

Women's Heart Health

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Outline

- Key statistics on heart health in women – globally and in Australia
- Differences in heart disease between men and women:
 - Risk factors
 - Presentation
 - Treatment
- Key messages and strategies to improve outcomes for women with heart disease

Burden of Cardiovascular Disease in Women and their Associated Risk Factors

Global Burden of Cardiovascular Disease in Women

Cardiovascular
disease in
women

35%

of all deaths in women worldwide are caused by cardiovascular disease



275 million

women were diagnosed with cardiovascular disease in 2019

8.9 million

women died from cardiovascular disease in 2019

*The Lancet Commission
on Women and Heart
Disease (2020)*

Cardiovascular Disease in Australian Women

More than half a million Australian women have cardiovascular disease

An estimated 510,000 (4.8%) Australian women aged 18 and over reported 1 or more heart, stroke and vascular diseases in 2017-2018

Around **22,200 women per year have an acute coronary event** (heart attack or unstable angina) (2016), and **17,900 women have a stroke** (2015).



Australian Institute of Health & Welfare

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<https://www.aihw.gov.au/reports/heart-stroke-vascular-diseases/cardiovascular-disease-in-women>

Cardiovascular Disease in Australian Women

Indigenous women are up to twice as likely to have CVD, and to die from coronary heart disease or stroke

CVD accounted for 12% of the total burden of disease among Australian women in 2015

22,200 women died from CVD in 2016—or 3 in 10 of all female deaths

CVD hospitalisation rates for females fell overall between 2006–07 and 2015–16 but increased among younger women



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<https://www.aihw.gov.au/reports/heart-stroke-vascular-diseases/cardiovascular-disease-in-women>

Yet cardiovascular disease among women has historically been...

understudied,
under-recognised,
underdiagnosed,
undertreated,
 and women are
under-represented in
 clinical trials.

*The Lancet Commission
 on Women and Heart
 Disease (2020)*

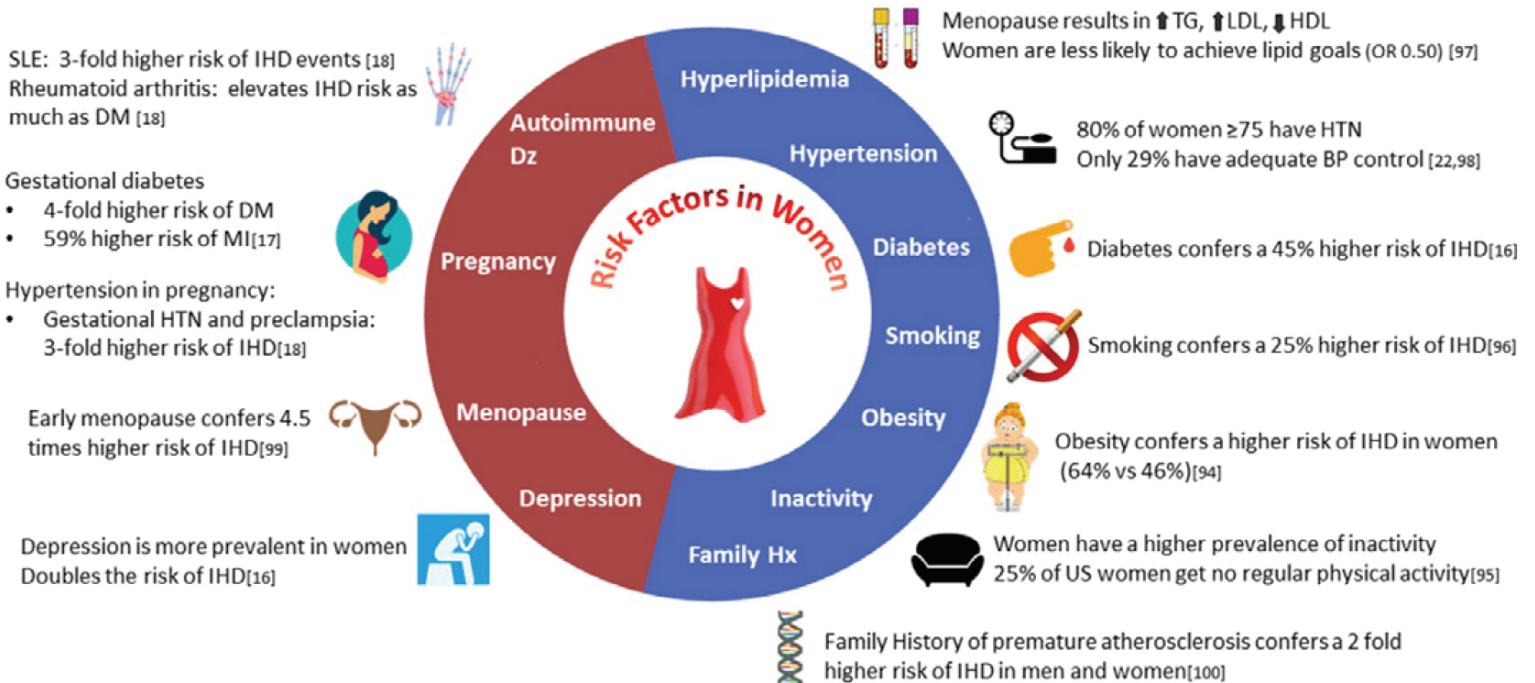
We need to better understand sex and gender differences in heart disease if we are to 'close the gender gap' in cardiovascular care



