



Professor Rob Doughty
Cardiologist
Auckland Heart Group
Auckland



Dr Fiona Stewart
Cardiologist
Auckland Heart Group
Auckland

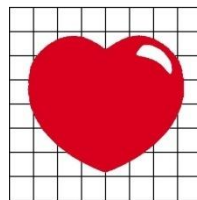


Professor Ralph Stewart
Auckland City Hospital and the
Auckland Heart Group

Friday, June 9, 2017

(Room 12)

16:30 - 18:30 WS #77: Cardiology 101 Forum for GPs
(120 minutes, not repeated)



Cardiology 101

Dr Fiona Stewart, Prof Ralph Stewart and Professor Rob Doughty
Auckland Heart Group
Green Lane Cardiovascular Service, Auckland City Hospital
And The University of Auckland

Breathlessness and NTproBNP

84 yr old man

MI and CABG 25 yrs ago, moderate LV impairment

long smoking history, COPD

Aspirin 100mg, felodipine 10mg, Duride 60mg, atorvastatin 80mg,
spironolactone 25mg, cilazapril 5mg, frusemide 40mg (variable), combivent/duolin
inhalers

Increase in oedema, slight change in breathlessness

Mild intermittent oedema

- Sinus rhythm, HR 76
- BP 128/68
- Mild peripheral oedema, chest clear
- NT-proBNP 106pmol/L
- ***What does this tell you?***

Breathlessness and NT-proBNP (2)

33yr old female

Morbid obesity (Hgt 171cm, weight 173kg, BMI 59)

Increasing breathlessness/chest tightness

CXR: CTR 61%, interstitial oedema

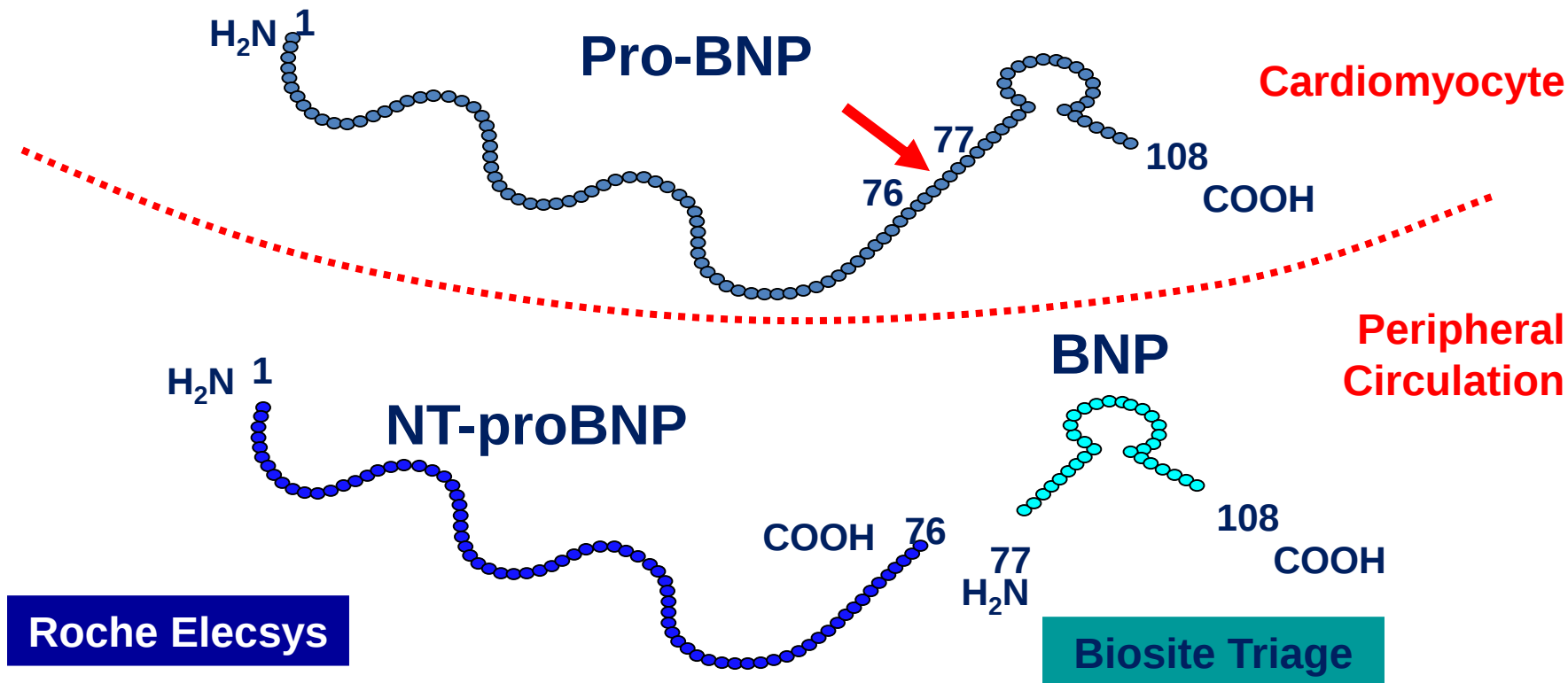
NT-proBNP 71pmol/L

Normal renal function

- ***What does the NT-proBNP tell you?***

NT-proBNP 71pmol/L

Breathlessness and NT-ProBNP: Learning Points



Adapted from Lam et al, JACC 2007; 49:1193

Brain natriuretic peptide assists in the diagnosis of patients presenting with symptoms of suspected HF

Rule out test:

NT-proBNP < 35pmol/L

Rule in HF

< 50 years

NT-proBNP < 50pmol/L

50-75 years

NT-proBNP < 100pmol/L

>75yrs

NT-proBNP < 210pmol/L

Beware:

Atrial fibrillation (higher values)

obesity (lower than expected values)

NTproBNP in established HF rarely “normalises”

- ***What does the NT-proBNP tell you?***

NT-proBNP 71pmol/L

- ***What do you do next?***

- ***What does the NT-proBNP tell you?***

NT-proBNP 71pmol/L

- ***What do you do next?***

Frusemide 40mg daily, weight decrease 10kg over a week, feeling less breathless

- ***What does the NT-proBNP tell you?***

NT-proBNP 71pmol/L

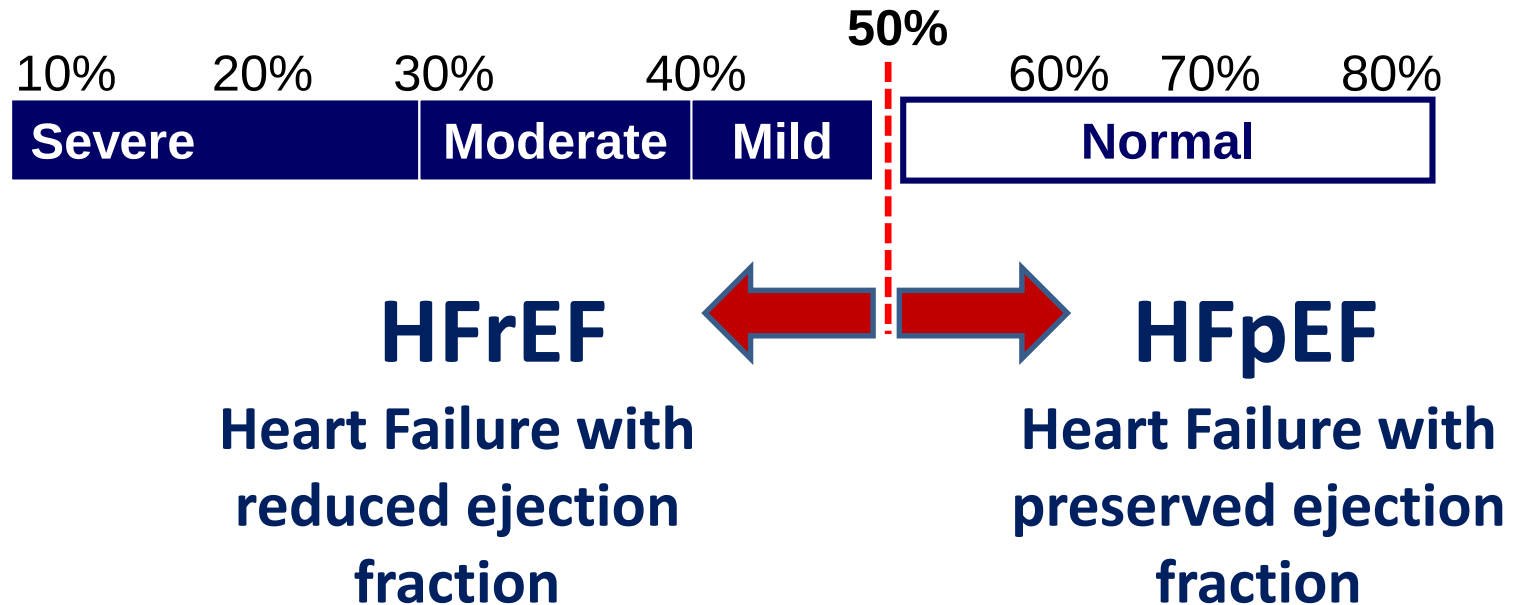
- ***What do you do next?***

Frusemide 40mg daily, weight decrease 10kg over a week, feeling less breathless

Echo: LVEDD 7.2cm (N<5.7cm), LVEF low-normal

Heart Failure and LV Ejection Fraction

LVEF



HF and Renal Function

80 yr old man

Long-standing HF, severe mitral regurgitation,
severe LV impairment

HTN, Gout, AAA, prostatic Ca, THJR, AF

Dabigatran 110mg bid, cilazapril 5mg, spironolactone 12.5 mg,
frusemide 80mg

Tired and increased shortness of breath

JVP 4-5cm, BP 118/60, HR 59, mild oedema

Weight 71kg increase to 73.9kg

Frusemide 80mg

What to do next?

Date	Weight	Frusemide	Spiro	Creatinine	K+
April	71	80	12.5	84 (eGFR75)	4.8
29	73.9	120	12.5	117	5.1
30		120	12.5		
31		120	12.5		
1	72	80	12.5	165	5.6
2	71.2	80	12.5		
6	70.8	80	12.5		
7	71	80	-	151	5.0
8		-	-		

Diuretics – “tips and tricks”

- **Worsening renal function often occurs in context of worsening HF – management = diuresis**
- **Watch renal function closely when change in diuretics**
- **Rest for an hour after taking morning frusemide**
- **Care with combination of ACEi and spironolactone**

AF and HF

68 yr old male

Prior atrial flutter 2015

Hypertension. Prostatic Ca 2002

Cilazapril/HCT 5/12.5mg one tablet

Presents with 1 month of exertional
breathlessness, started PND, then acute
admission

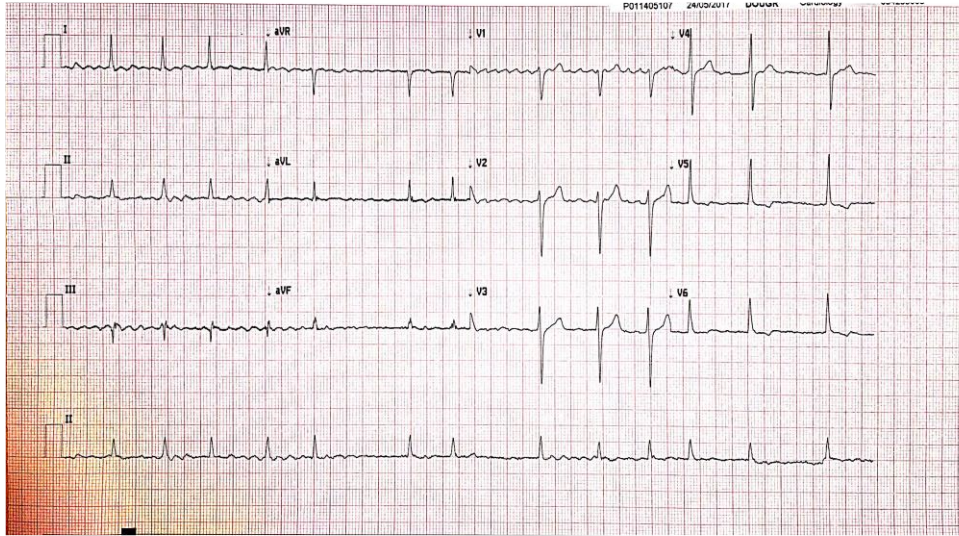
AF and HF

HR 130 irregular BP 100/60 at initial assessment

Mild oedema, clear chest

CXR: no pulmonary oedema

ECG:



NT-proBNP 274pmol/L

AF and HF

What does the NT-proBNP mean?

NT-proBNP 274pmol/L

Normal renal function

Hospital:

- Overnight stay, rate control, diuretic
- Discharge: Metoprolol 23.75mg, frusemide 40mg, dabigatran 150mg bid

Your review 5 days later:

Remains breathless with modest exertion

Oedema resolved. HR 120 at rest, BP 120/74

What will you do next?

