Dr Ben Fitzgerald Cardiologist TPCH



Table 1. PBS criteria for statins	
•The patient must have received dietary therapy (typically for	r 6 weeks)
 Fasting lipid levels must be checked after completion of diet 	tary therapy
Patient characteristics	Qualifying total cholesterol level
Patients with existing CHD	Total cholesterol >4 mmol/L
Patients with:	
Diabetes mellitus	Total cholesterol level >6.5 mmol/L
 Familial hypercholesterolaemia 	or
 Family history of CHD (first degree relative <60 years of age) 	Total cholesterol level >5.5 mmol/L with HDL <1 mmol/L
Hypertension	
Peripheral vascular disease	
Patients with HDL <1 mmol/L	Total cholesterol level >6.5 mmol/L
Men aged 35–75 years	Total cholesterol level >7.5 mmol/L
Postmenopausal women aged up to 75 years	or a triglyceride level >4 mmol/L
Other patients not included above	Total cholesterol level >9 mmol/L or a triglyceride level >8 mmol/L



Figure 1. Incidence of CHD vs. total cholesterol

https://www.racgp.org.au/afpbackissues/2005/200506/200506stocks.pdf



J Am Coll Cardiol. 2014;64:485-494



https://www.racgp.org.au/afpbackissues/2005/200506/200506stocks.pdf

	stati	n	Cont	rol		Risk Ratio	Risk Ratio
Study or Subgroup	Events	Total	Events	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
ACAPS (5)	0	460	6	459	2.2%	0.08 [0.00, 1.36]	+
AFCAPS / TEXCAPS (6)	17	3304	25	3301	8.3%	0.68 [0.37, 1.26]	
ASCOT-LLA (7)	74	5168	82	5137	9.1%	0.90 [0.66, 1.23]	
ASPEN (4)	44	959	41	946	8.9%	1.06 [0.70, 1.60]	
ASTRONOMER (8)	2	103	12	79	5.2%	0.13 [0.03, 0.55]	·
Beishuizen et al (9)	3	103	4	78	5.2%	0.57 [0.13, 2.46]	• • • • • • • • • • • • • • • • • • •
Bone et al (10)	0	485	0	119		Not estimable	
Cards (11)	61	1428	82	1410	9.1%	0.73 [0.53, 1.01]	
HOPE-3 (12)	334	6361	357	6344	9.4%	0.93 [0.81, 1.08]	
HYRIM (13)	4	283	5	85	5.7%	0.24 [0.07, 0.87]	+
JUPITER (14)	83	8901	157	8901	9.2%	0.53 [0.41, 0.69]	
KAPS (15)	2	214	3	89	4.3%	0.28 [0.05, 1.63]	+
MEGA (16)	11	3866	32	99	8.1%	0.01 [0.00, 0.02]	•
METEOR (17)	1	700	0	281	1.9%	1.21 [0.05, 29.54]	• • • • •
Prevent - IT (18)	4	433	2	412	4.5%	1.90 [0.35, 10.33]	
woscops (19)	50	3302	78	3293	9.0%	0.64 (0.45, 0.91)	
Total (95% CI)		36070		31033	100.0%	0.43 [0.26, 0.70]	
Total events	690		886			1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	
Heterogeneity: Tau ² = 0.6	7; Chi ² = 2	09.70, 0	if=14 (P	< 0.000	01); I [#] = 9	3%	
Test for overall effect: Z =	3.38 (P =	0.0007)					Favours [statin] Favours [control]

Figure 1: Over all meta-analysis of comparative studies in statin use and risk ratio of all cause mortality events.

Cardiol Cardiovasc Med 2018; 2 (4):123-134

Functional testing in 2021

Dr Ben Fitzgerald Cardiologist TPCH



- Anatomy versus function
- Anatomical tests provide us with information about the coronary arteries
- Functional tests give us information regarding underlying ischaemia – whether the underlying anatomy has functional significance

Why do we care?



Why do we care?

- Chest pain due to CAD should be due to myocardial ischaemia
 - Intermediate risk patients may better tested with a functional test
- To identify patients for prevention of CAD, an anatomical test may better suited
- High risk patients are usually best investigated with an invasive coronary angiogram

Functional tests

• Treadmill test



• Stress echo



Myocardial perfusion
 studies



Functional tests

Ischaemic cascade



Figure 4.1: Number of MBS-subsidised services for cardiac stress tests and imaging per-100,000 deople aged 18 years and over, age and sex standardised, by state and territory of patient residence, by cardiac test type, 2016–17

,500

6,000

5,500

5,000

4,500

4,000

3,500

3,000

2,500

2,000

1,500

1,000

500

6%

33%

539

ustralia NSW Vic

Exercise ECG

scans

5%

34%

52%

Myocardial perfusion

2%

52%

Qld

7%

31%

55%

WA

28%

60%

11%

33%

50%

Stress echocardiography

Computed tomograph of coronary arteries

SA Tas ACT NT

31%

51%

57%



Rates across Australia

Figure 4.5: Number of MBS-subsidised services for cardiac stress tests and imaging per 100,000 people aged 18 years and over, age and sex standardised, by Statistical Area Level 3 (SA3) of patient residence, 2016–17



Dated areas indicate rates that are considered more volatic than other published rates and should be interpreted with explore. These rates are excluded howe the calculation of the offbarries between the highest and lowest 2XD rates in Australia. For further dated along the restriction cancel, plasme wher to the Tachwind Supplement. Summun: AIRW analysis of Machene Threadile Schedule State and ASSI furitering allowing Papalation 20. June 2006.

