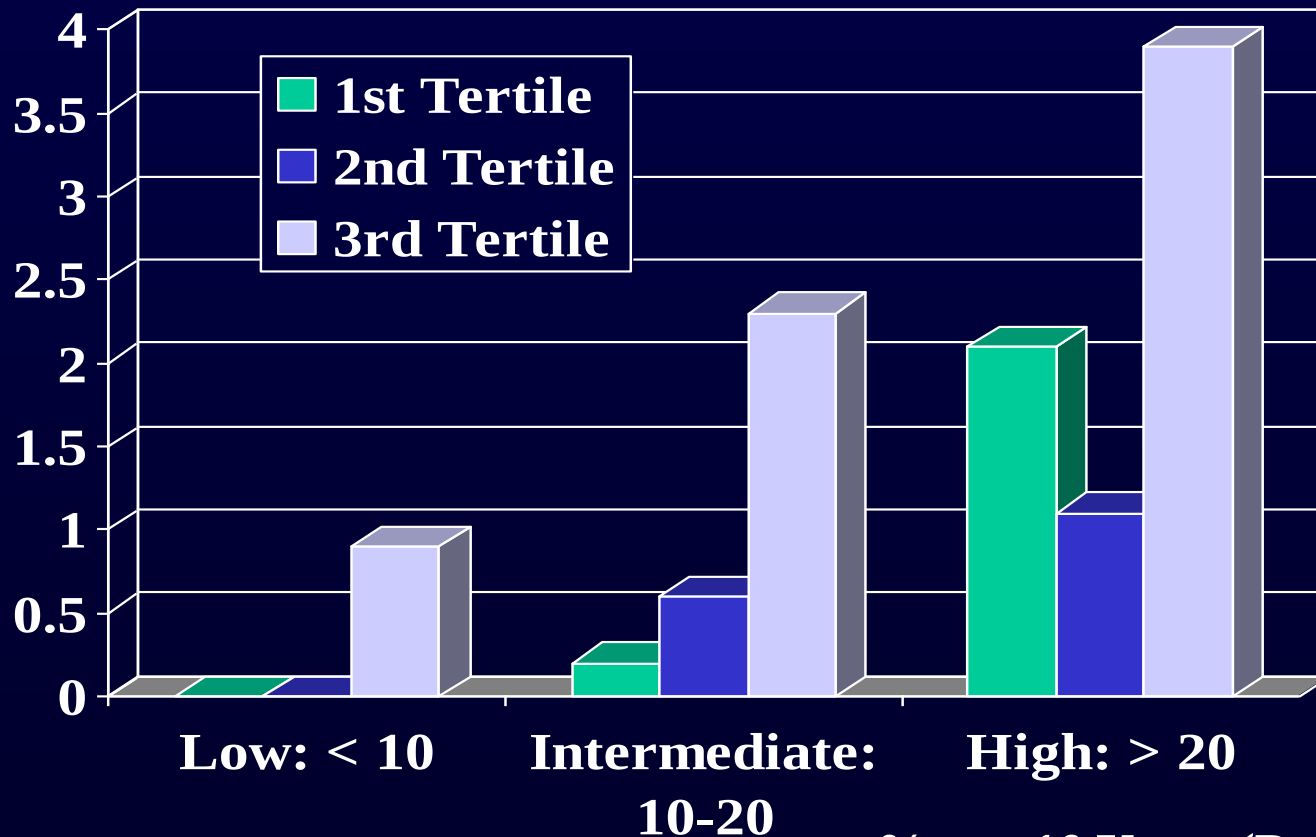
Calcium Score & Any Coronary Events: MESA Study NEJM 2008;358:1336-45



St Francis Heart Study: Coronary Event Rates as a function of Calcium Score within Framingham Risk Groups

Arad JACC 2005;46:158-65

% per year (CVS Events)



4613 Asymptomatic People

% per 10 Years (Predicted)

St Francis Heart Study [of 4,613 Asymptomatic People]