AF and HF

Brain natriuretic peptide assists in the diagnosis of patients presenting with symptoms of suspected HF

Rule out test:

NT-proBNP < 35pmol/L

Rule in HF

< 50 years

NT-proBNP < 50pmol/L

50-75 years

NT-proBNP < 100pmol/L

>75yrs

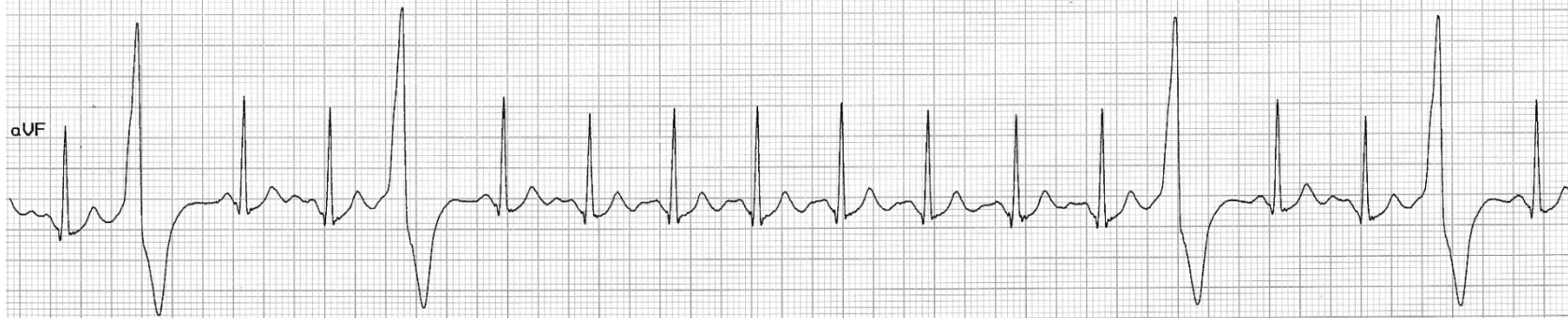
NT-proBNP < 210pmol/L

Beware:

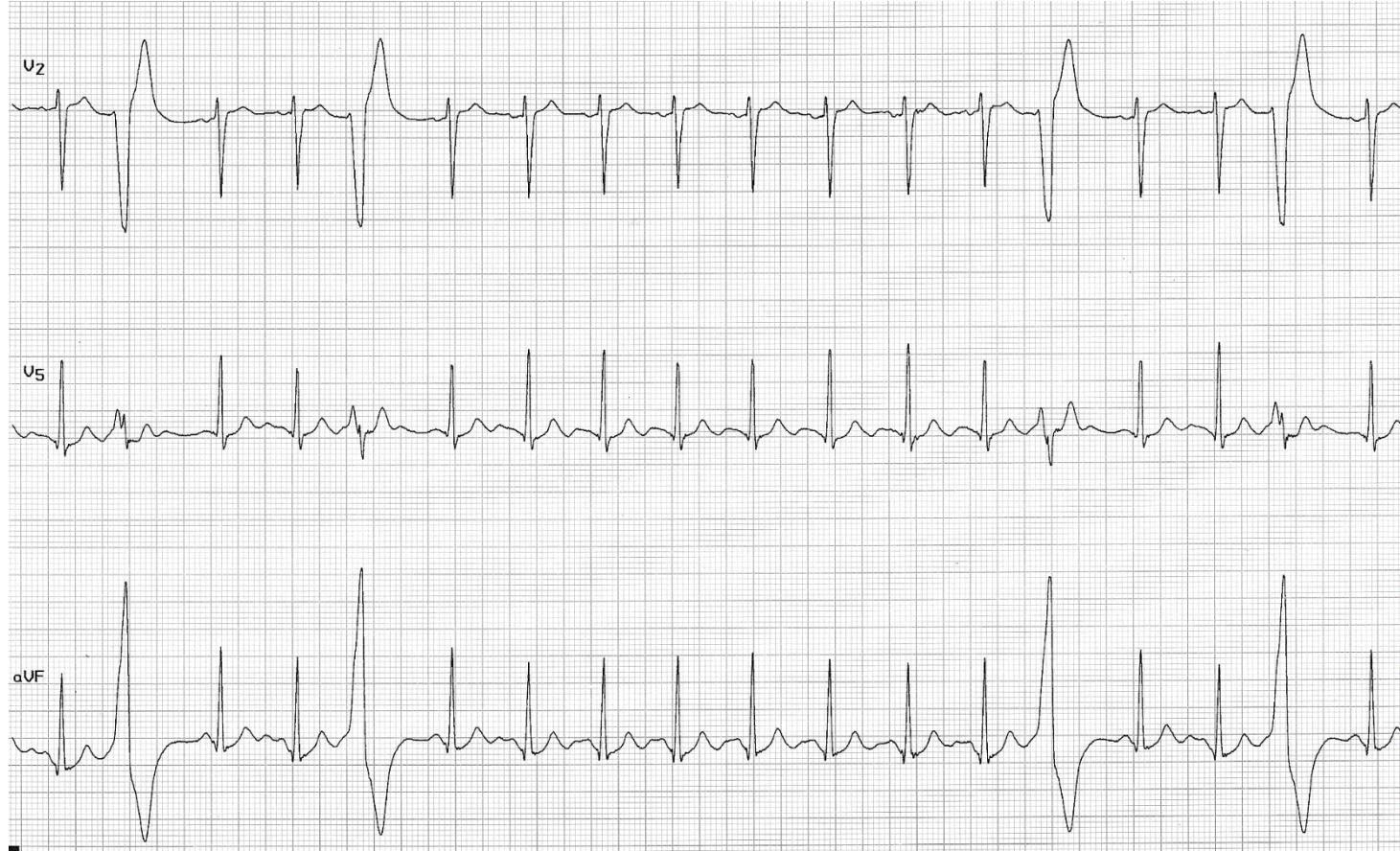
Atrial fibrillation (higher values)

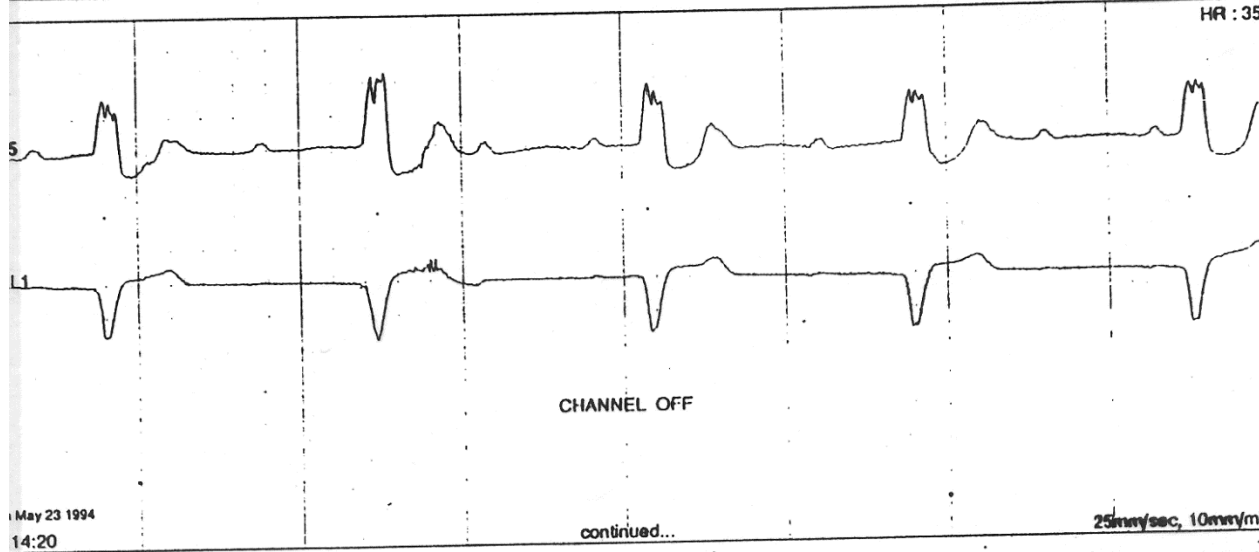
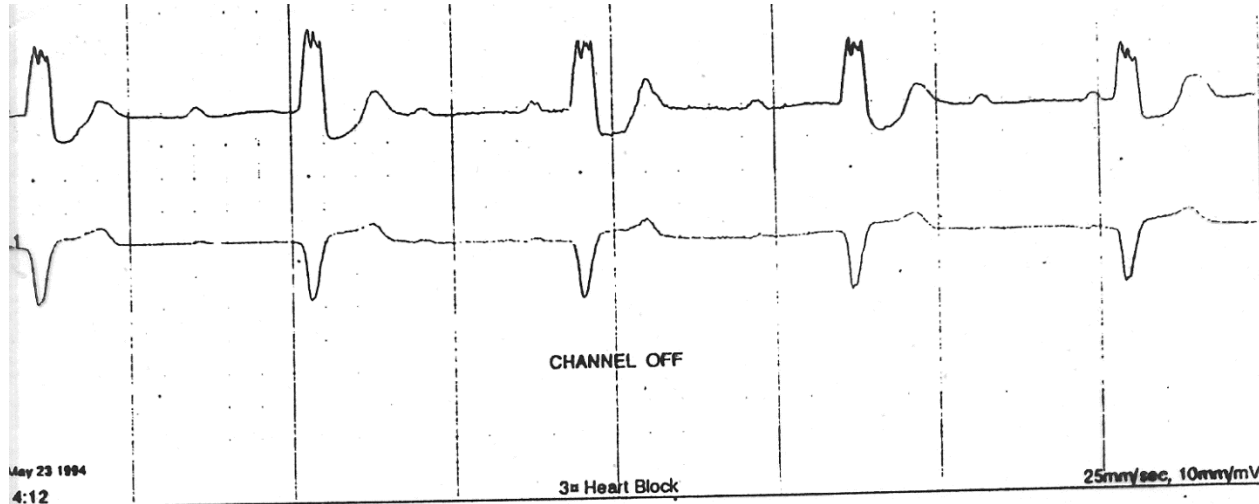
obesity (lower than expected values)

NTproBNP in established HF rarely “normalises”

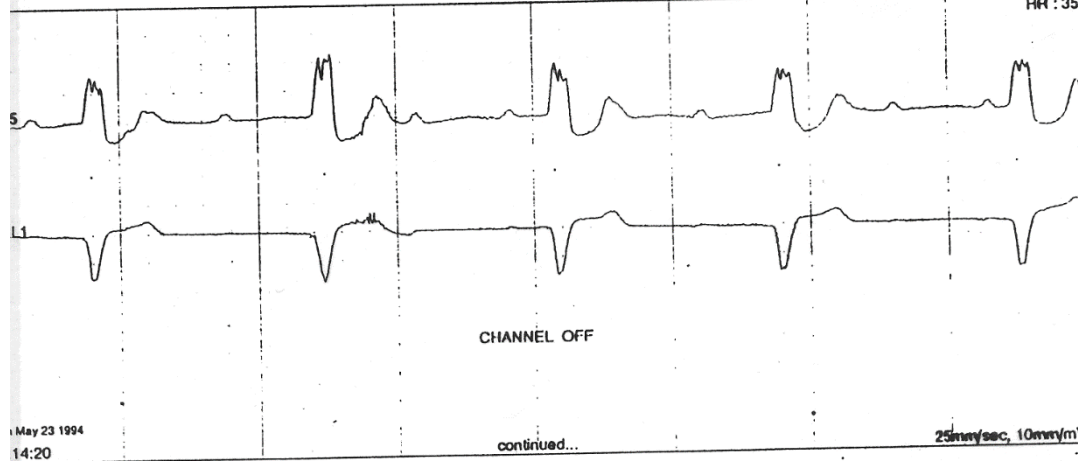
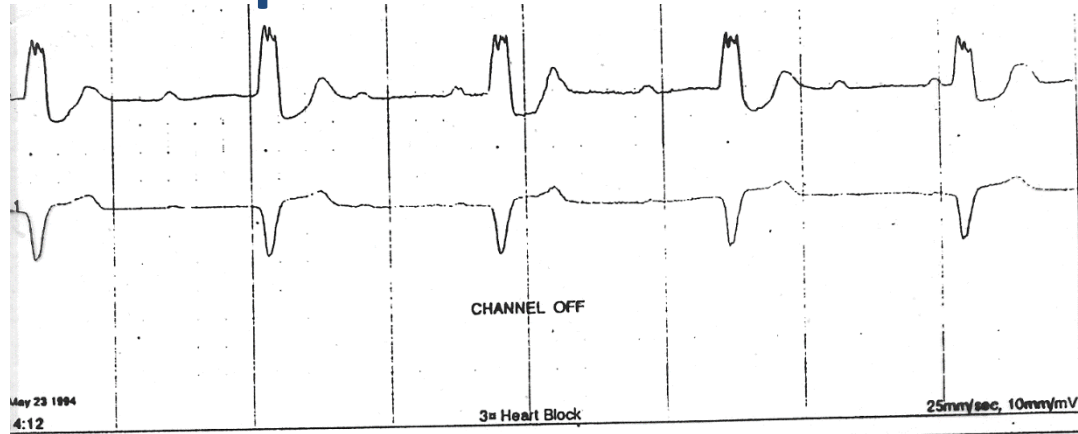