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Emerging Risk Factors

Traditional Risk Factors



Traditional CVD Risk Factors in Women



Diabetes confers a 45% higher risk of coronary heart disease in women than men



Smoking confers a 25% higher risk of coronary heart disease in women than men

Traditional CVD Risk Factors in Women



Only 48% of older women with hypertension have adequate blood pressure control



Women with hyperlipidaemia receive lower preventive medications e.g. statins, compared to men



Women are more sedentary than men, and gap in activity worsens with age

Emerging Risk Factors in Women

Hypertensive disorders of pregnancy (HDP)
Pre-eclampsia
Gestational diabetes
Preterm birth



Premature menopause (age <44)
Polycystic Ovarian Syndrome (PCOS)

-> 2-3-fold increased risk of cardiovascular disease, independent of other traditional risk factors



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Emerging CVD Risk Factors in Women – what do we do about them?

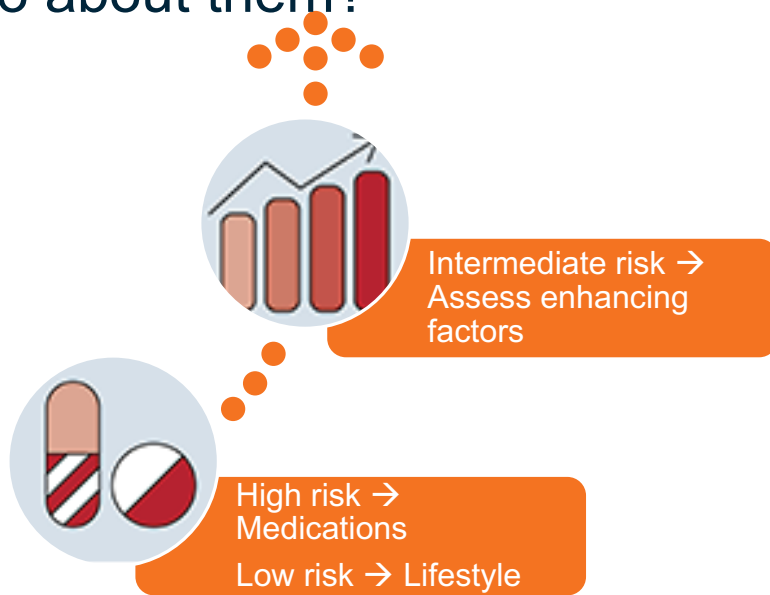
<https://www.cvdcheck.org.au/what-is-absolute-risk>

For individuals 45 years and over (30 years for First Nations people), absolute risk is chance of developing CVD over the next 5 years, taking into account sex, age, SBP, smoking status, TC/HDL, diabetic status and LVH on ECG.

Determines who qualifies for more intensive medical therapy (statins, blood pressure-lowering)

A screenshot of the CVD Risk Calculator interface. It shows a form with the following fields and values: Gender: Female (selected); Age: 50 years; Systolic Blood Pressure: 140 mmHg; Smoking Status: No (selected); Total Cholesterol: 5.5 mmol/L; HDL Cholesterol: 1.8 mmol/L; Diabetes: Yes (selected); ECG LVH: (empty field). The interface is clean and modern, with blue and grey accents.

Emerging CVD Risk Factors in Women – what do we do about them?