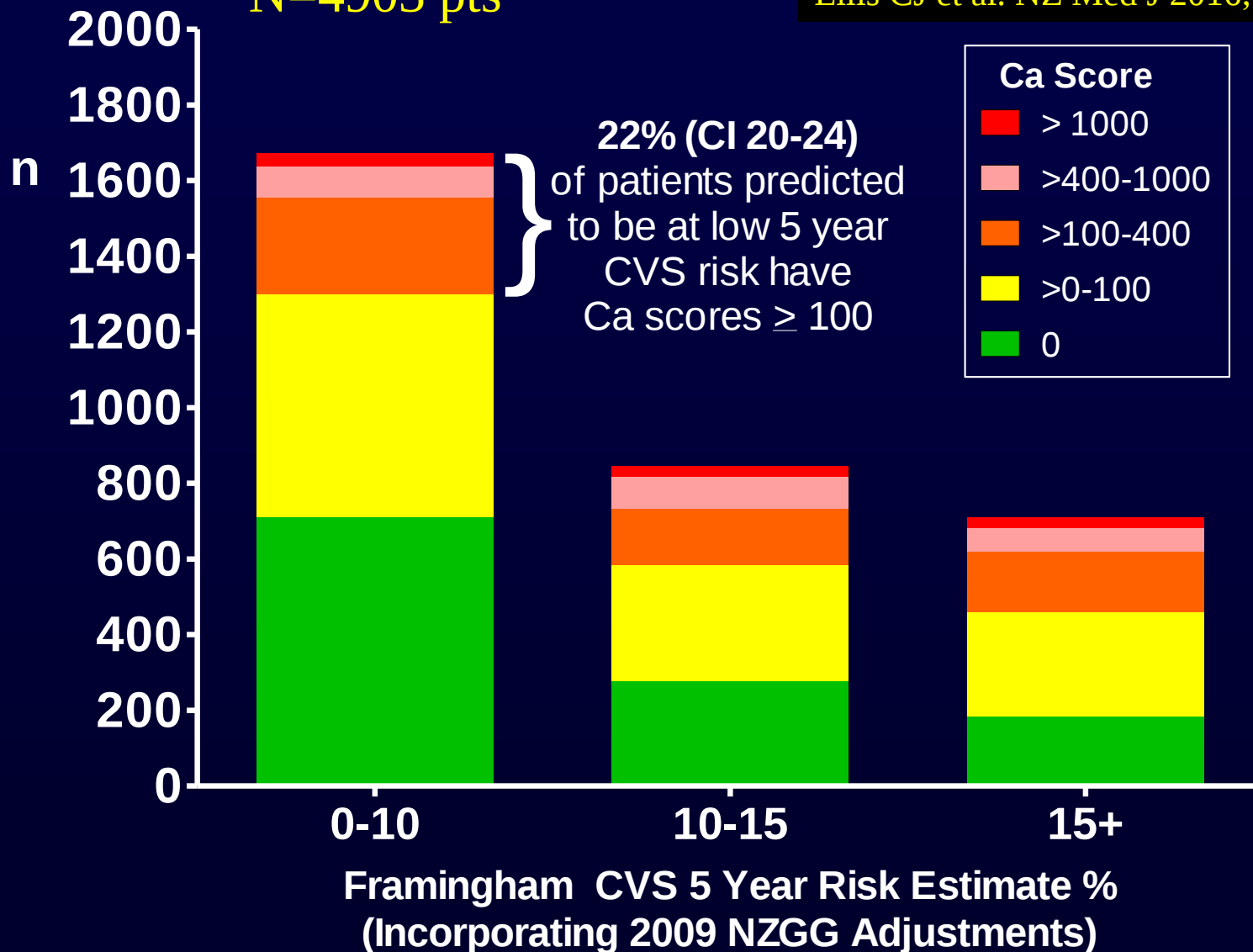
Arad et al. JACC 2005;46: 158-65, 166-72.