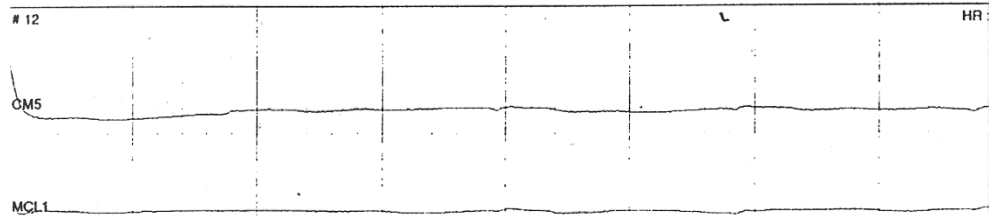
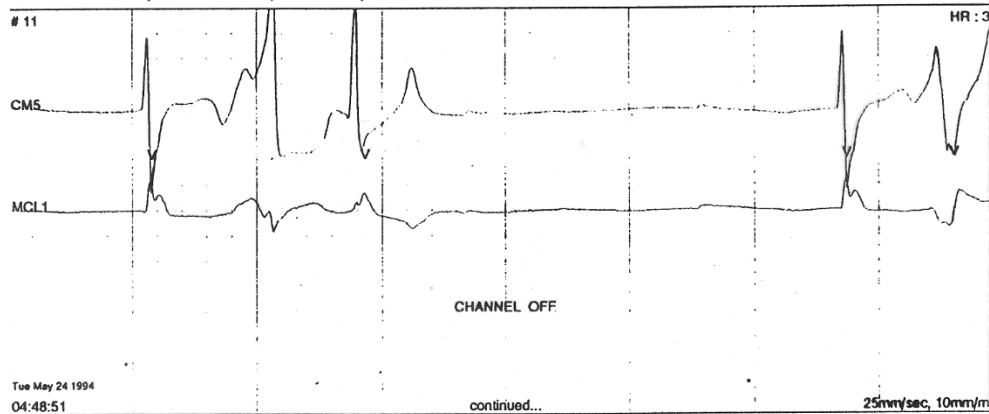
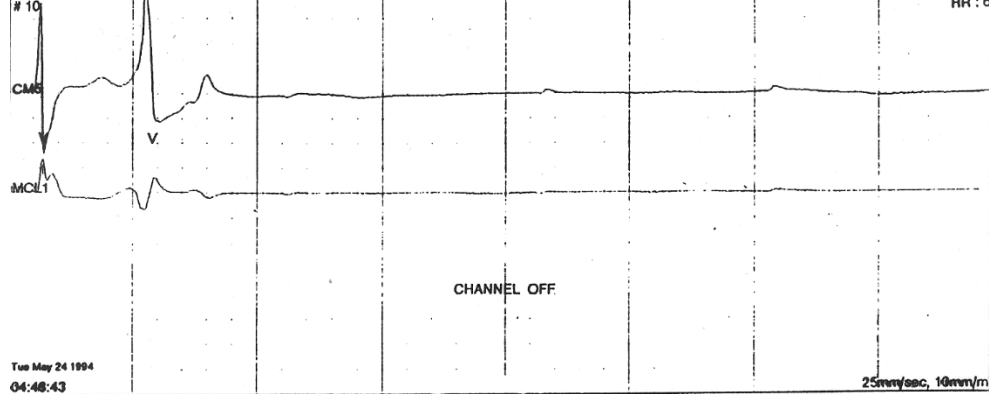
VPBs

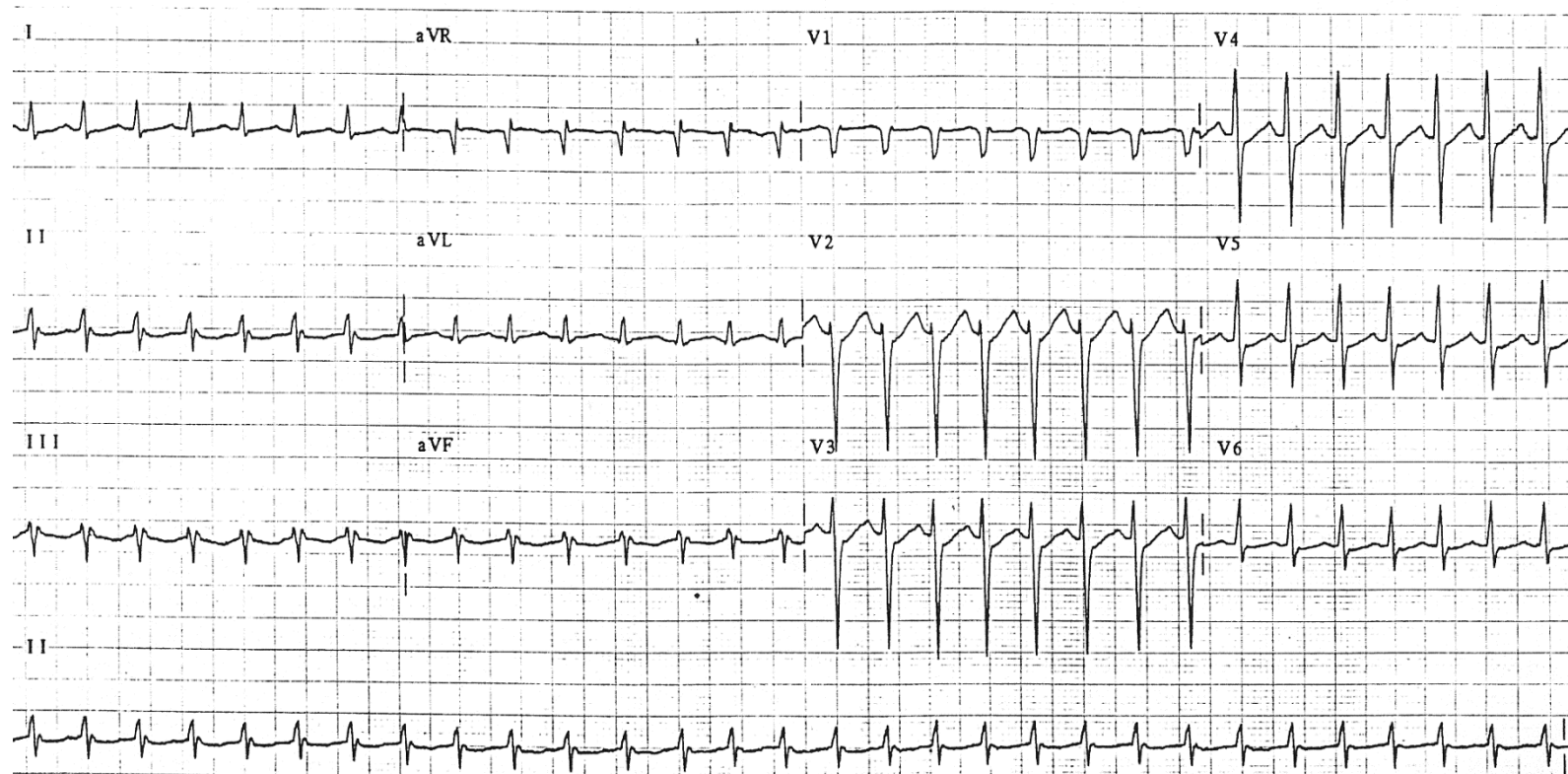




Complete Heart Block







LOC 00000-0000

Speed: 25 mm/sec

Limb: 10 mm/mV

Chest: 10 mm/mV

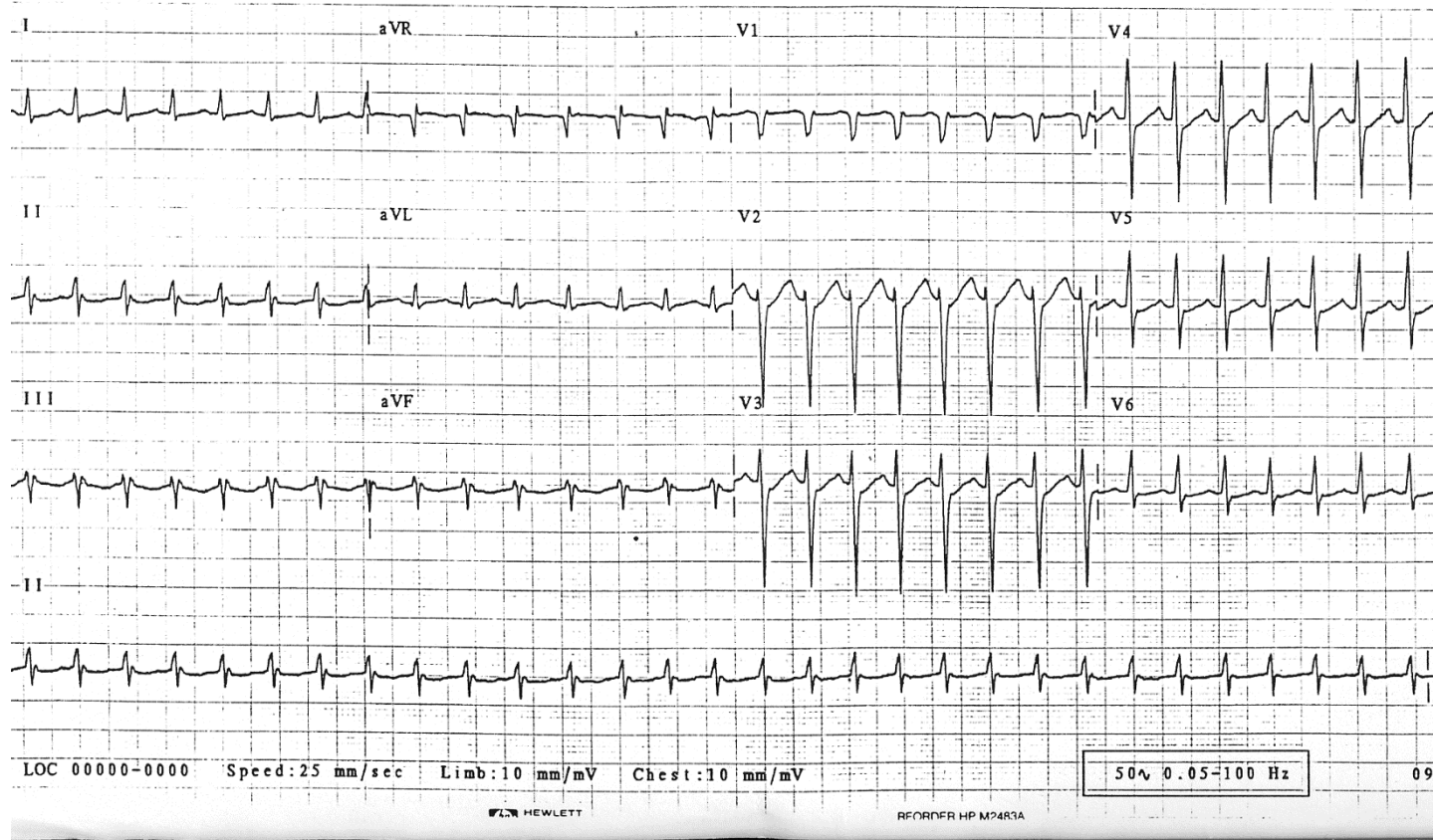
50 μ 0.05-100 Hz

09

HEWLETT

REORDER HP M24R3A

SVT



SVT

Supraventricular Tachycardia

- All ages
- Fast, regular heart rate
- Associated light headedness, SOB
- Needs urgent treatment
- Prevent with medical treatment
- Cure with Electrophysiology Study and Ablation
- Otherwise normal heart
- No need for thromboprophylaxis

Case 1

72 year old woman

Hypertension on cilazapril

Asymptomatic

Found to have an irregular pulse.

First - confirm diagnosis ECG

Ideally 12 lead ECG + long rhythm strip



Management of asymptomatic AF

- Consider possible causes
- Prevent thrombo-embolism / stroke
- Is heart rate control needed ?
- Is rhythm control appropriate ?

Why is she in AF?

Is there underlying cardiac or other disease ?

- Inter-current illness

Infection, pulmonary embolism?

- Thyroid disease

TSH

- Cardiac disease

Clinical evaluation, 12 lead ECG, Echo,
+/- cardiology referral

Lifestyle risk factors for AF?

Alcohol

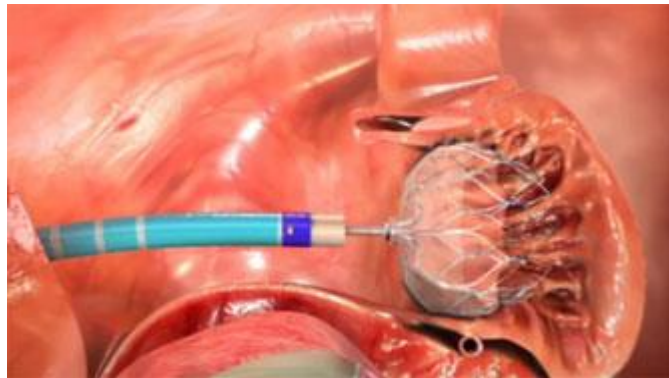
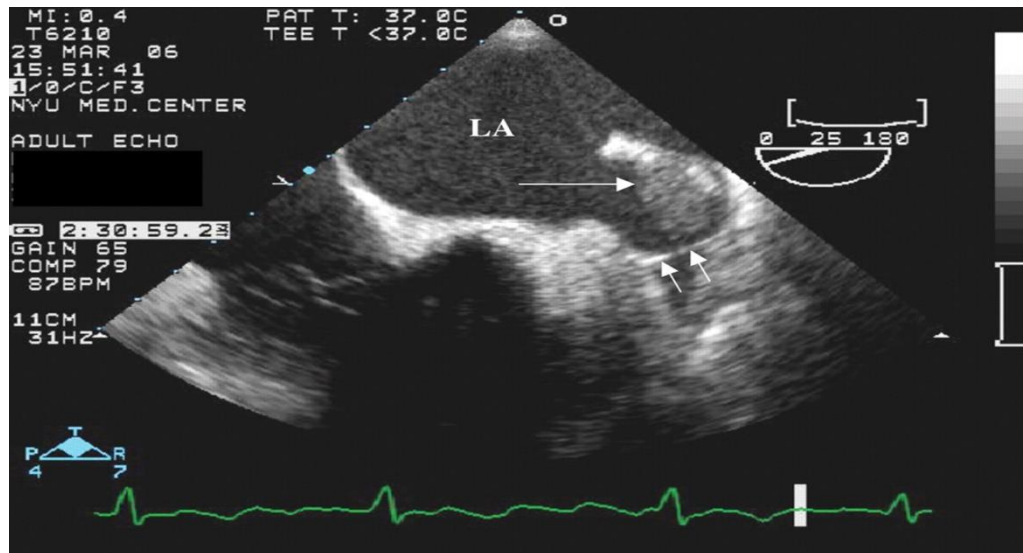
Stress

Obesity

Exercise – too little and too much

AF increases the risk of stroke!

thrombus in left atrial appendage from stasis



When should a patient with AF be anti-coagulated ?