Australian Commission on Safety and Quality in Health Care 2018

Exercise treadmill testing

- Patient is connected to an ECG monitor
- They walk on the treadmill, with the speed and elevation progressively increasing
- Exercise for....
 - Maximum predicted heart rate (220-age)
 - Exercise tolerance



Exercise treadmill testing

- Easy and readily performed
- Inexpensive
- However...
 - Sensitivity 67%, specificity 72% (meta-analysis: 58 papers, 11691 patients) International Journal of Clinical Practice 2012



Myocardial perfusion studies

- Radionuclide myocardial perfusion imaging permits assessment of cardiac perfusion and function at rest and during exercise or with pharmacologic stress
- It involves intravenous injection of a radioactive perfusion tracer and then uses a special camera system, to detect the gamma photons
- A specialized computer program reconstructs the images into the standard displays
- It provides rest and post-stress assessment of myocardial perfusion, viability, and global and regional left ventricular systolic function, as markers of underlying coronary artery disease



Myocardial perfusion studies

- Advantages:
 - Accuracy
 - Proven risk stratification ability
 - Prognostic value
 - Improved diagnostic accuracy over exercise treadmilltesting
- Disadvantages:
 - Requirement of specialised equipment
 - Availability of radioactive isotope
 - Image quality
 - Cost
 - Radiation exposure





- Non-invasive assessment of cardiac status
- Permits the detection of myocardial ischaemia via visualization of regional wall motion abnormalities (RWMA's)



"Conceptually a simple technique...which contrasts with the technical difficulty posed by the practical performance of this technique"

Prof Tom Marwick 2002



- Advantages:
 - Accuracy and higher specificity
 - Proven risk stratification ability
 - Prognostic value
 - Improved diagnostic accuracy over exercise treadmill testing
 - Assess cardiac structure and function
 - No radiation
 - Lower cost than nuclear studies
- Disadvantages:
 - Operator dependent (need experts!!!)
 - Availability
 - Image quality (can be addressed with echo contrast)

- Assessment of risk of underlying CAD
- Evaluation of patients with known CAD



- Assessment of risk of underlying CAD
- Evaluation of patients with known CAD
- Assessment of myocardial viability

	Dobutamine dose				
	Baseline	Low-dose	Peak-dose		
Normal	\leq	\leq			
Ischemia	<u> </u>				
Viable		$ \ge$			
Viable/ischemia (biphasic)	—		<u> </u>		
Scarred			_		

- Assessment of risk of underlying CAD
- Evaluation of patients with known CAD
- Assessment of myocardial viability
- Evaluation of dysphoea of possible cardiac origin including assessment of filling pressures
 Rest
 Peak



- Assessment of risk of underlying CAD
- Evaluation of patients with known CAD
- Assessment of myocardial viability
- Evaluation of dysphoea of possible cardiac origin including assessment of filling pressures
- Exercise tolerance/capacity
- BP response to exercise
- Evaluation of mitral valve disease, including mitral stenosis and mitral regurgitation
- Evaluation of aortic stenosis
- Evaluation of hypertrophic cardiomyopathy (assess left ventricular outflow tract gradients, mitral regurgitation, and pulmonary hypertension)
- (Evaluation for pulmonary hypertension, as pulmonary artery systolic pressure can be estimated at rest and with exercise)
- Prognostic data
- Imaging data

- Assessment of risk of underlying CAD
- Evaluation of patients with known CAD
- Assessment of myocardial viability
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- (Evaluation for pulmonary hypertension, as pulmonary artery systolic pressure can be estimated at rest and with exercise)
- Prognostic data
- Imaging data

Resting ECG



Resting quads





Courtesy of Prof Scalia

Exercise to....?

- Symptom limitation?
- Set heart rate?
- Maximal exertion?
- Need to achieve ≥ 85% MPHR to maximize sensitivity of the test
- Failure to achieve ≥ 85% MPHR has seen the sensitivity drop from 88% to 73%

JACC1992;19(1):74-81 Stress echo n=179 JACC 1989;14(6):1477-5 Stress thallium n=461 JNM 1980;21(12):1125-30 Nuclear stress ventriculogram n=77 BHJ 1972;34(9):919-23 Bicycle stress test n=63



Courtesy of Prof Scalia







Aim to complete within 90 seconds

ECG monitoring including peak






Stress echocardiography

- RWMA can also be caused by:
 - Abnormal septal motion
 - Pacing
 - LBBB
 - Post cardiac surgery
 - Sarcoidosis
 - Focal myocarditis
- These are not usually brought on by stress (exercise)

Case 1

- 52M
- FHx CAD
- No symptoms
- Assessment of risk
- What should we do?