- A Coronary Calcium Score of ≥ 100 Agatston units
 - Resulted in x 10 times increase risk of a CVS events
- The Coronary Calcium Score
 - Was superior to the Framingham Risk Equation (Receiver-operator curve 0.79 ± 0.03 vs 0.69 ± 0.03 , $p=0.0006$)
 - Enhanced stratification of Framingham Risk categories, low, intermediate, high risk ($p<0.0001$)

Agatston Calcium Score by Band of 5-Year CVS Risk Estimated by the NZ Guidelines Group 2009 'Adjusted' (Anderson) Framingham Equation

N=4903 pts

Ellis CJ et al. NZ Med J 2016; 124: 1335.

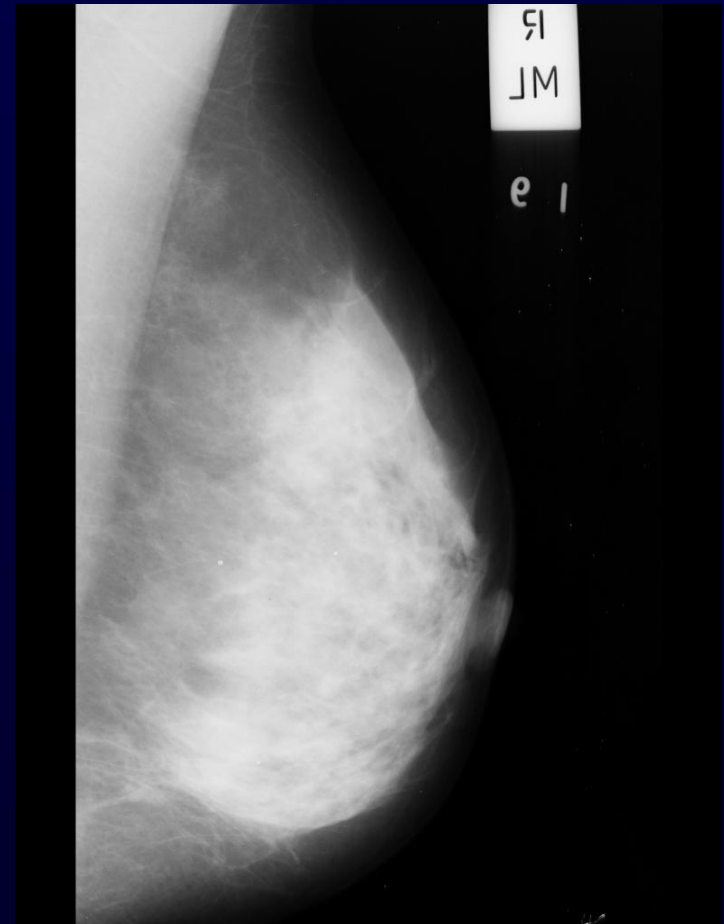


The Radiation Dose of a CT Calcium

Calcium Score (Alone)