CHA₂DS₂-VASc Score

	Score
C Congestive Heart Failure/LV Dysfunction	1
H Hypertension	1
A Age ≥ 75 Years	2
D Diabetes Mellitus	1
S Stroke (TIA/TE)	2
V Vascular Disease ^[a]	1
A Age 65-74 Years	1
S Sex (female)	1

a. Prior myocardial infarction, peripheral artery disease, aortic plaque.

LV = left ventricular; TE = thromboembolism; TIA = transient ischemic attack

The CHADS₂ Index Stroke Risk Score for Atrial Fibrillation

	<u>Score (points)</u>	<u>Risk of Stroke (%/year)</u>	
	0	1.9	
Approximate Risk threshold for Anticoagulation	1	2.8	3%/year
	2	4.0	
	3	5.9	
	4	8.5	
	5	12.5	
	6	18.2	

OAC not recommended if low risk of stroke

Age <65 years +

no evidence of other
cardiovascular disease +

no other stroke risk factors
or history of stroke

Which anti-coagulant ?

Drug	Advantages	Disadvantages
Aspirin 100mg od	• Once daily • Easy	• Not effective (twice risk vs OAC) • Similar bleeding to OAC!
Warfarin INR 2.0 to 2.5	• Effective for stroke prevention • Bleeding risk	• Blood tests and does adjustments • Drug interactions • Increased intracranial bleeding vs NOACS
Dabigatran 150mg b.d. or 110mg b.d.	• b.d. • No monitoring • Better risk/benefit than warfarin	• GI side effects • Does adjustment if renal impairment (eGFR<30mls/min) • Contraindicated with poor renal function / mechanical heart valve
Oral Factor Xa inhibitors	• Similar risk/benefit as dabigatran • Well tolerated	• Does adjustment if renal impairment, age >80 years, increase bleeding risk • Contraindicated with poor renal function / mechanical heart valve • Not currently funded in NZ

Risk of bleeding risk can be estimated by the HAS-BLED score

Condition	Points
H - Hypertension	1
A - Abnormal renal or liver function (1 point each)	1 or 2
S - Stroke	1
B - Bleeding	1
L - Labile INRs	1
E - Elderly (> 65 years)	1
D - Drugs or alcohol (1 point each)	1 or 2

HAS-BLED score	Bleeds per 100 patient-years
0	1.13
1	1.02
2	1.88
3	3.74
4	8.70
5	12.5

Note: HAS-BLED has been validated for warfarin, but not for the new anticoagulants.

Guidelines recommend OAC if risk of stroke even if bleeding risk is increased !

So consider reversible risk factors for bleeding

- Uncontrolled hypertension
- Previous reasons for bleeding
- Anticoagulation dose
- Intensity / control of anticoagulation (INR)*₋
- Anti-platelet drugs
- Non steroidal anti-inflammatory drugs
- Excessive alcohol

Dabigatran reversal with Praxbind

Idrarucimab

- Specific monoclonal antibody
- High affinity for dabigatran
- Prevents binding of Dabigatran to thrombin
- Rapid action
- But expensive – usually reserved for serious bleeding

Heart rate control

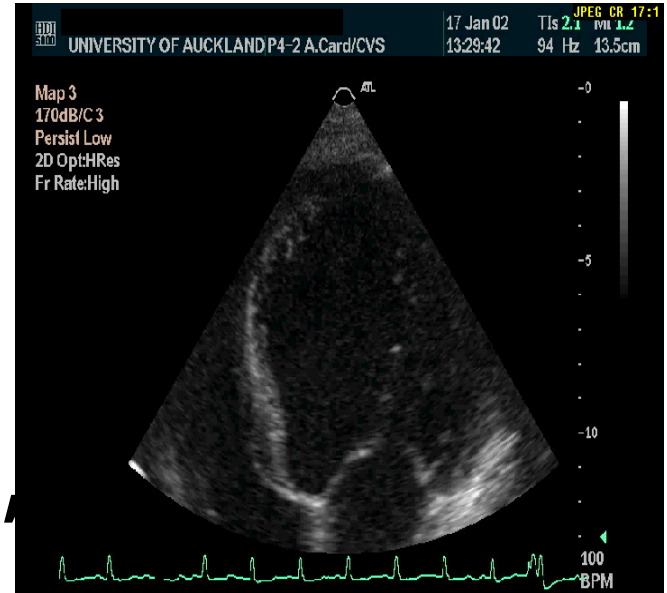
Target <90 beats/minute at rest

Why ?

- Symptoms
- Prevent rate related cardiomyopathy

Medications

- beta-blocker (metoprolol, bisoprolol)
- calcium antagonist (diltiazem, verapamil)



Case 2

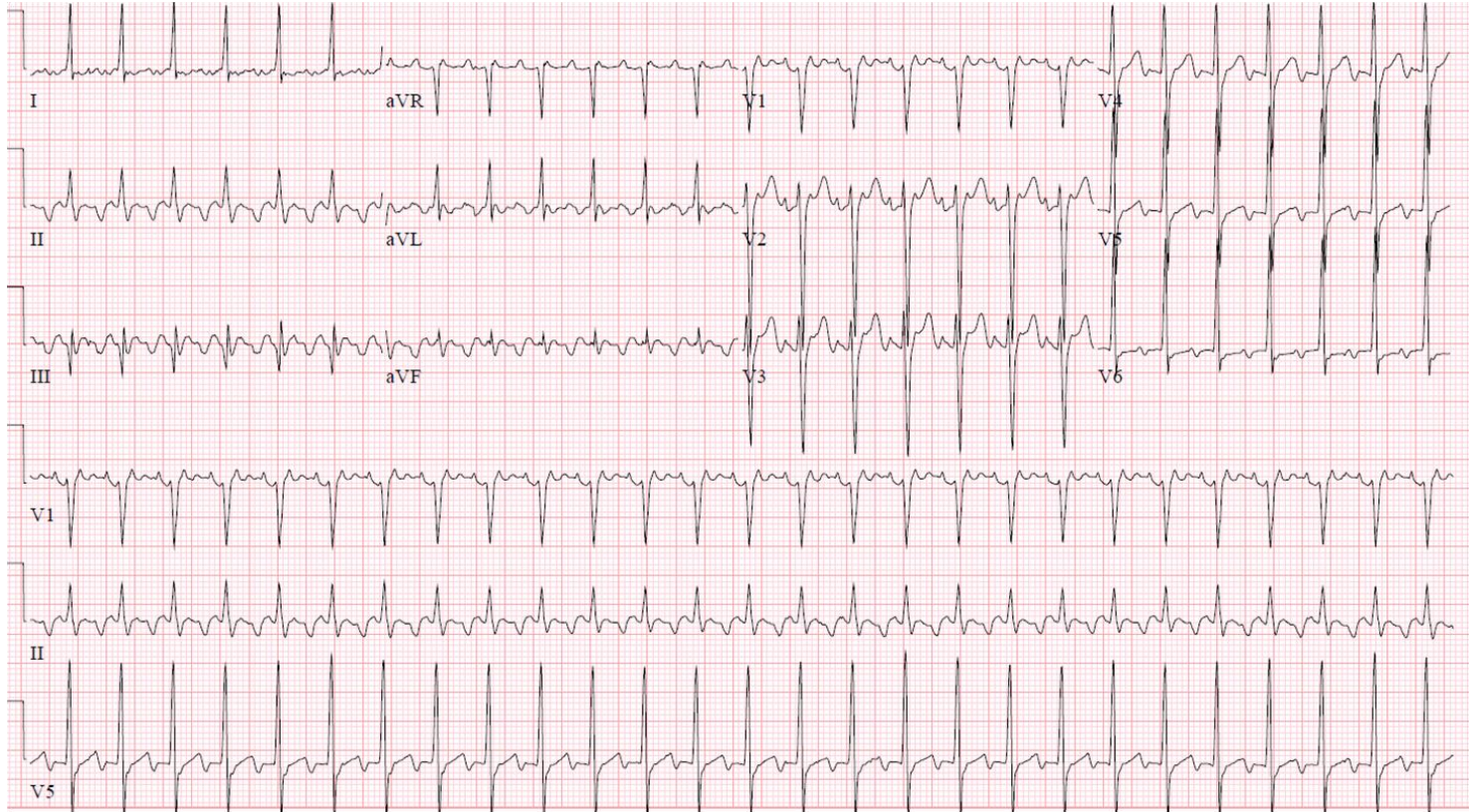
A 48 year old man who is normally well patient presents acutely with rapid palpitations present for 2 hours. He feels weak and slightly lightheaded unless resting.

Heart rate $\sim$ 120, BP $\sim$ 115/90

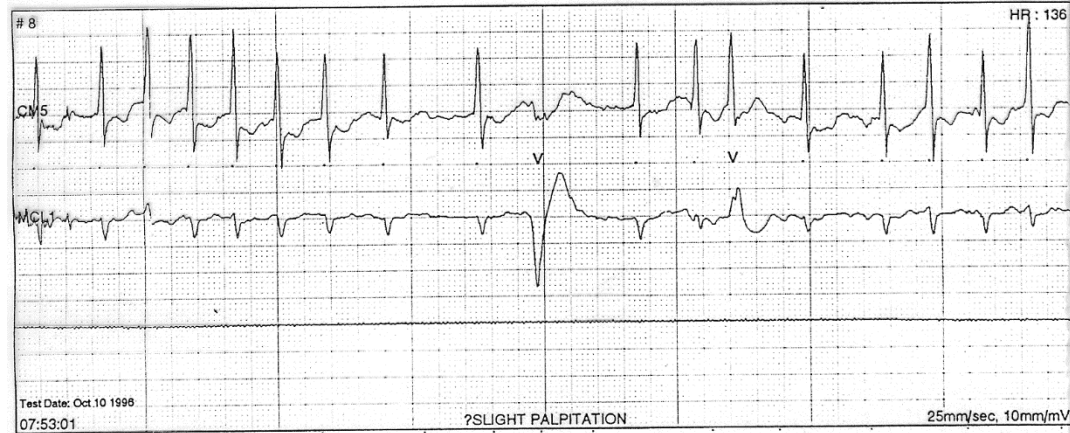
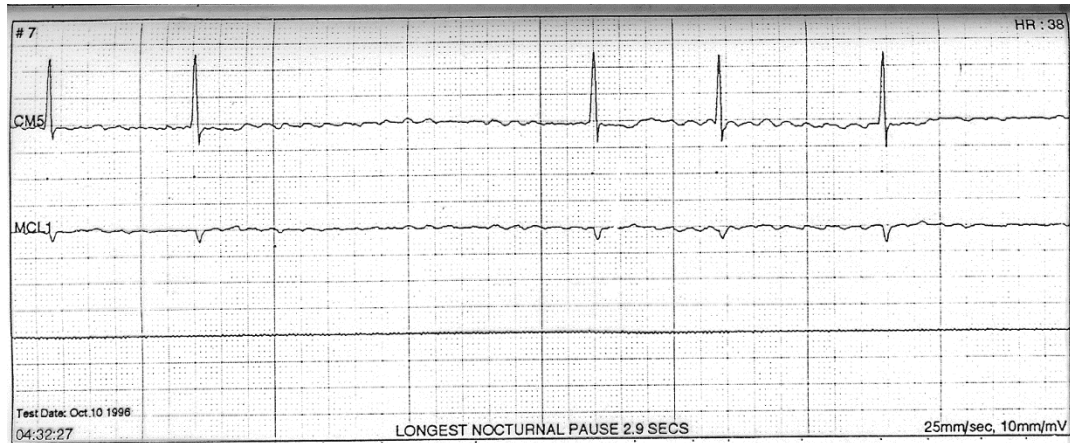
Confirm diagnosis by ECG



Other arrhythmias are possible



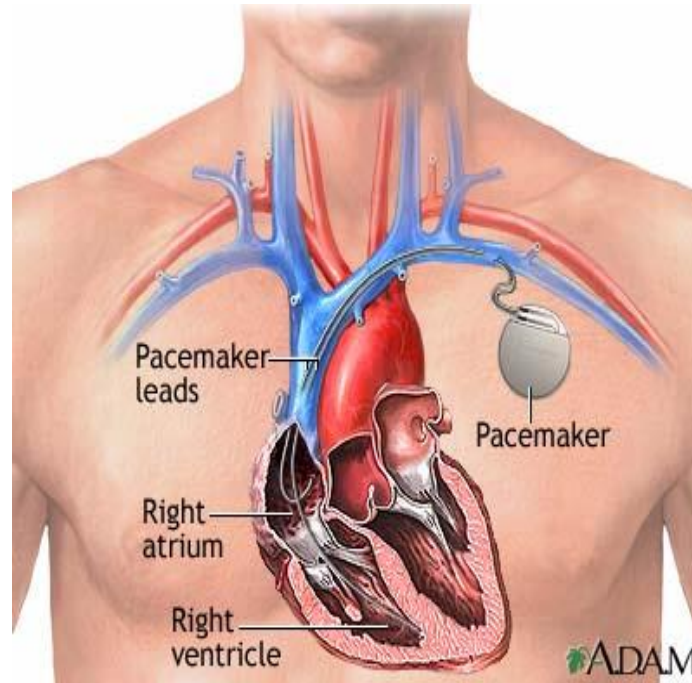
Atrial Fibrillation



Pacemaker



Pacemaker



AUCKLAND
HEART
GROUP

AF: rhythm control

Indication

- Symptoms

Consider referral to AD/Cardiology for

- Anti-arrhythmic drugs (flecainide, amiodarone) ?
- Cardioversion ?
- Heart rate control and wait for spontaneous reversion ?

Patient presents in rapid AF

How well is the arrhythmia tolerated ?

Symptoms of dyspnea, chest discomfort, dizziness

Is it new or recurrent ?

Does the patient usually revert spontaneously or with treatment?