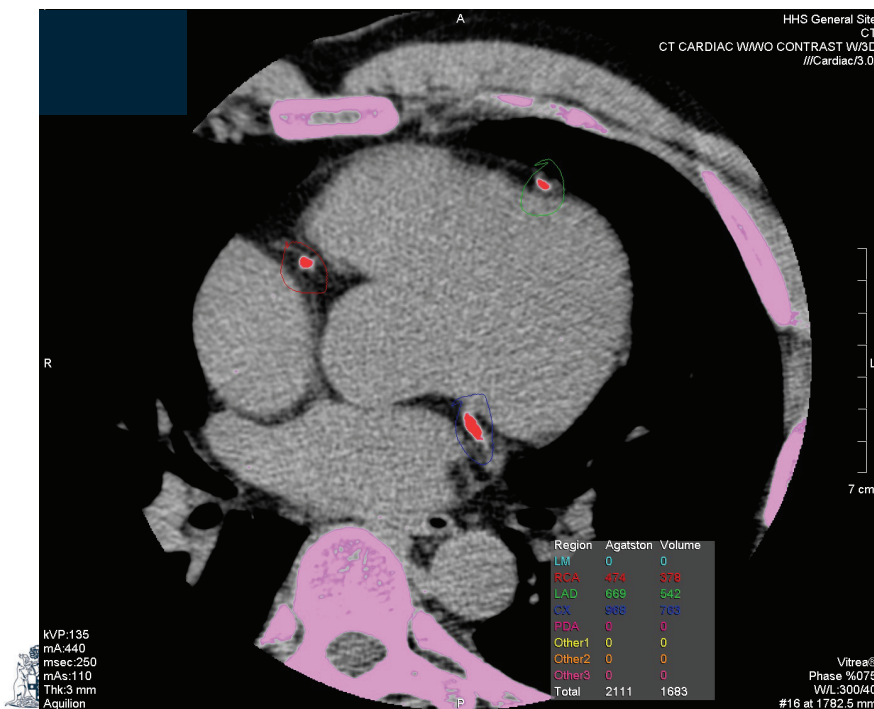
- ACC/ AHA new primary prevention CVD guidelines
- Uses Pooled Cohort Equation (updated cohort, calculator includes race and treatment (HT, aspirin, statin))
 - Consider risk enhancing factors for clinician-patient risk discussion
 - Identifies utility of CT Calcium Scoring in re-classifying CVD risk for those at intermediate risk



<http://tools.acc.org/ASCVD-Risk-Estimator-Plus/#!/calculate/estimate/>
Arnett DK, et al 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease. *J Am Coll Cardiol* 2019;Mar 17

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CT Coronary Artery Calcium Scoring



Useful in intermediate risk patients with risk enhancing factors

- ie women with a history of
- Pre-eclampsia/HDP
 - GDM
 - PCOS
 - Premature menopause

- Low dose radiation (similar to a mammogram)
- Quick (<5 minutes)
- No IV contrast/cannula
- But – cost to patient as no medicare rebate (\$150-600)

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CT Coronary Artery Calcium Scoring

Table 5. Use of Area under the Curve for Risk Factors Alone and for Risk Factors plus Coronary-Artery Calcium Score to Predict Major Coronary Events and Any Coronary Event, According to Racial or Ethnic Group.*

Racial or Ethnic Group	Major Coronary Event†			Any Coronary Event		
	AUC for Risk Factors Alone	AUC for Risk Factors plus Coronary-Artery Calcium Score	P Value	AUC for Risk Factors Alone	AUC for Risk Factors plus Coronary-Artery Calcium Score	P Value
White	0.76	0.79	0.10	0.75	0.79	0.02
Chinese	0.83	0.88	0.05	0.74	0.85	<0.001
Black	0.79	0.87	0.04	0.81	0.87	0.005
Hispanic	0.84	0.86	0.11	0.80	0.84	0.10
Total	0.79	0.83	0.006	0.77	0.82	<0.001

* Separate models are fitted for each racial or ethnic group. AUC denotes area under the receiver-operating-characteristic curve. P values are for the comparison between AUC without and AUC with the coronary-artery calcium score.

† Major coronary events were myocardial infarction and death from coronary heart disease.



Detrano R Coronary Calcium and CV Risk MESA NEJM2008

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Heart Disease in Women and Men – Acute Coronary Events

Sex/Gender Differences in Heart Attack Symptoms



The Global Registry of Acute Coronary Events of 26,000 women and men with acute coronary syndromes

Women with heart attacks older (~7 years), more comorbidities (diabetes, HT, heart failure), less likely to have previous MI's

Less central chest pain (more jaw, back pain), more associated symptoms (nausea, vomiting, dizziness)

Common presenting symptoms in women with ACS.

Frequency	Symptom(s)
Most common	Chest pain 92% (vs 94%)
Next most common	Jaw pain Nausea Vomiting
More atypical symptoms	Middle or upper back pain Neck pain Breathlessness Paroxysmal nocturnal dyspnea Indigestion Loss of appetite Weakness Fatigue Dizziness Palpitations



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Young MI, 3,500 MI patients <55 years of age

Interviewed regarding their symptoms & presentation

Majority of men and women had chest pain, but women more likely to have additional non-chest pain symptoms