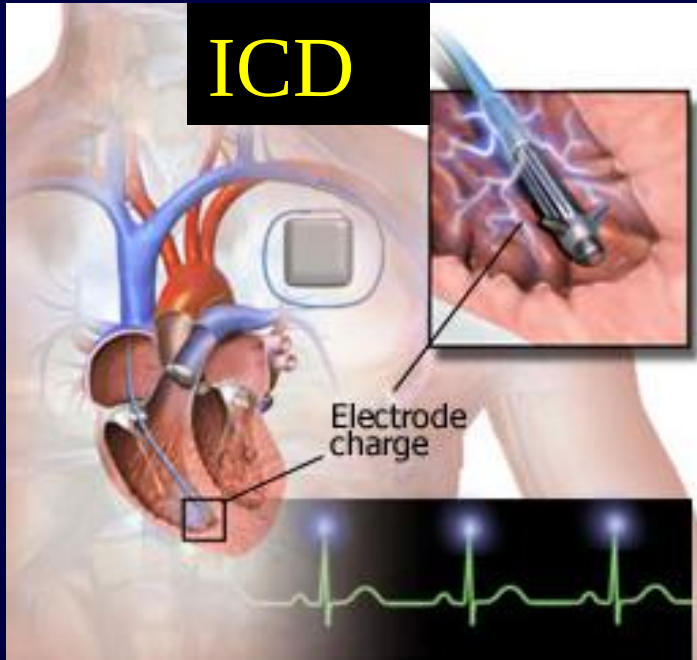
~ 1 mSv: ~ Same
as a Mammogram

Background Radiation
dose in NZ is 3 mSv/year



Secondary Care: Expensive with Invasive Treatments

ICD



STENTS



CABG



Prevention is Better than Cure

Primary Prevention is Better than Cure (We Have to do Better than This)

Collapsed January 2016

Sunday Star Times: 1 May 2016



- Age 54 years
- Physical activity
- Cardiac arrest
- Club's AED
- FH IHD
- High Cholesterol
- No Treatment....

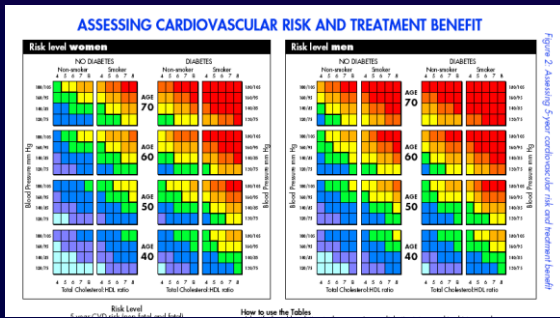
“There was no pain, no numbness, no warning. I was running for a pass, and then the light changed - a bit like an eclipse.”

Geoff Brogan, above, with wife Tara.

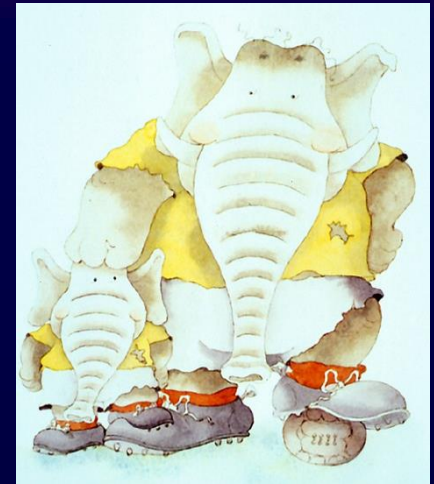
Summary: Combine Strategies to Investigate those at High Risk

- Epidemiology Based
 - Risk Factors
 - Complex Equation
- **Additional** Imaging Based
 - Strategies are now available
 - Look for Atheroma





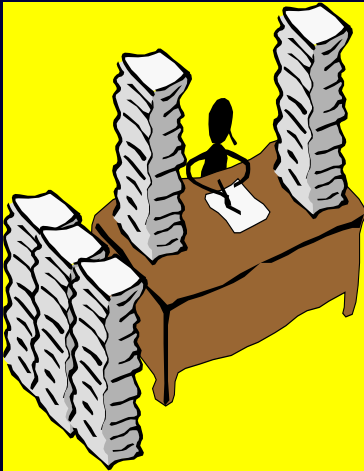
NB: A Calcium Score is MORE Predictive of CVS Risk than the Framingham Equation