Is there evidence of an additional acute medical problem?

Does the patient have known to heart disease / co-morbidity?

Is the heart rate rapid (>110)?

If yes consider beta-blocker, diltiazem

Is anti-arrhythmic treatment appropriate

(eg 'pill in pocket' Flecainide 100mg stat)

A patient who gives a history of palpitations who is currently well in sinus rhythm

Is the diagnosis AF ?

How do I find out ?

Is the patient still at risk of stroke now that he is in sinus rhythm ?

Alivecor device for ECG rhythm strip on phone



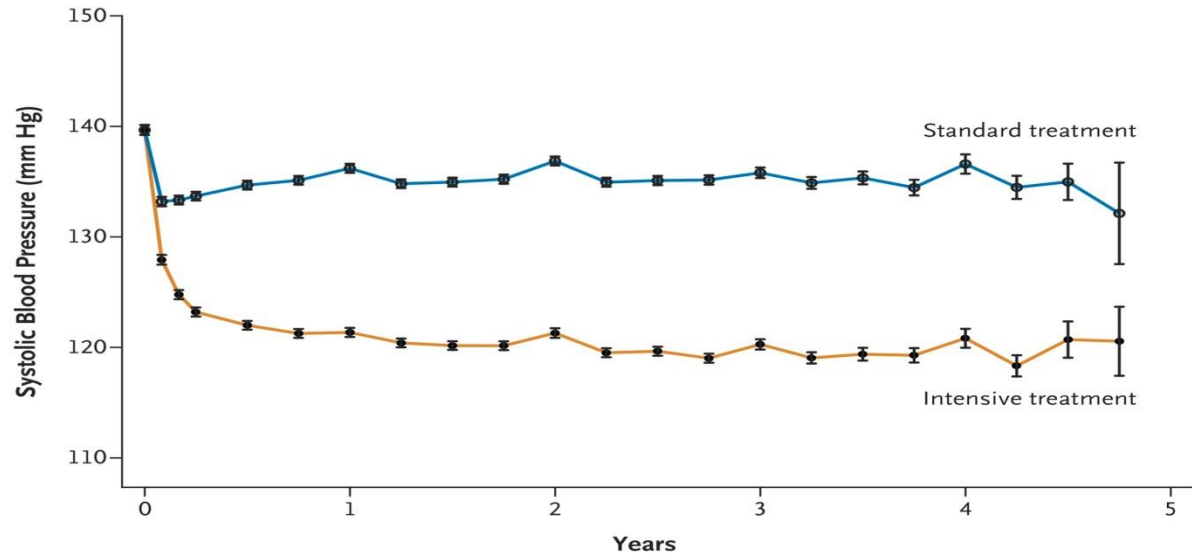
Secondary prevention

**How important is
blood pressure control ?**

A Randomized Trial of Intensive versus Standard Blood-Pressure Control – The SPRINT trial, NEJM 2016

- Patients at increased cardiovascular risk but without diabetes were assigned to intensive treatment of systolic BP (target, <120 mm Hg) or standard treatment (target, <140 mm Hg).
- After a median of 3.26 years, the rate of cardiovascular events was significantly lower with intensive treatment.

Systolic Blood Pressure in the Two Treatment Groups over the Course of the SPRINT Trial.

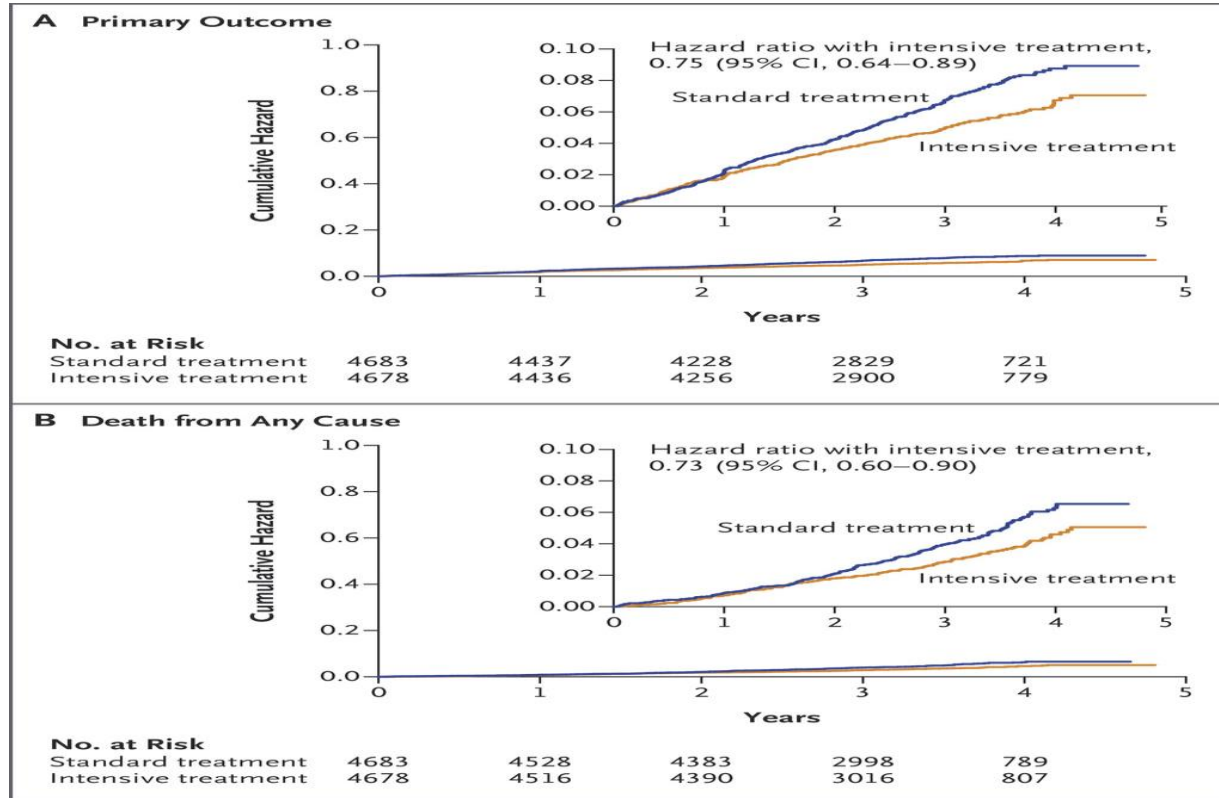
**No. with Data**

Standard treatment	4683	4345	4222	4092	3997	3904	3115	1974	1000	274
Intensive treatment	4678	4375	4231	4091	4029	3920	3204	2035	1048	286

Mean No. of Medications

Standard treatment	1.9	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.9
Intensive treatment	2.3	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	3.0

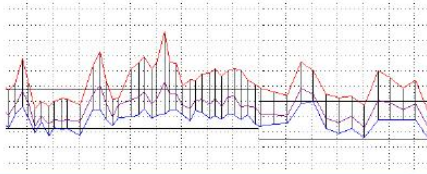
A Randomized Trial of Intensive versus Standard Blood-Pressure Control



The SPRINT trial: Conclusions

- Among patients at high risk for cardiovascular events but without diabetes,
- targeting a systolic blood pressure of less than 120 mm Hg, as compared with less than 140 mm Hg, resulted in lower rates of fatal and nonfatal major cardiovascular events and death from any cause,
- significantly higher rates of some adverse events were observed in the intensive-treatment group.

Variability of blood pressure



beat-to-beat

24-H

day-to-day

visit-to-visit

seconds

minutes

days

weeks

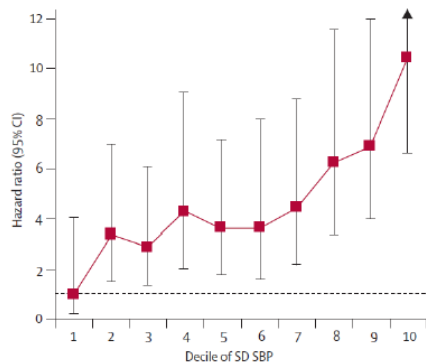
months

years



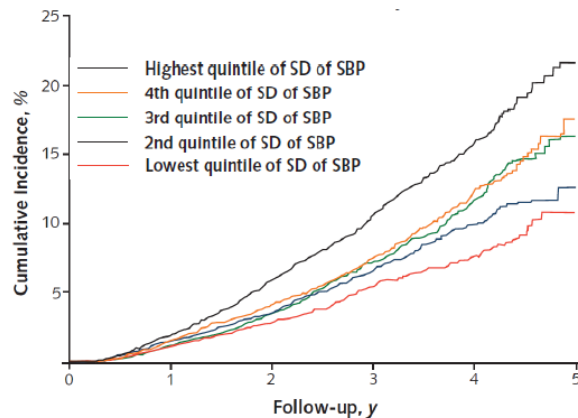
Is visit-to-visit BP variability a CV risk factor?