	Overall			Among Patients With STEMI		
	Women (n=2009)	Men (n=976)	P*	Women (n=922)	Men (n=563)	P*
Individual symptoms, %						
Chest pain, pressure, tightness, or discomfort	87.0	89.5	0.185	87.3	91.5	0.092
Dizziness	28.0	26.3	0.774	29.5	28.1	1
Epigastric: indigestion, nausea, or stomach pain, pressure, burning, or discomfort	61.5	50.2	<0.001	67.1	53.1	<0.001
Pain/discomfort in jaw, neck, arms, or between shoulder blades	64.9	58.1	0.002	67.7	58.6	0.003
Palpitations	18.7	12.5	<0.001	15.4	11.0	0.103
Shortness of breath	52.8	47.6	0.043	51.2	48.7	1
Sweating	53.3	55.5	0.774	62.1	63.1	1
Weakness or fatigue	45.2	40.9	0.142	46.1	43.7	1
Confusion	12.1	11.2	0.774	13.3	12.6	1
Number of associated, non-chest pain symptoms						
Mean (SD)	3.4 (2.0)	3.0 (1.9)	<0.001	3.5 (1.9)	3.2 (1.9)	0.001
0 symptoms, %	5.6	6.7	<0.001	4.2	5.7	0.009
1-2 symptoms, %	32.5	38.5		29.8	36.8	
3-4 symptoms, %	33.0	33.4		36.2	33.6	
>4 symptoms, %	29.0	21.4		29.7	24.0	



Care was sought for their cardiac symptoms before MI hospitalization in ~30% of women

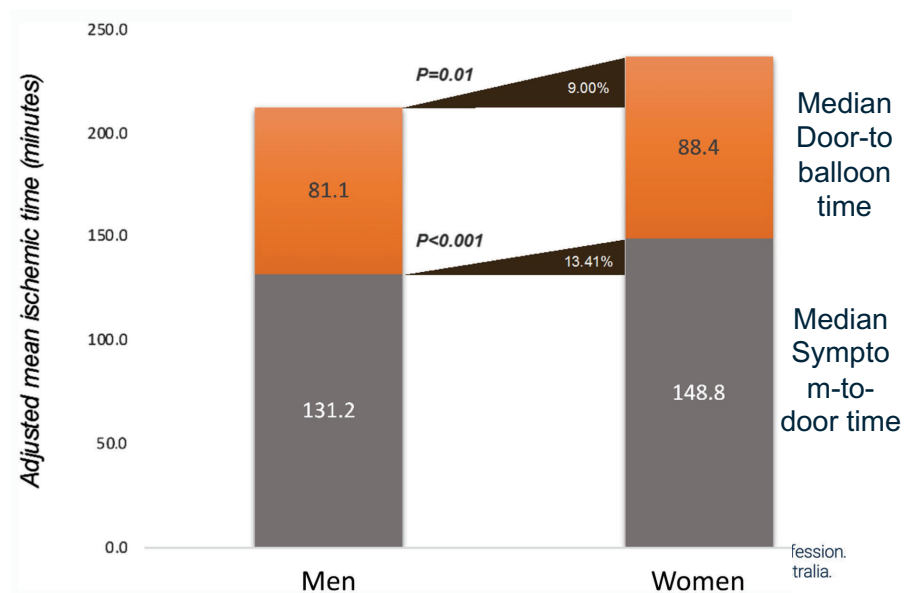
53% of young women with consequent MI were told their symptoms were not heart-related, compared to 37% of men

	Women (n=2009)	Men (n=976)	P*
Sought medical care for similar symptoms, %	29.5	22.1	<0.001
Provider did not think symptoms were heart-related, %	53.4	36.7	<0.001
Perceived cause of symptom, %			
Indigestion or acid reflux	29.1	40.5	0.401
Stress/anxiety	25.0	15.2	0.401
Muscle pain	13.3	15.2	1
Asthma	14.9	10.1	1
Stomach illness or flu	5.1	3.8	1
Diabetes mellitus	5.7	2.5	1
Fatigue	5.1	0.0	0.401
Other	7.3	3.8	1
Among those with suspected symptoms of heart disease, %			
Tested for a heart condition	89.1	89.0	0.589
Test showed evidence of a heart condition	57.4	56.6	0.268



Sex/Gender Differences in Heart Attack Treatment

Based on state registry data in 30 hospitals in Victoria, after adjustment for confounders, it takes 25 minutes longer to open a blocked coronary artery in a woman, compared to a man



Contribution of Clinician and Patient Bias in Heart Attack Symptom Assessment

Objectively, chest pain remains the most common presenting symptom of an acute coronary syndrome in both men and women

Yet compared to men, women are:

More likely to take longer to present with heart attack symptoms (patient bias)

More likely to bear the label of 'atypical' chest pain and receive delays to heart attack care (clinician bias)



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Biological Differences: Heart attacks in Women vs Men

Differing underlying causes for an acute coronary syndrome in men versus women

Female-predominant conditions that have only recently been better recognised



- Microvascular disease & MINOCA (myocardial infarction with non-obstructive coronaries)
- SCAD (Spontaneous coronary artery dissection)
- Coronary vasospasm
- Heart attack mimickers e.g. Takotsubo Syndrome



ECG Differences in ST-Elevation MI (STEMI)

Women are more likely to have the right coronary artery occluded versus the left anterior descending artery in men with STEMI

