



## Module 2

# Global Cardiovascular Risk Assessment and Reduction in Women with Hypertension

# Global Cardiovascular Risk Assessment and Risk Reduction in Hypertensive Women

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## **Pamela**

A 54-year-old, post-menopausal woman presents to your office for an annual examination

# Case Development & Disclosures

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# Conflict Disclosure Information

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- Presenter 1:
  - Grants/Research Support: \_\_\_\_\_
  - Speakers Bureau/Honoraria: \_\_\_\_\_
  - Consulting Fees: \_\_\_\_\_
  - Other: \_\_\_\_\_

# Learning Objectives

## ***CV risk assessment: art & science of CV risk reduction strategies***

Upon completion of this activity, participants should be able to:

- Do a critical appraisal of CV risk assessment
- Evaluate indications and limitations of CV risk stratification
- Calculate vascular age; discuss how vascular age assessment can help in CV risk reduction
- Formulate a management plan using the Canadian Hypertension Education Program (CHEP) recommendations

CV; cardiovascular

# Statement of Need

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*Please write down your answer to the following:*

“My greatest challenge as a health care provider in the management of female patients with hypertension is \_\_\_\_\_.”

# Gender Gap in CV Risk Management

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- Women with atherosclerosis less likely to be:
  - Diagnosed with CAD
  - Treated for CAD

CV: cardiovascular; CAD: coronary artery disease

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# In-Hospital Mortality Rate: Acute MI

## In-hospital mortality following a heart attack (per 100 patients) 1997-2000

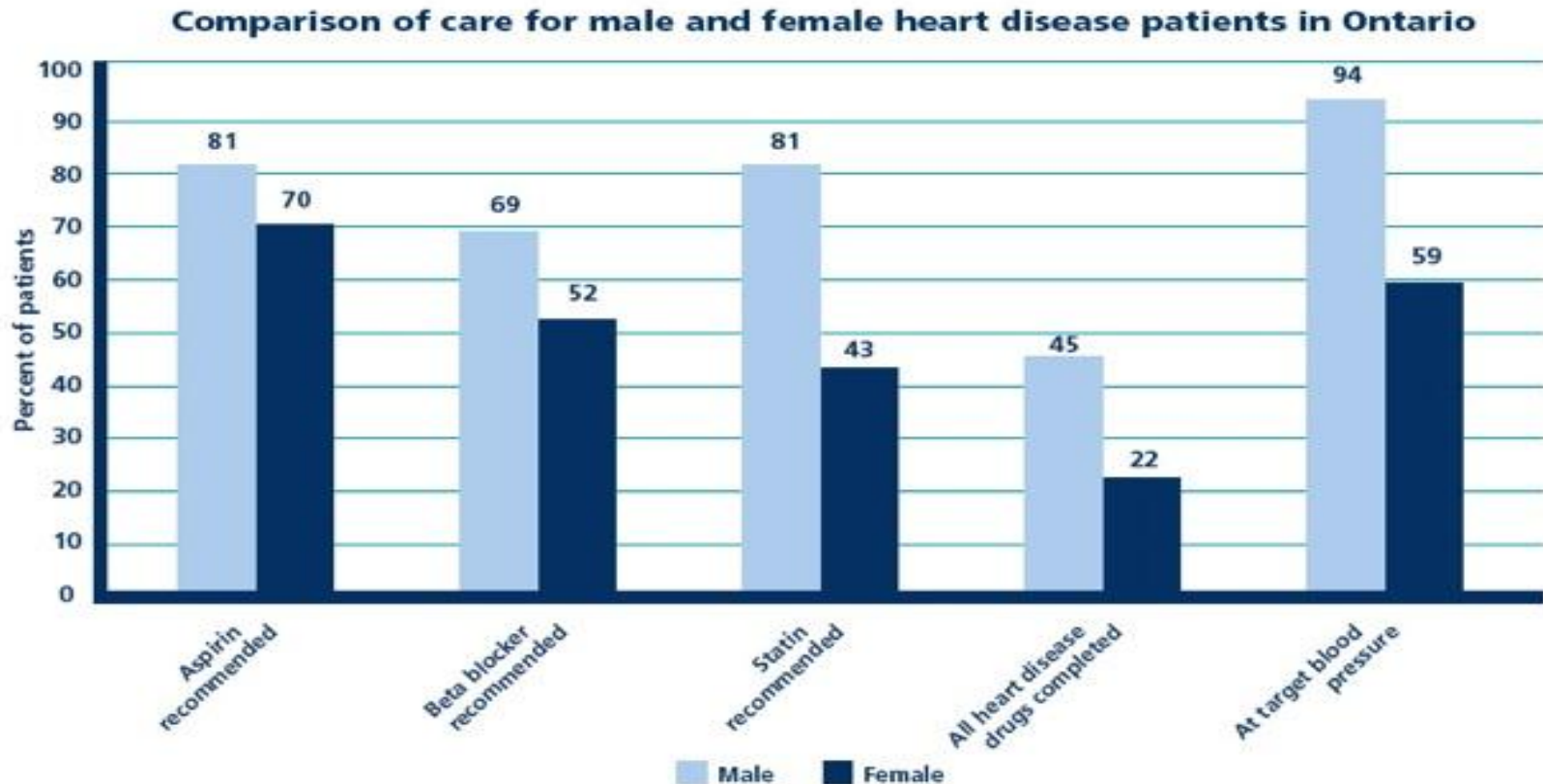
Age group	Women	Men
20-49 years	3.1	1.6
50-64 years	5.9	3.9
65-74 years	12.6	10.3
75+ years	24.4	22.2
Total (age 20+)	16.7	9.9