Framingham-Based:
5 or 10-Year Risk or
“Lifetime” Risk

CVS Risk Assessment

Family History

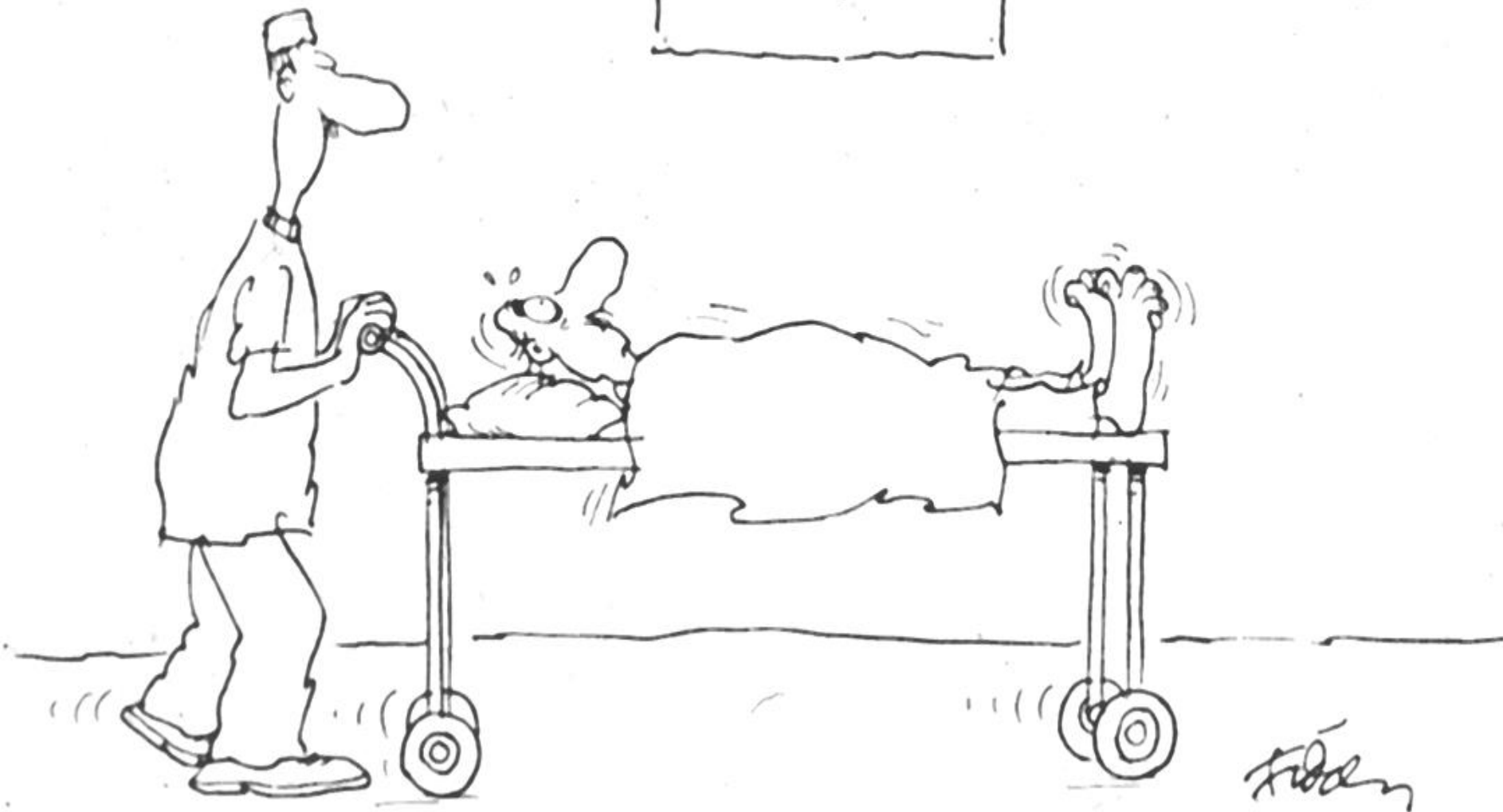


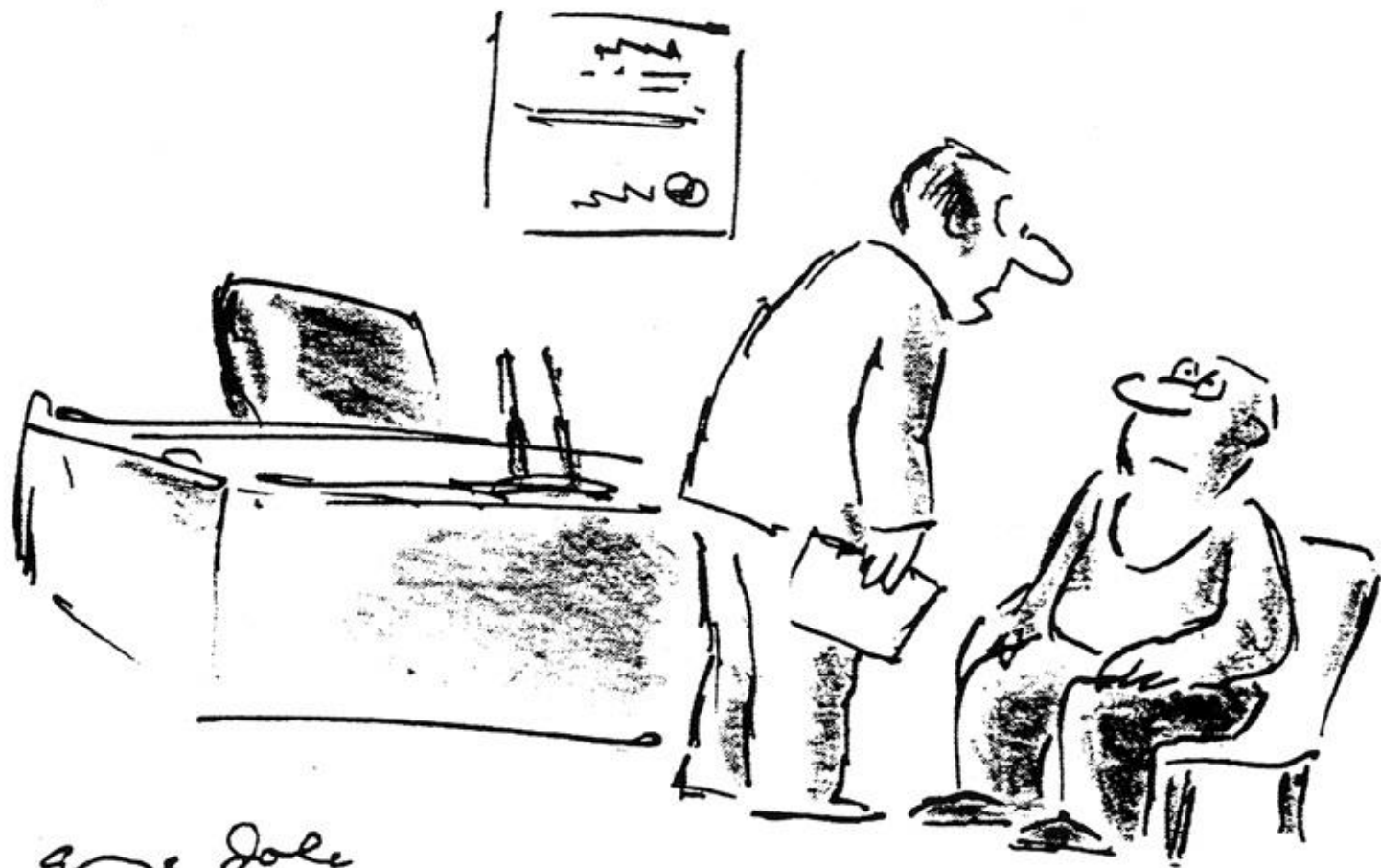
“Modern Risk Factors”



Calcium Scoring (& CT Cardiac Angiography)

The End
➔





Gene Dole

"You're free, of course, to get a second opinion – but for heaven's sake hurry!"