Women can have more subtle ECG findings with anterior STEMI

	<40 yo	>40 yo	All Ages
V2 -or- V3	>2.5 mm	>2 mm	>1.5 mm
ALL other Leads	>1 mm	>1 mm	>1 mm

1.5mm of ST elevation V2-V3 in women compared to >2-2.5mm in men for diagnosis of STEMI

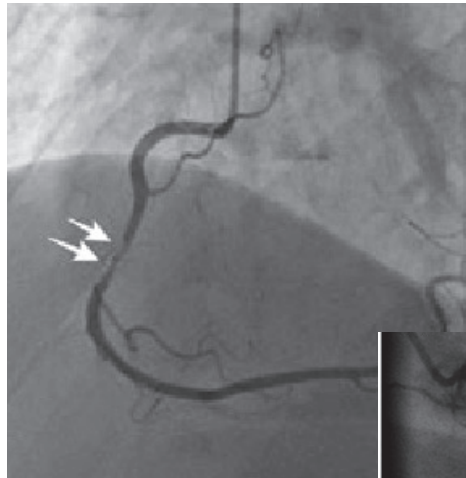


MINOCA (Myocardial Infarction with Non-Obstructive Coronary Arteries)

Much more common in women than men

The major epicardial coronary arteries do not have major blockages

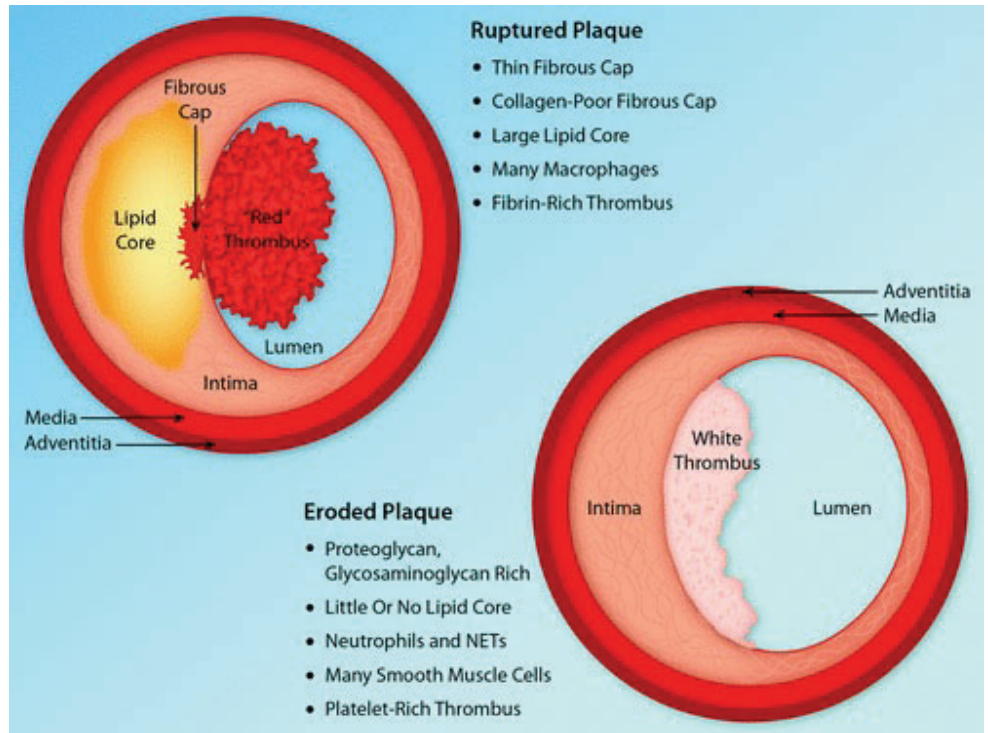
Heart attacks are a result of microvascular disease and endothelial dysfunction



Biological Differences: Heart attacks in Women vs Men

Plaque Erosion more common in women than men, which is less likely to cause obstructive epicardial disease, more subtle ECG changes

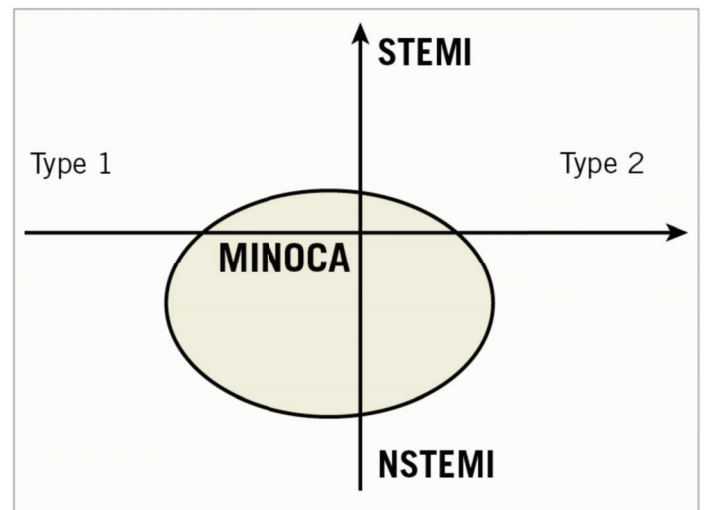
Contributes to higher MINOCA rates in women than men