Options:

Calcium score



Stress echo



• CTCA

- ICA (invasive coronary angiography)

Vitrea® W/L:1413/-368 Segmented RCA to AM





• Calcium score = 0

Calcium score	Interpretation
0	Significant CAD unlikely
1-100	Minimal to mild calcification – low risk
101-400	Moderate calcification – intermediate risk
> 400	Extensive calcification – significant CAD more likely





kVP:135 mA:440 msec:400 mAs:112 Thk:0.5 mm Aquilion

Vitre W/L:1000/2 SEGMENT 880ms 0.0 Curved N RCA - P







Case 2

• 72F

- HT and mild to moderate AR
- Recent sudden and unexpected death of her daughter
- Some increasing SOBOE over last few weeks or months
- "Am I going to have the same problem?"



Options:

- Calcium score
- Stress echo



0

• CTCA

- ry ohy)
- ICA (invasive coronary angiography)



• Stress echo:

- Preserved LV function
- No change to AR
- exercised for 5 minutes and 40 seconds according to a standard Bruce protocol
- 166bpm (112% of maximum predicted heart rate) and to 6.8METS (moderate workload)
- No chest pain
- No ECG changes with exercise









Case 3 • 63F

- History of HT and benign palpitations, on metoprolol
- Presented with chest heaviness at rest
- ECG sinus rhythm, no ischaemic changes
- Normal troponins





 ICA (invasive coronary angiography)









CORONARY ANGIOGRAM & ANGIOPLASTY REPORT

- The coronary vasculature in general demonstrates significant calcification and relatively diffuse disease.
- Left Main: Moderate calibre vessel with mild disease.
- LAD: Relatively small vessel which does not quite reach the ventricular apex. There is a severe (99%) stenosis with associated calcification proximally. There is further segments of severe diffuse disease midvessel and distally
- Intermediate Artery: Small to moderate calibre vessel with mild diffuse disease.
- Circumflex Artery: Small vessel with a 70% stenosis midvessel.
- **Right Coronary Artery:**Large calibre dominant vessel with mild to moderate diffuse disease. There is no significant focal stenosis.

• PCI TO THE LAD

Case 3 Summary

- CP
- Non-ischaemic ECG
- Normal troponins

• CTCA



PCI to LAD

Case 4

- 67M
- Chest tightness running up the stairs to the train
- Settled with rest
- Mild dyslipidaemia

Australian absolute cardiovascular disease risk calculator



Options:

Calcium score



• Stress echo



• CTCA ^



• ICA (invasive coronary

angiography)

W/L:1413/-368 Segmented RCA to AM









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Case 5

- 53M
- Mining executive
- Corporate health check CACS 3141



Options:

Calcium score



• Stress echo



Vitrea® W/L:1413/-368 Segmented RCA to AM





- Coronary angiogram
 - Three vessel coronary disease moderate but heavily calcified
 - Normal left ventricular function
 - This pattern of anatomy may not give a durable result with coronary stenting given the heavy calcification



MBS changes to Cardiac Imaging Services effective 1st August 2020

Initial Echocardiography changes, GP requested new items

- 55126 Initial real time echocardiographic examination (Echo): provides access to a baseline initial echocardiographic examination that is an entry point for patients who may require ongoing echocardiographic examinations. A service under item 55126 is restricted to two years. 55126 replaces 55113, 55114 and 55115 in certain circumstances.
- 55128 (MMM 3-7 area CPs only) Serial real time echocardiographic examination of the heart (Echo) for valvular dysfunction requested by medical practitioners in a Modified Monash Model (MMM) 3 to 7 area (Echo) for specific clinical indications is a new item. 55128 is expected to replace 55114 in certain circumstances.
- 55133 Frequent repetition serial real time echocardiographic examination (Echo) of the heart to monitor pericardial effusion/pericarditis or assessing the effects of PBS medications. This test can be referred by any practitioner.
- For patients who do not meet the above criteria, please refer the patient to a cardiologist for consultation and review for testing as per MBS guidelines to access Item numbers 55127, 55129 and 55132.

Stress echocardiography changes, <u>CP requested new items</u>

Items 55141, 55145, 55146 include the exercise stress ECG component (11729 or 11730), and replace 55116 and 55117.

Exercise stress echocardiography (Treadmill stress echo) - restricted to one study every two years

- 55141 Exercise stress echocardiography focussed stress study (Treadmill stress echo)
- 55145 Pharmacological stress echocardiography (Dobutamine stress echo)
- 55146 Pharmacological stress echocardiography (Dobutamine stress echo) following a failed exercise stress echo (must be performed within 4 weeks of failed stress echo).

Exercise stress ECG - restricted to one study every two years