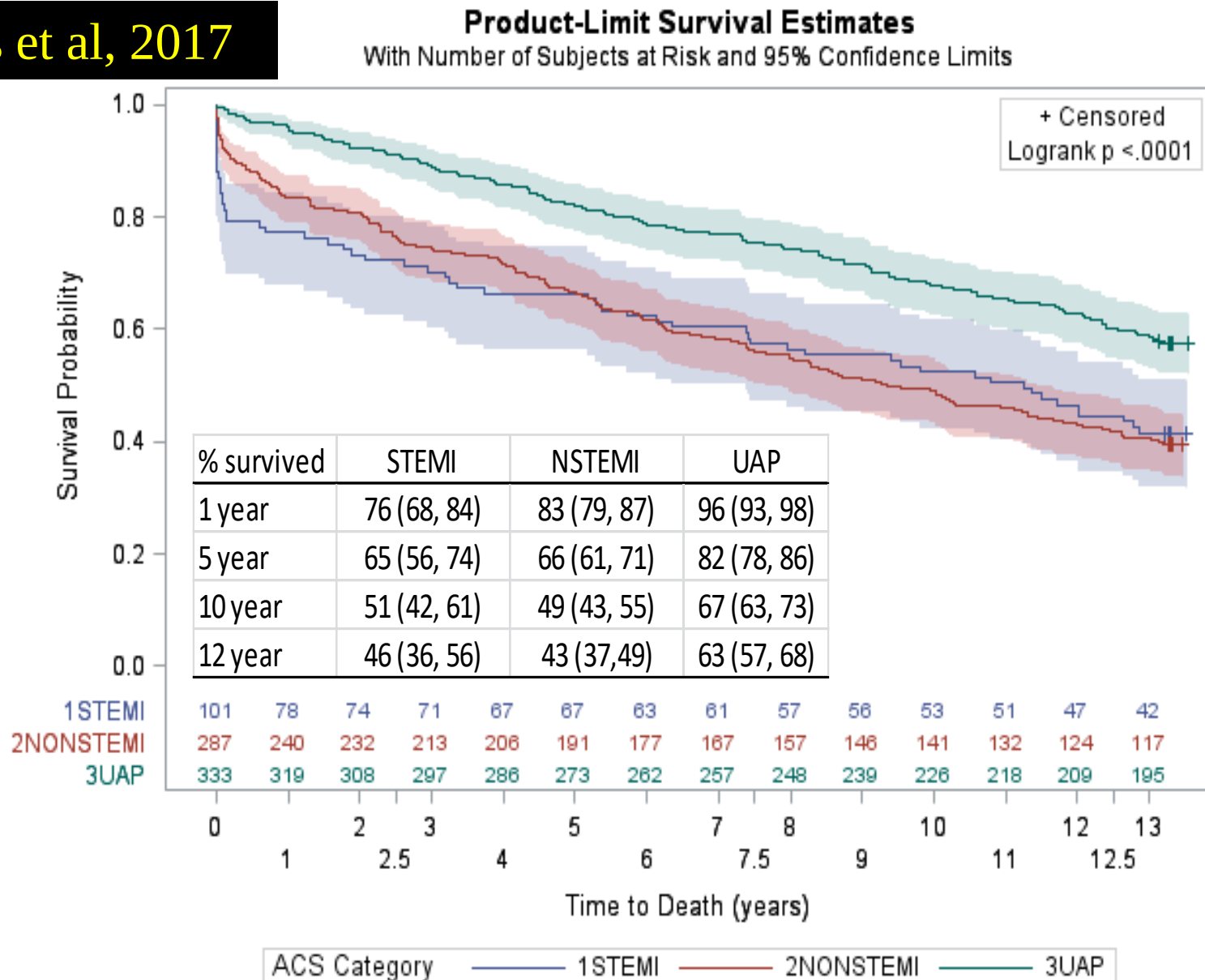
Calcium Score Test: Interpretation

1. Total calcium score: Nil, >100, >400
2. Age/gender percentile range
 - IF $\geq 75^{\text{th}}$ percentile = consider statins
 - IF $\geq 25^{\text{th}}$ - $< 75^{\text{th}}$ = discuss options
 - IF $< 25^{\text{th}}$ percentile = discuss lifestyle
3. Framingham risk factors
4. Family history