MINOCA (Myocardial Infarction with Non-Obstructive Coronary Arteries)

The prognosis of MINOCA is not benign (slightly lower MACE but similar mortality to obstructive MI)

Due to the lack of epicardial stenosis leads to under-treatment with pharmacotherapy e.g. statins and dual antiplatelet therapy



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Lindahl et al. Eurointervention, 2021

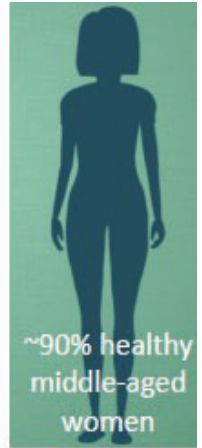
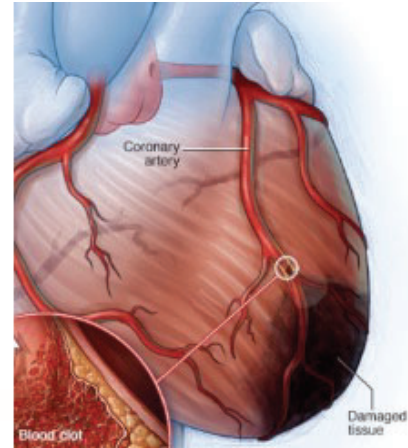
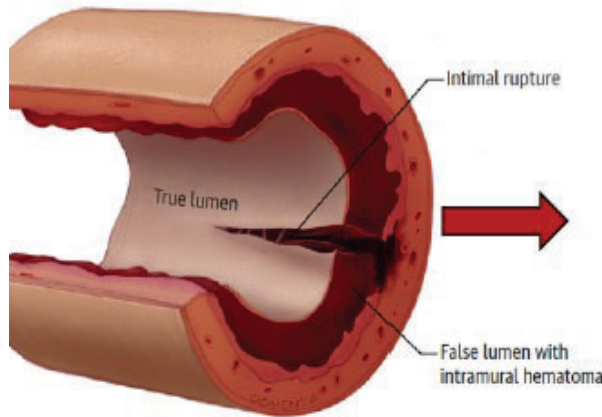
Spontaneous Coronary Artery Dissection (SCAD)

Sudden dissection of the coronary artery, 90-95% women

- Accounts of ~30% of heart attacks in women aged under 50

Strong female predominance; the majority without cardiovascular risk factors, often young or middle-aged

Linked to genetic predisposition (fibromuscular dysplasia) and hormonal changes e.g pregnancy



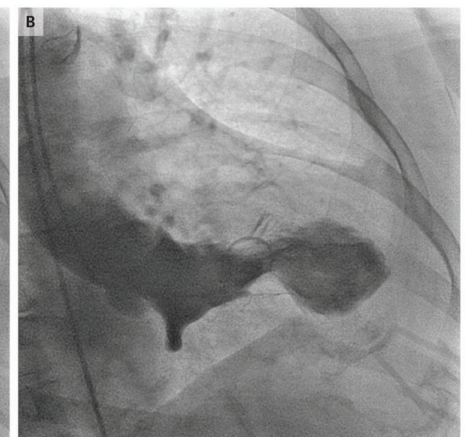
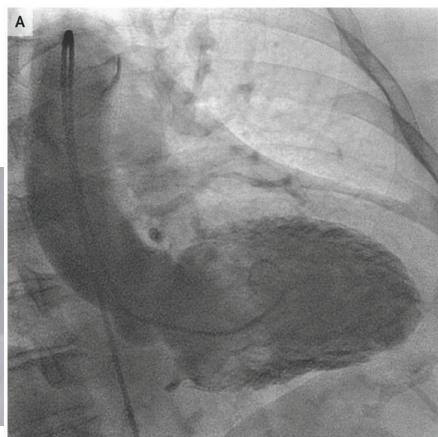
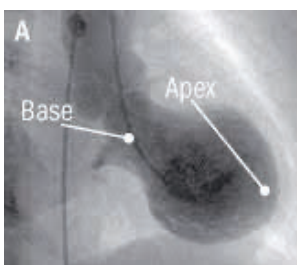
Takotsubo Syndrome (Stress-related Cardiomyopathy)