UK-TIA trial
risk of stroke



Rothwell P, et al. *Lancet* 2010

ALLHAT trial
All-cause mortality



Muntner P, et al. *Ann Intern Med* 2015

US veterans
N ~2900000

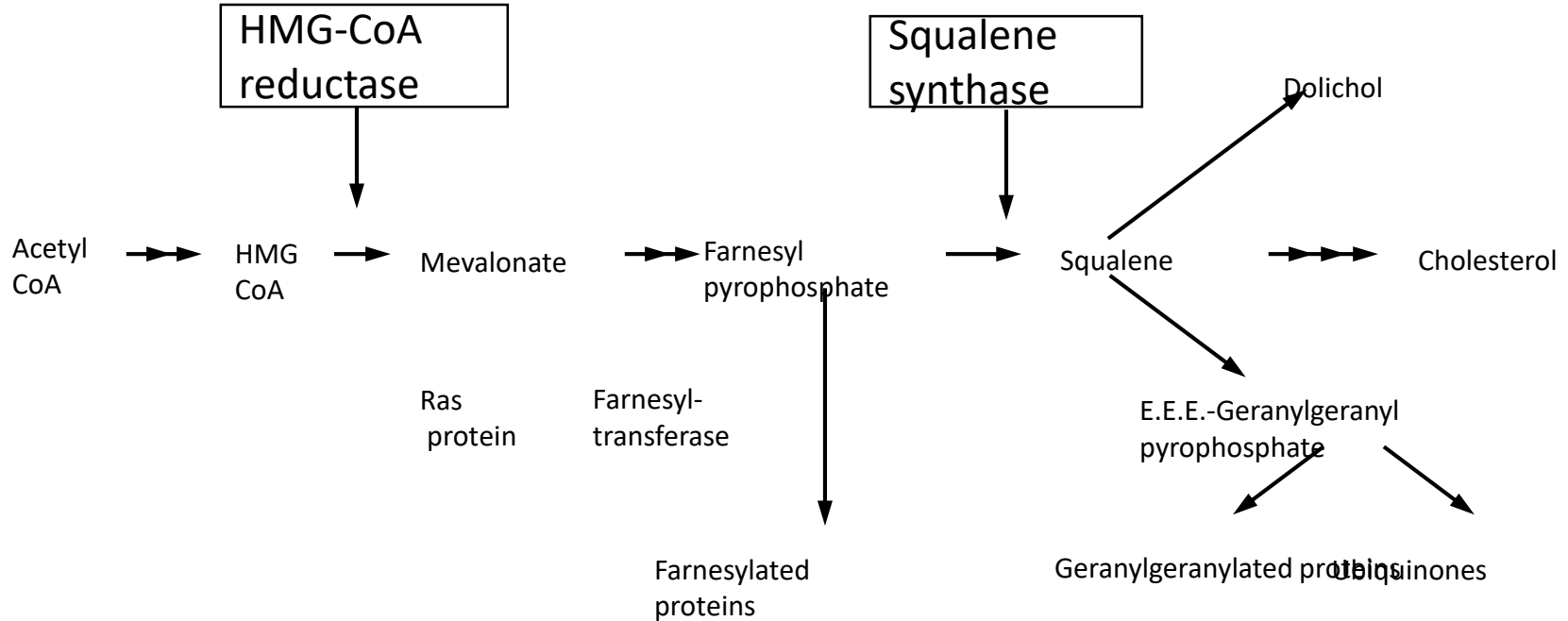


Gosmanova EO, et al. *J Am Coll Cardiol* 2016

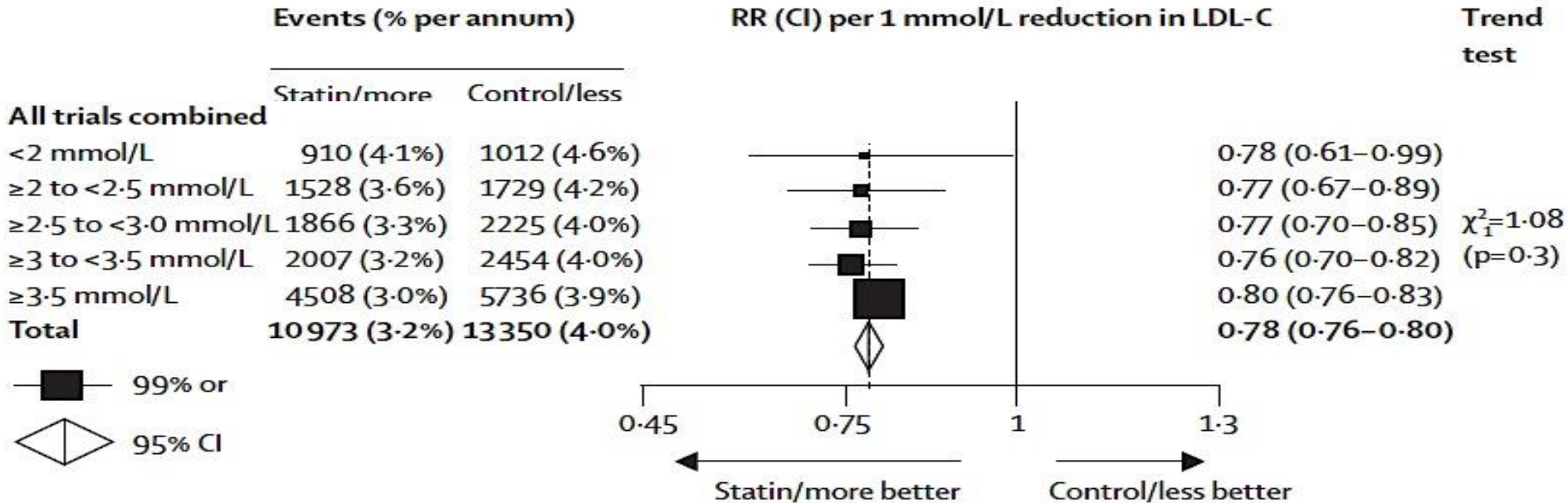
Secondary prevention

Importance of lowering LDL cholesterol

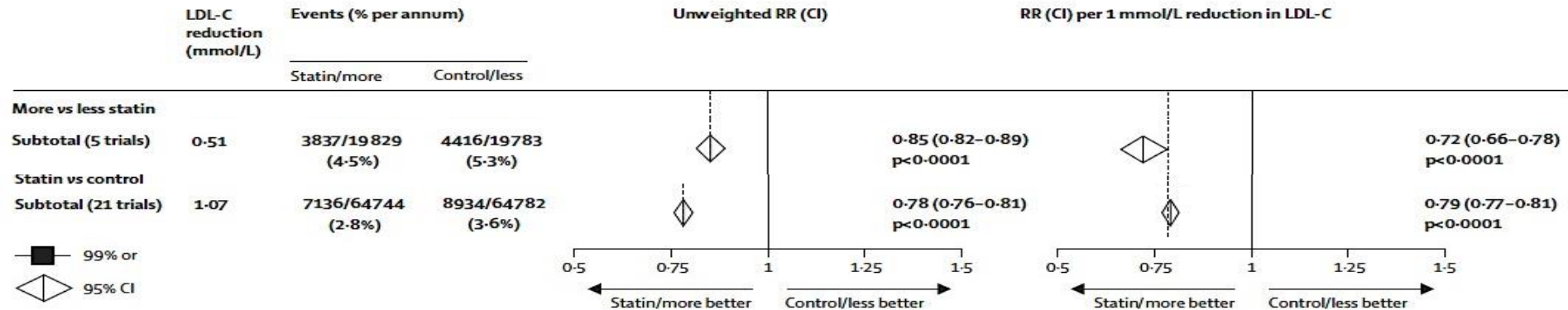
Cholesterol biosynthesis pathway



Effects of statins on major vascular events by LDL cholesterol level before treatment

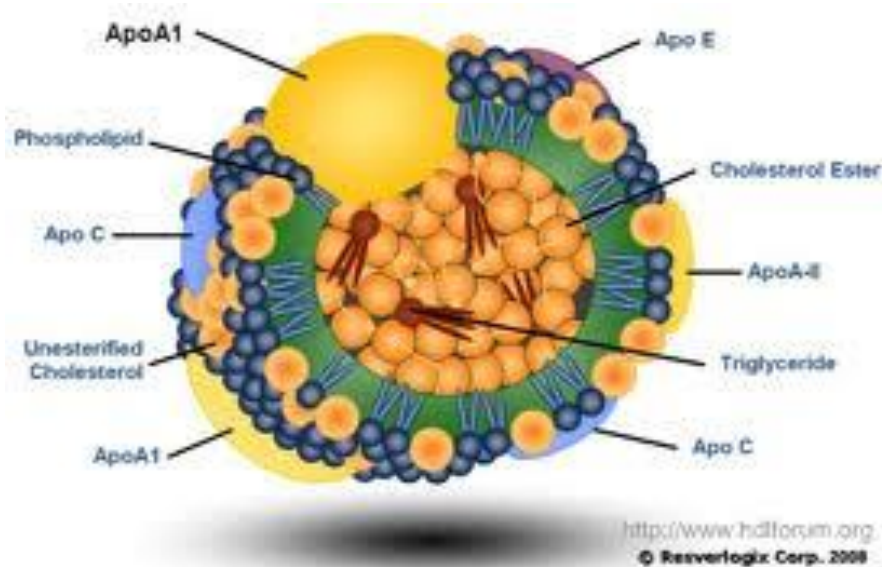


Statins and CV risk – *greater risk reduction with high dose statins*



HDL cholesterol

To date HDL cholesterol raising drugs have not reduced CV events



Maree, a 64 year old office worker suffered an NSTEMI 5 months ago with subsequent stenting of her LAD artery. She feels that she is on too many pills and that the statins in particular are causing muscle aches and have made it hard for her to think and work efficiently. She says that she is taking too many pills and wants to stop them. She has read that statins don't work in women and that they cause memory impairment.

Current medications

Aspirin 100mg

Clopidogrel 75mg

Atorvastatin 80mg

Cilazapril 0.5mg

Metoprolol CR 47.5mg

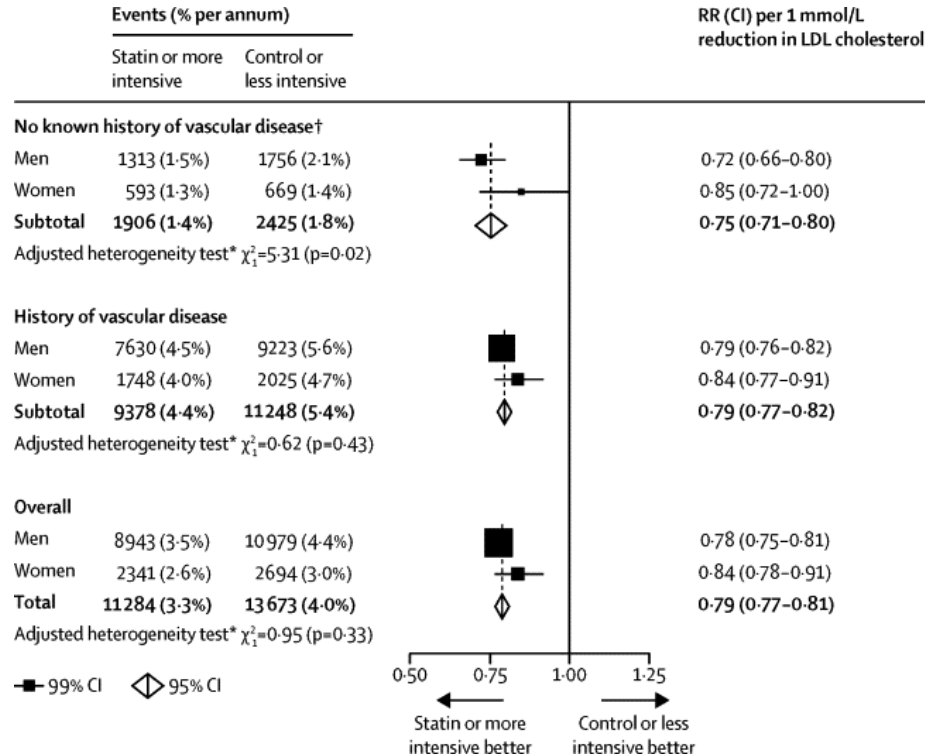
Statin Treatment in Women

Cholesterol Treatment Trialists

- **174,149 patients**
 - **46,675 women**
- **22 trials statin vs control**
 - **124,537 patients**
- **5 trials more intense vs less intense statin**

Cholesterol Treatment Trialists

Effects on Major Cardiovascular Events per 1mmol/l ↓LDL



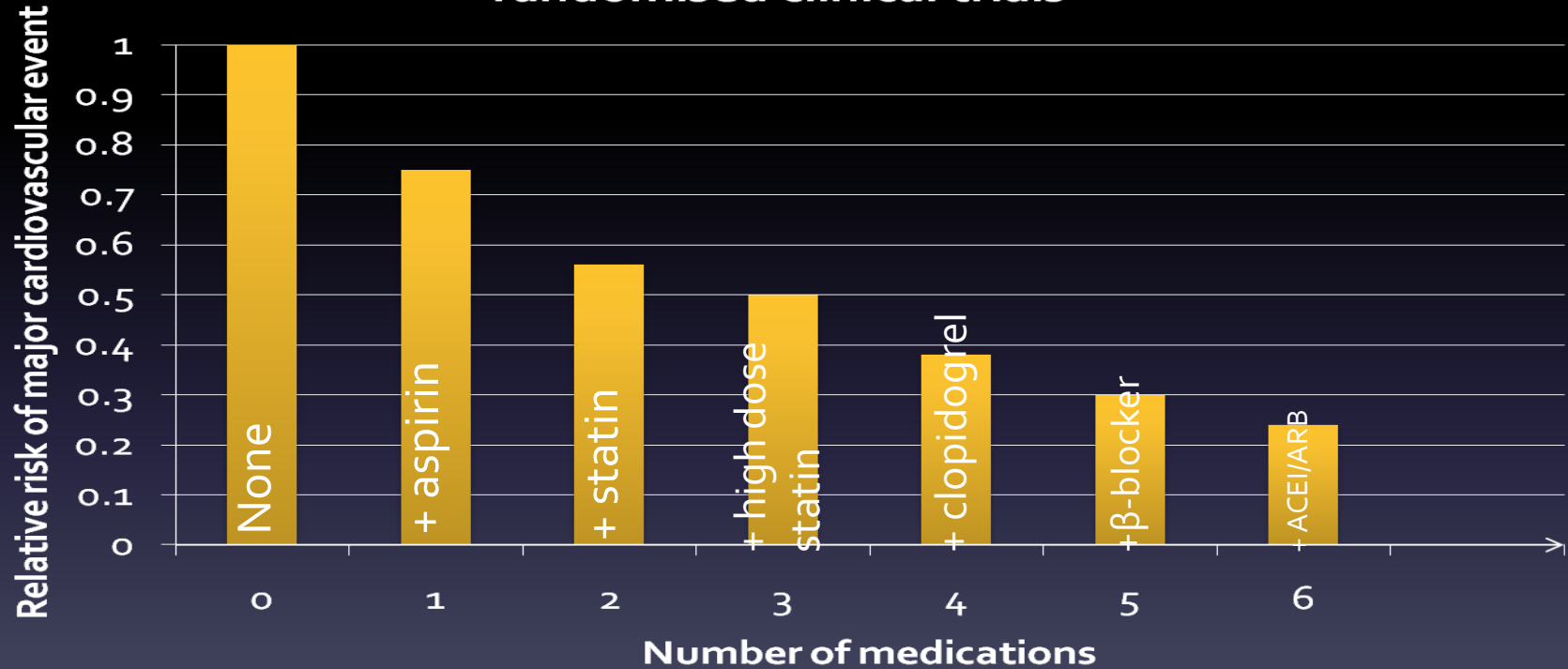
Secondary Prevention

- **Women suffer more depression and have higher rates of mental stress induced ischaemia**
- **Women are less likely to attend cardiac rehabilitation**

Secondary prevention

**Importance of combination
of medical therapies**

Cumulative benefits of multiple medical treatments after myocardial infarction based on results of randomised clinical trials



Secondary prevention - drugs

- **High dose statin >> any dose statin > no statin**
- **Anti-platelet therapy**
 - Dual anti-platelet therapy for one year post stenting++ (aspirin and ticagrelor)
- **ACE inhibitor / angiotensin receptor antagonist**
 - (strong indication if LV ejection fraction <40%)
- **Beta-blocker**
 - (strong indication if LV ejection fraction <40%)
- **Good blood pressure control**

Anti-platelet, Anti-coagulant, Both, None

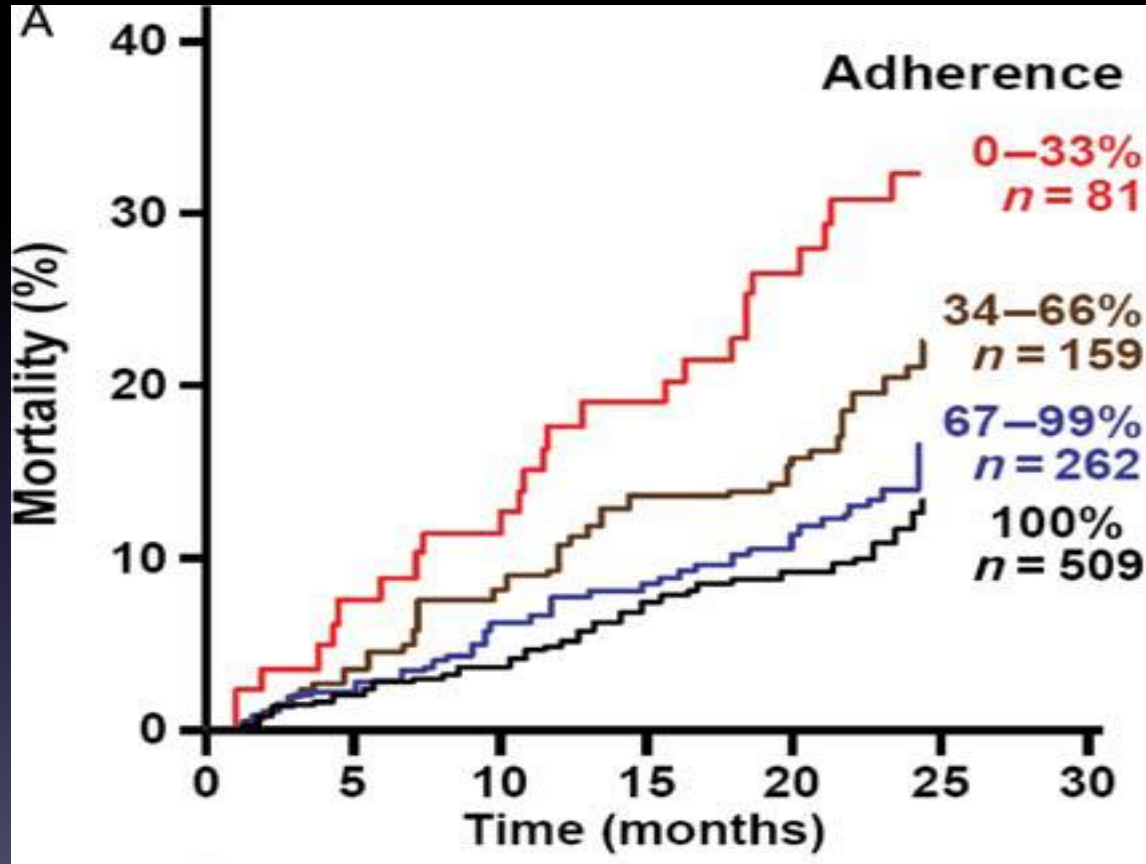
<i>Indication</i>	Anti-coagulation	Anti-platelet
<i>Weak</i>	Atrial fibrillation but no risk factors for stroke	CV risk factors but no clinical evidence of CVD
<i>Strong</i>	Atrial fibrillation and risk factors for stroke	Stable coronary artery or cerebro-vascular disease
<i>Definite</i>	Atrial fibrillation and previous stroke / TIA. Mechanical heart valve	Coronary stent <12 months Acute coronary syndrome or carotid territory stroke/TIA < 6mths Advanced CVD / history of multiple events