2002 ACS Cohort: Mortality following ACS

CJ Ellis et al, 2017



Main Lifestyle Methods of Prevention

Lifestyle Methods

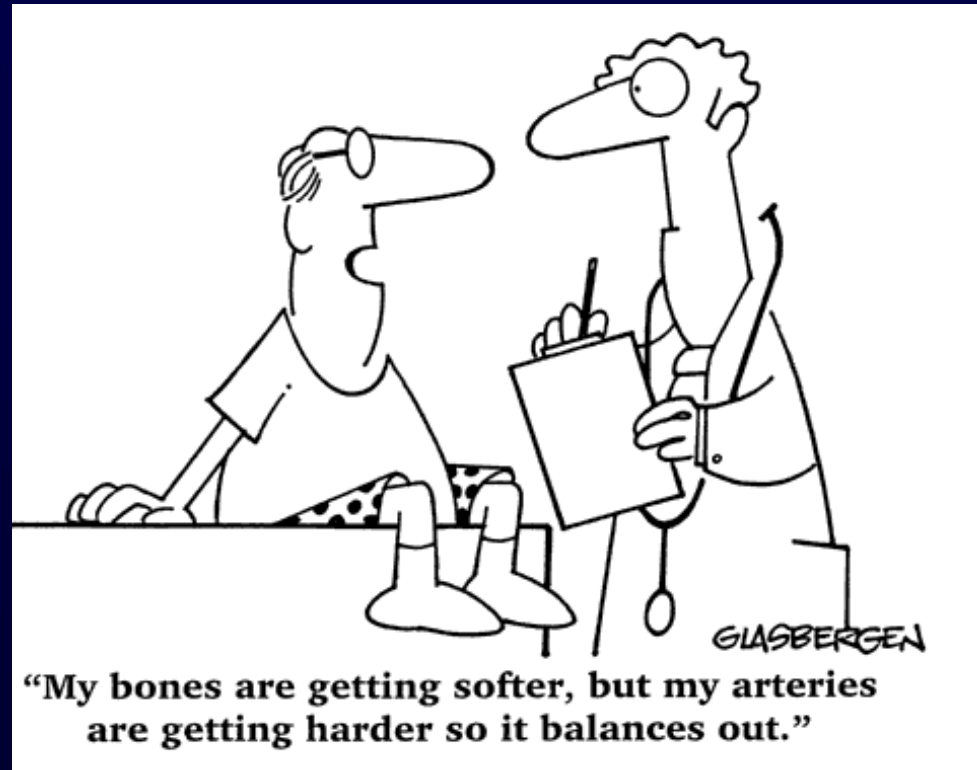
- Don't Smoke
- Exercise Regularly
- Normal Weight
- Good Diet



Main Medical Methods of Prevention

Medical Methods

- High Blood Pressure
- High Cholesterol
- High Glucose



There is compelling scientific evidence that morbidity & mortality from atherosclerotic vascular disease is reduced by improving these lifestyle and medical risk factors

CTT Lancet 2010 Interpretation

Lancet 2010; 376: 1670-81

- Statin therapy *safely* reduces 5-year incidence of major CVS events by '*just over*' 1/5 per 1.0 mmol/l reduction in LDL cholesterol
- *There was no evidence of any threshold within the cholesterol range studied, suggesting that reduction of LDL cholesterol by 2-3mmol/l would reduce risk by about 40-50%*

Statins 2016: How? – Plain English

- They ‘stabilise’ the ‘sludge’
- More ‘fibrous tissue’
- This ‘strengthens’ the build up
- Decreases the ‘inflammation’
- ‘Safer Ageing’
- ‘Like putting ‘glue’ on the inside of the artery
- ‘Fewer blockages’, long-term