Accounts for ~10% of 'heart attacks' in women aged over 50

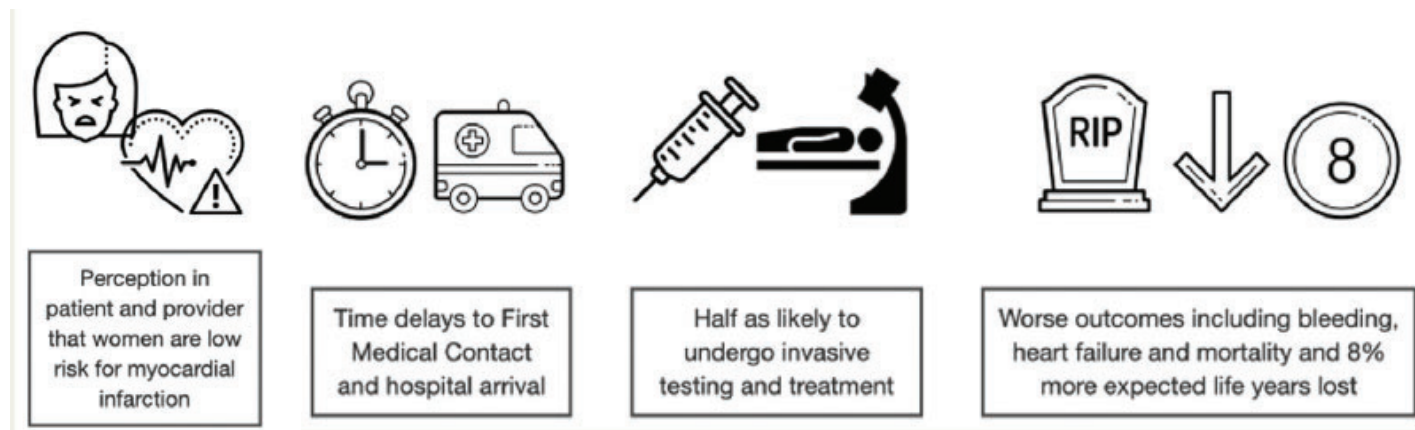
Important to recognize as treatment is different to atherosclerotic MI, and most recovery

Also known as broken heart syndrome or 'stress-induced cardiomyopathy' due to its precipitation usually by an emotional or physical trigger causing a heart attack-like condition (elevated troponin, abnormal ECGs and marked apical left ventricle hypokinesis)

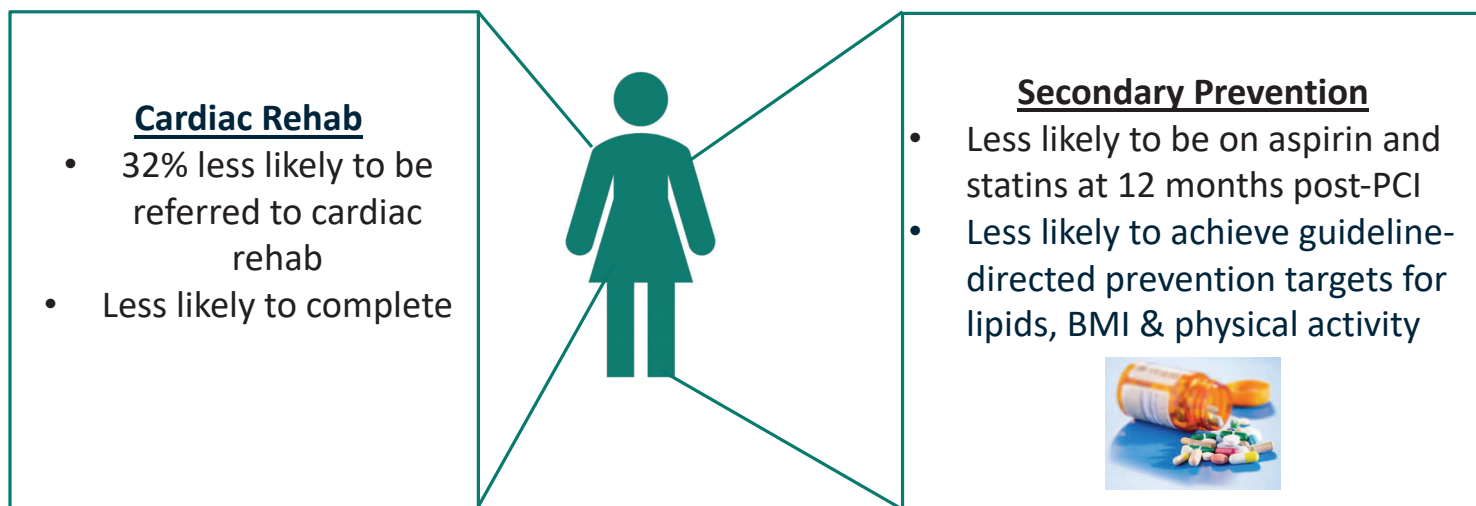
Affects ~80-90% female predominance



But these biological differences unlikely to account for the totality of the gender gap in heart attack care



Secondary Prevention after a Heart Attack



In Summary, Women with acute coronary syndromes, compared to men are....