Adherence rates to common cardiovascular medications

Medication	Self-Reported Adherence, %	Consistent Adherence, %
Aspirin	83	71
Lipid-lowering agents	63	46
β -blockers	61	44
Aspirin + β -blocker	54	36
Aspirin + β -blocker + lipid-lowering agent	39	21

Baroletti et al. *Circulation* 2010;121:1455-

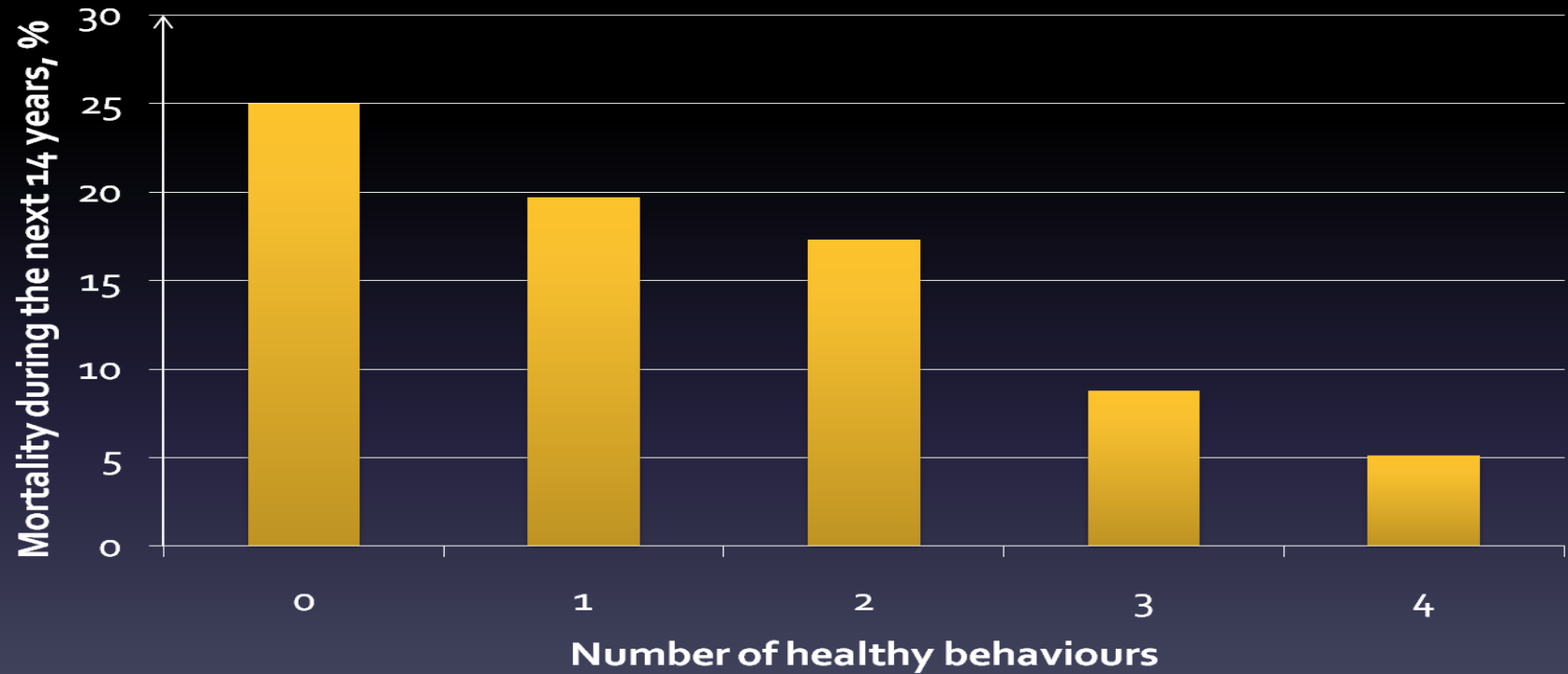
Mortality by medication adherence



Secondary prevention

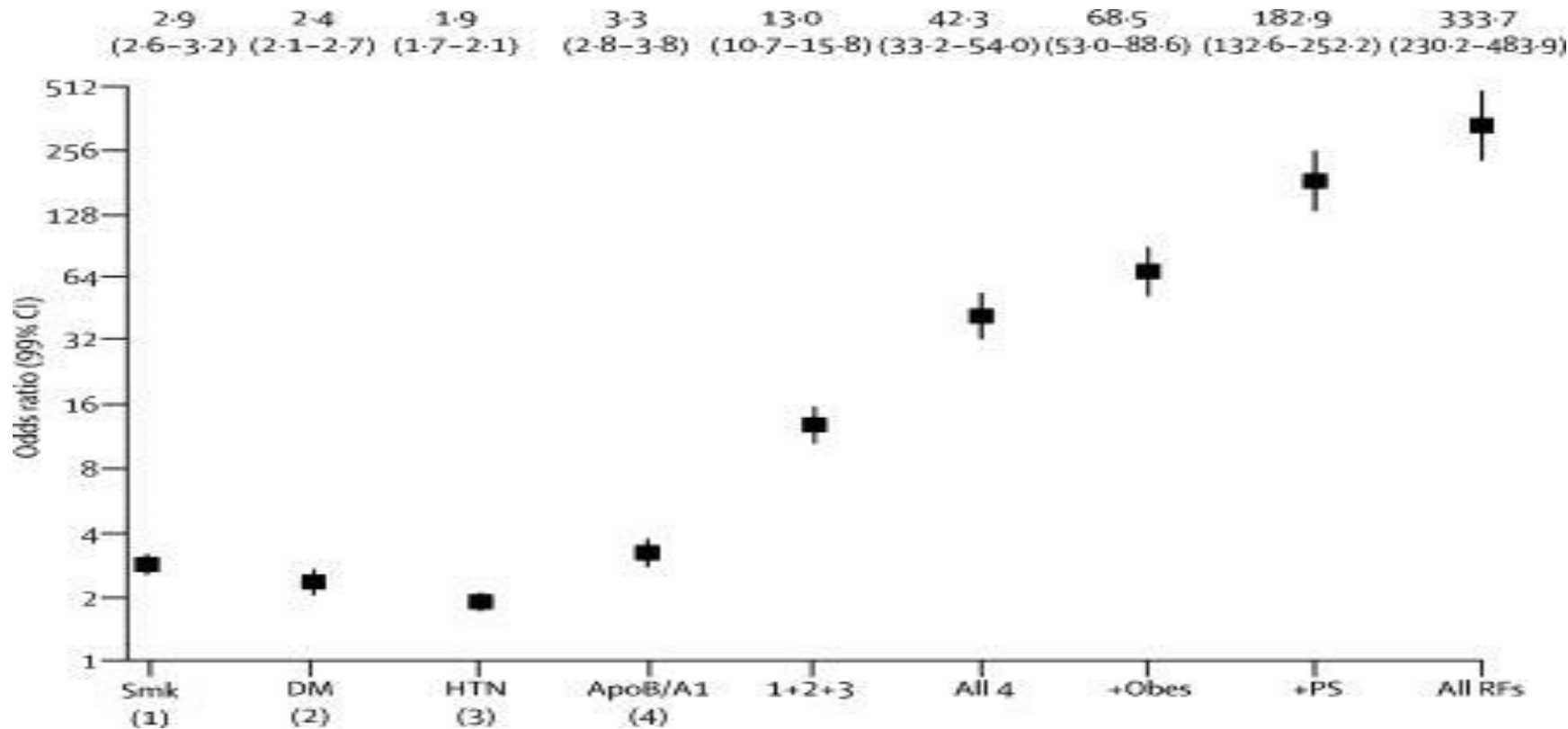
Importance of lifestyle risk factors

Life style at age 50 and mortality (No smoking, alcohol, physical activity, healthy diet)



The INTERHEART study

Cumulative impact of multiple CV risk factors

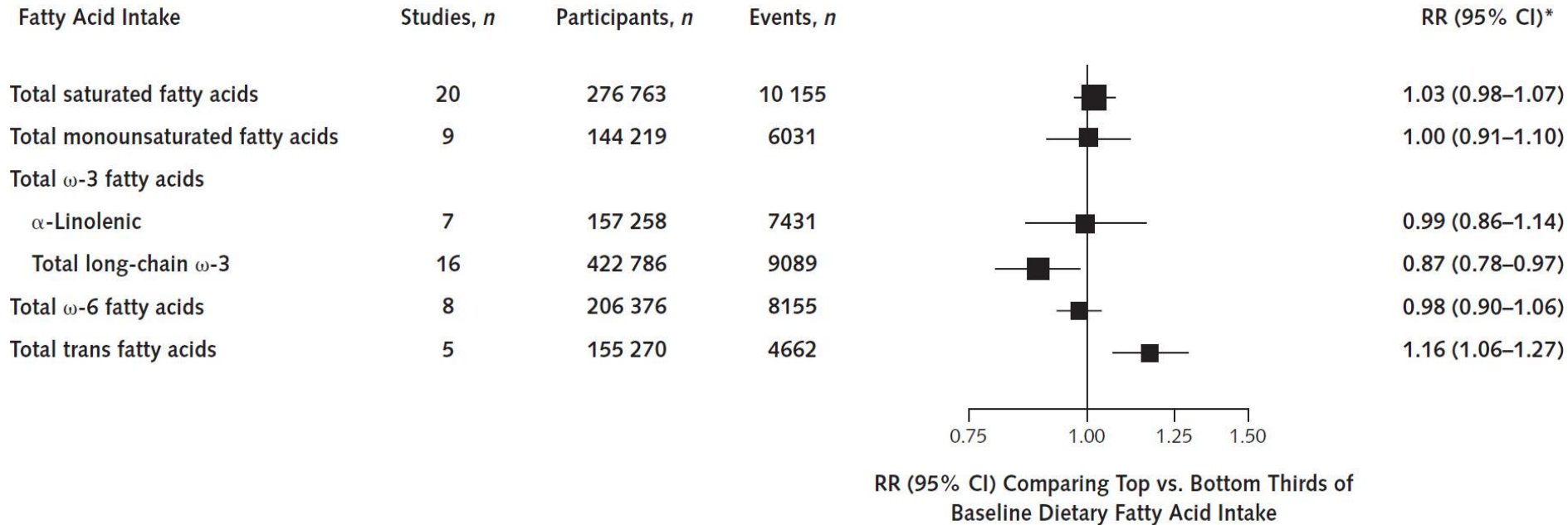


What about diet ?