More likely to have associated symptoms

More likely to be at higher risk when they present

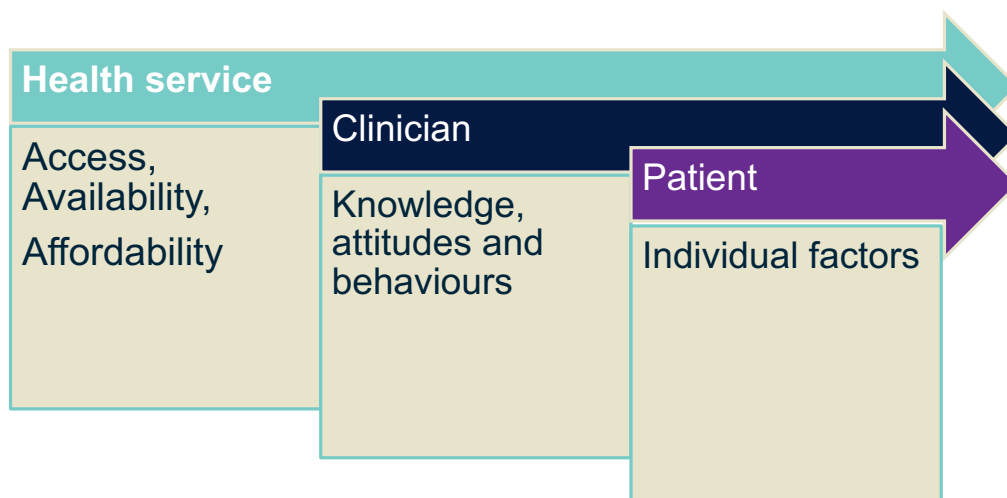
More likely to have non-atherosclerotic causes of ACS or MINOCA

More likely to have future MACE (OR 2.7) and to die (OR 2.2) at 6 months

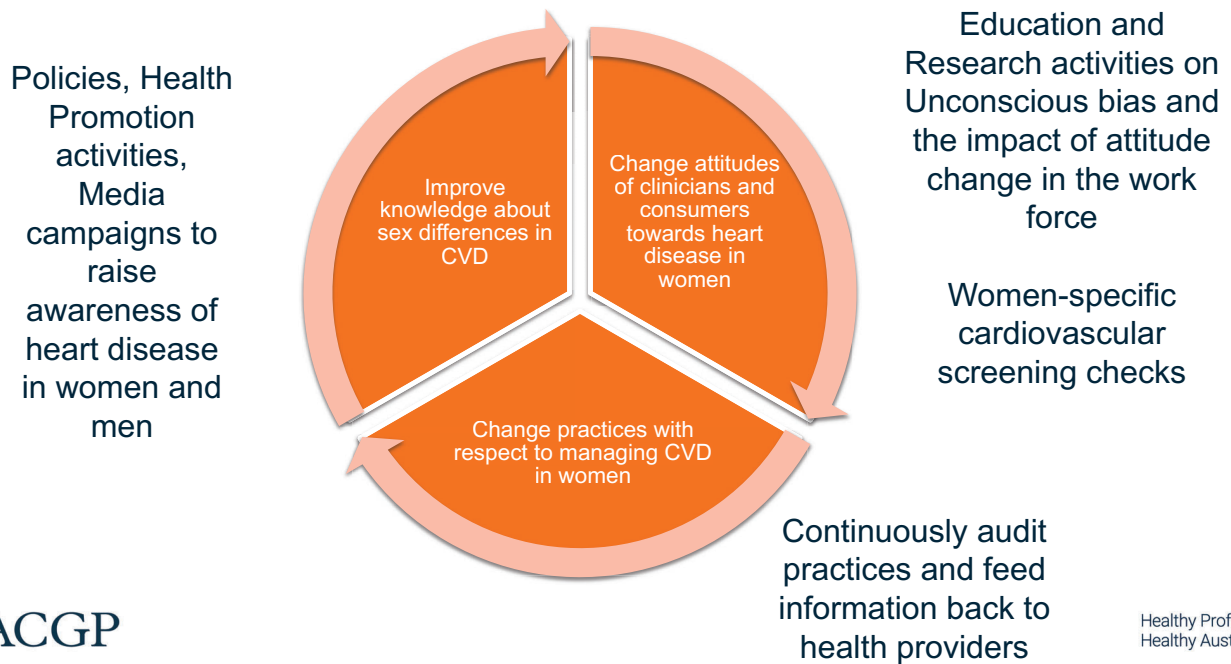
Less likely to have coronary angiography and coronary revascularization

Less likely to receive statins or referral to cardiac rehab

Barriers to Treatment in Women with Heart Disease



Potential Solutions to Barriers?



Conclusions

We have **made progress in women's heart health** with better understanding of sex-specific risk factors and awareness of differences in presentation, treatment and outcomes of heart disease

We all need to be aware of these important differences between men and women with heart disease and, ensure **equity in preventative and secondary treatment** for cardiovascular disease

Thank you



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