Association of Dietary, Circulating, and Supplement Fatty Acids With Coronary Risk: A Systematic Review and Meta-analysis

Chowdry et al, Ann Int Med, 2014

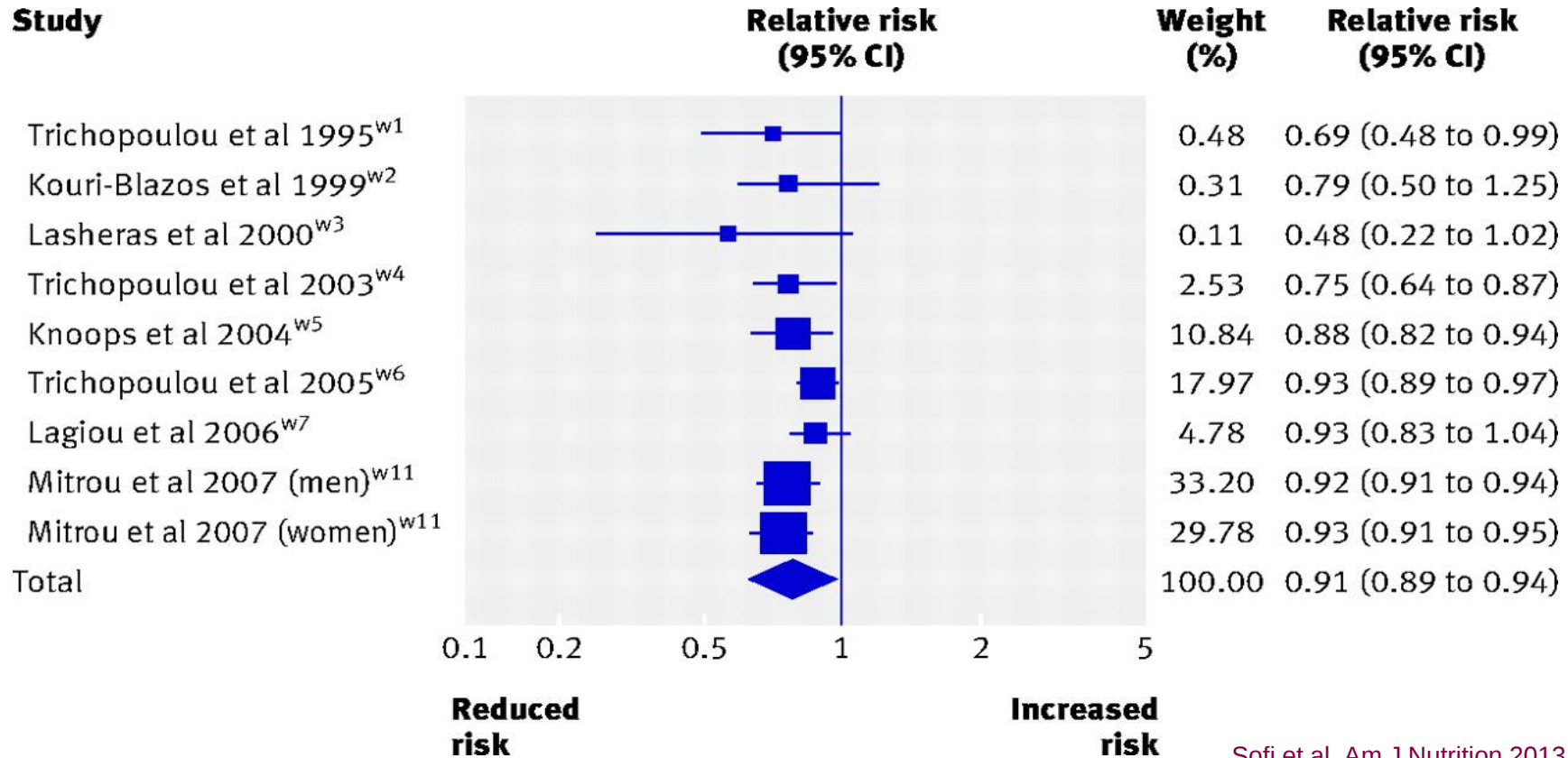


Impact of diet on LDL cholesterol

A vegan diet (which avoids all animal products) was associated with an average decrease in LDL cholesterol of $\sim 0.5 \text{ mmol/l}$.

For most people diet has small or modest effects on LDL cholesterol

Benefits of a Mediterranean dietary pattern have been reported in many studies

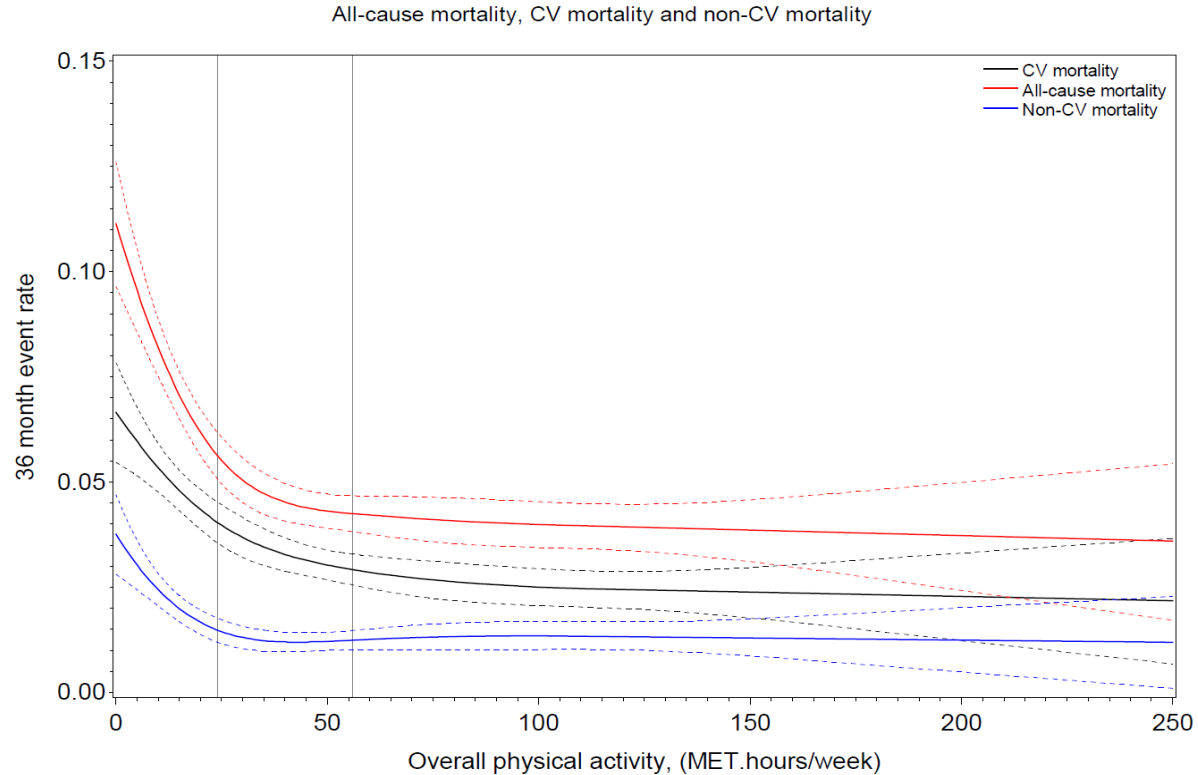


Obesity BMI and waist-hip circumference



Physical activity and mortality

1



Increased acute cardiac events triggered by major environmental events

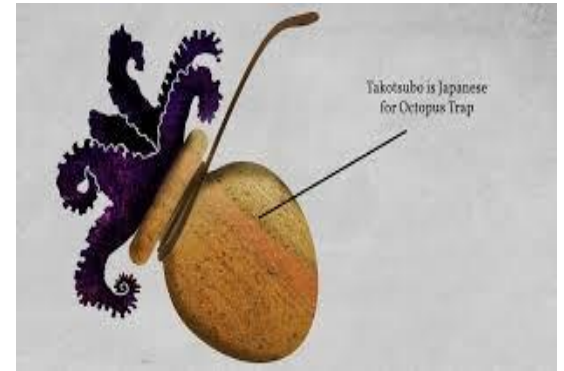


Acute myocardial infarction

Atrial fibrillation

Stress cardiomyopathy 'takotsubo'

Takotsubo



Takotsubo cardiomyopathy

*International cohort study*_T

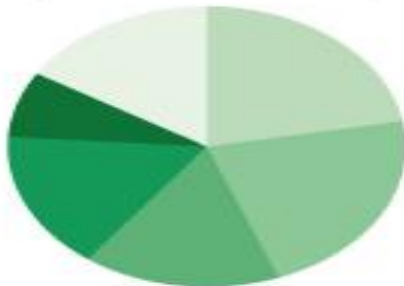
Templin C, Ghadri JR, Diekmann J, et al. N Engl J Med 2015;373:929-38

Physical triggers (N=630, 36.0%)



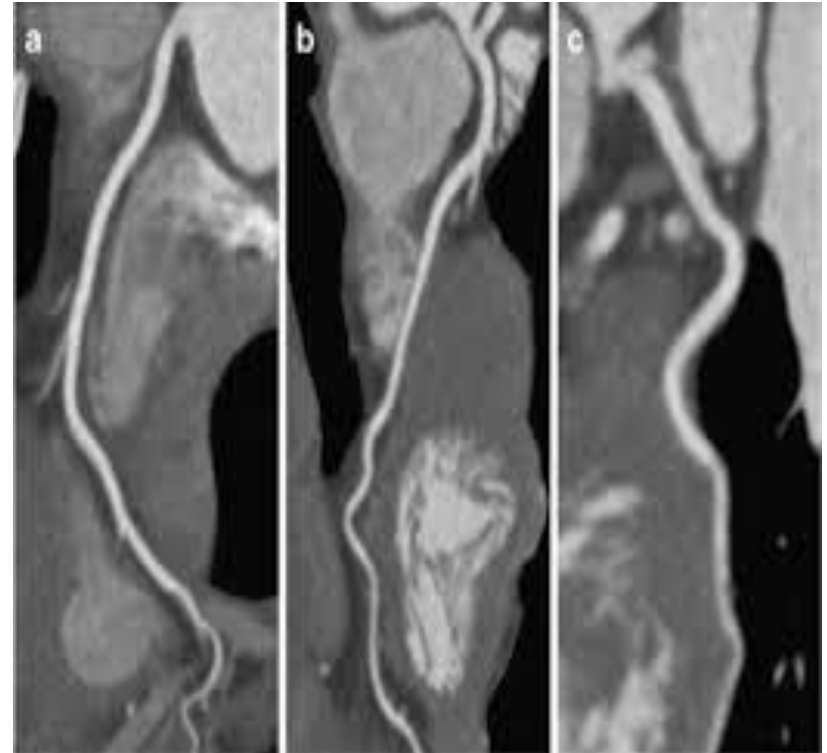
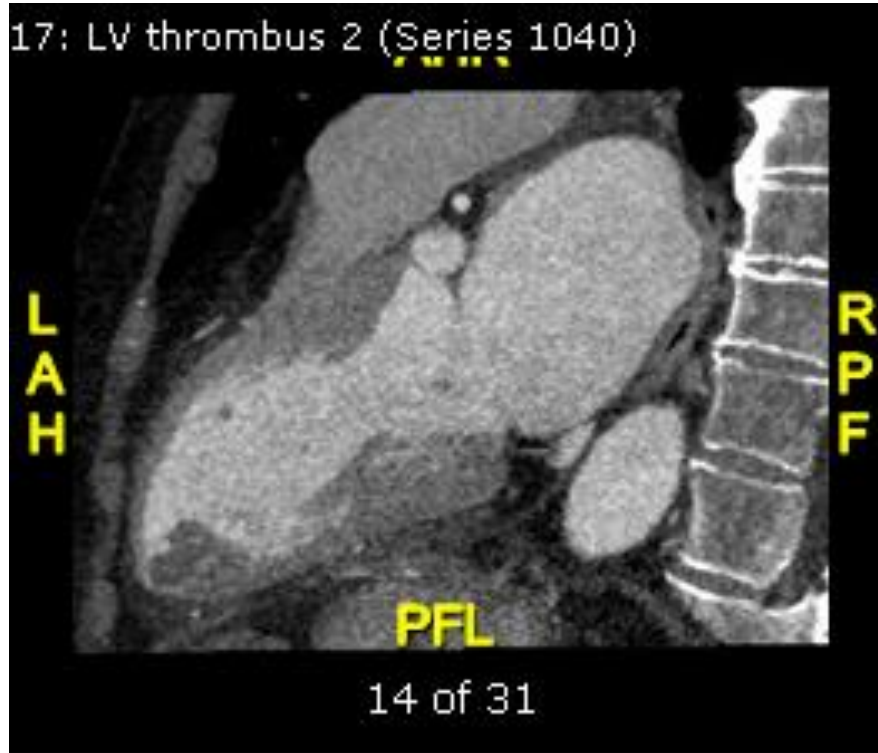
- 20.2% Acute respiratory failure
- 18.4% Post-surgical/fracture
- 15.5% Central nervous system conditions
- 8.1% Infection
- 1.3% Malignancy
- 36.5% Others

Emotional triggers (N=485, 27.7%)



- 22.1 % Grief/loss
- 22.1 % Panic/fear/anxiety
- 16.1% Interpersonal conflict
- 15.8% Anger/frustration
- 7.6% Financial or employment problems
- 16.3% Others

CT coronary angiogram



Secondary prevention - lifestyle

- **Smoking cessation+++**
- **Exercise++**
- **Healthy diet++**
- **Reducing psycho-social stress ?**
- **Healthy body weight ?**

Progressive heart failure

78 year old Samoan man

- Comorbidities: HTN, prior GI bleeds, T2DM, ex-smoker, chronic kidney disease
- Creatinine 190umol/L
- Heart Failure diagnosed 2003
- Out of hospital VF arrest 2006
 - Implantable defibrillator for secondary prevention following resuscitated sudden death

- **Frusemide 80-120mg daily**
- **Cilazapril 2.5mg daily**
- **Carvedilol 6.25mg am, 12.5 mg pm**
- **Amiodarone 200mg daily**
- **Simvastatin 40mg daily**
- **Gliclazide 80mg daily**
- **Metformin 500mg bid**
- **Omeprazole 40mg daily**

Worsening symptoms of heart failure

a)

- **BP 80/40**
- **creatinine increase 250umol/L**

Worsening symptoms of heart failure

a)

- BP 80/40
- creatinine increase 250umol/L

b)

- BP 150/76
- creatinine 200umol/L

2 years later, progressive heart failure and renal failure

End-stage HF – management issues

- Symptom control**
- ICD turned off**
- Patient and relatives counselling, and ACP**
- Palliative care**

Heart failure and coronary disease

57 yr old male

- Prior anterior MI 6 months ago
- Primary stent (2 hour delay)
- Uncomplicated recovery
- Echo – LVEF 40%, marked anterior wall hypokinesis
- Discharged
 - Cilazapril 1mg, metoprolol CR 23.75mg, atorvastatin 80mg, aspirin and ticagrelor

- **Presents 3 months later to you**
- **Progressive decline in exercise, short of breath**
- **BP 130/80, JVP 4cm, bibasal crackles, weight 4 kg increase over 2-3 weeks, bilateral ankle oedema**
- **Diagnosis?**

Polypharmacy in HF management

Cilazapril 5mg daily

Metoprolol 190mg daily

Spironolactone 25mg daily

Frusemide 80mg daily (variable)

Aspirin 100mg daily

Atorvastatin 80mg daily

Allopurinol 300mg daily

.....