MI: myocardial infarction

Tu et al. *Can J Cardiol* 2003;19:893-901



# Women Less Likely to Be Effectively Treated for CAD



Source: Comparison of Models of Primary Health Care in Ontario study; CT Lamont Primary Health Care Research Centre, 2007

CAD: coronary artery disease

# Pamela

## Patient history

- Pamela, a 54-year-old teacher who is post-menopausal, presents for an annual exam
- She attends aerobic classes 2x/week
- She admits to smoking 3-4 cigarettes/day, and occasionally more, when stressed
- She has no health complaints and is not on any medications



# Pamela

## Family history

- Mother, aged 74, diagnosed with intermittent claudication at 62 years of age
- Father, aged 79, no history of CV disease

## Physical exam

- BMI: 26.8 kg/m<sup>2</sup>; waist circumference: 87 cm
- BP: 148/88 (avg. of repeated measures with validated oscillometric device [eg, Bp-TRU])
- HR: 72 bpm
- Nothing else of significance on physical exam
- You send Pamela for routine labs



Bp-TRU® (BPM-100) Vsm Medtech, Coquitlam, BC, Canada

CV: cardiovascular; BMI: body mass index; BP: blood pressure; HR: heart rate

# Pamela: Laboratory Investigations

Test	Results	Normal values
Fasting glucose	6.0 mmol/L	4.0-6.0 mmol/L
Urea	4.0 mmol/L	3.0-7.0 mmol/L
Creatinine	76 µmol/L; eGFR 116 ml/min	44-106 µmol/L
K	4.1 mmol/L	3.5-5.0 mmol/L
A1 <sub>c</sub>	0.06	0.04-0.06
Hb	124 g/L	115-165 g/L
LDL	3.3 mmol/L	<3.3 mmol/L
TC	5.2 mmol/L	<5.2 mmol/L
TG	1.7 mmol/L	<2.2 mmol/L
HDL	0.9 mmol/L	>0.9 mmol/L
TC:HDL	5.78	<6.0

eGFR: estimated glomerular filtration rate; K: potassium; A1<sub>c</sub>: glycated hemoglobin a I; Hb: hemoglobin; LDL: low-density lipoprotein; TC: total cholesterol; TG: triglycerides; HDL: high-density lipoprotein; TC:HDL: total cholesterol high-density lipoprotein ratio

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## Discussion Question 1

Based on the lab findings and history,  
what is Pamela's CV risk?

Using Framingham table?

Using SCORE Canada?

Define CV risk?

CV: cardiovascular; SCORE: Systematic Cerebrovascular and Coronary Risk Evaluation

## Based on Lab Findings and History, What is Pamela's CV Risk?

***Please select all answers that you feel apply***

- A. Using Framingham, 10 year CV risk: 10-20% (moderate risk)
- B. Using Framingham, 10 year CV risk: <10% (low risk)
- C. Using Framingham, 10 year CV risk: >20% (high risk)
- D. Using SCORE Canada, 10 year risk of CVD mortality:  $\geq 5\%$  (high risk)
- E. Using SCORE Canada, 10 year risk of CVD mortality: 2-4% (moderate risk)

# CV Risk Estimation: The Framingham Heart Study

Estimation of 10-year risk of total cardiovascular disease in women (Framingham Heart Study)

POINTS	Age	HDL-C mmol/L	Total Cholesterol	SBP Not Treated	SBP Treated	Smoker	Diabetic
-3				<120			
-2		>1.6					
-1		1.3-1.6			<120		
0	30-34	1.2-1.3	<4.1	120-129		NO	NO
1		0.9-1.2	4.1-5.2	130-139			
2	35-39	<0.9		140-149	120-129		
3			5.2-6.2		130-139	YES	
4	40-44		6.2-7.2	150-159			YES
5	45-49		>7.2	>160	140-149		
6					150-159		
7	50-54				160+		
8	55-59						
9	60-64						
10	65-69						
11	70-74						
12	75+						
Points Allotted							TOTAL POINTS 14-16

CV: cardiovascular

Genest et al. *Can J Cardiol* 2009;25:567-79; Adapted from D'Agostino et al. *Circulation* 2008;117:743-53

# CV Risk Estimation: The Framingham Heart Study

## Cardiovascular disease risk for women

Points	Risk, %	Points	Risk, %	Points	Risk, %
-2 or less	<1	6	3.3	14	11.7
-1	1.0	7	3.9	15	13.7
0	1.2	8	4.5	16	15.9
1	1.5	9	5.3	17	18.51
2	1.7	10	6.3	18	21.5
3	2.0	11	7.3	19	24.8
4	2.4	12	8.6	20	27.5
5	2.8	13	10.0	21+	>30

Genest et al. *Can J Cardiol* 2009;25:567-79; Adapted from D'Agostino et al. *Circulation* 2008;117:743-53



# Description of “10-Year High Risk”

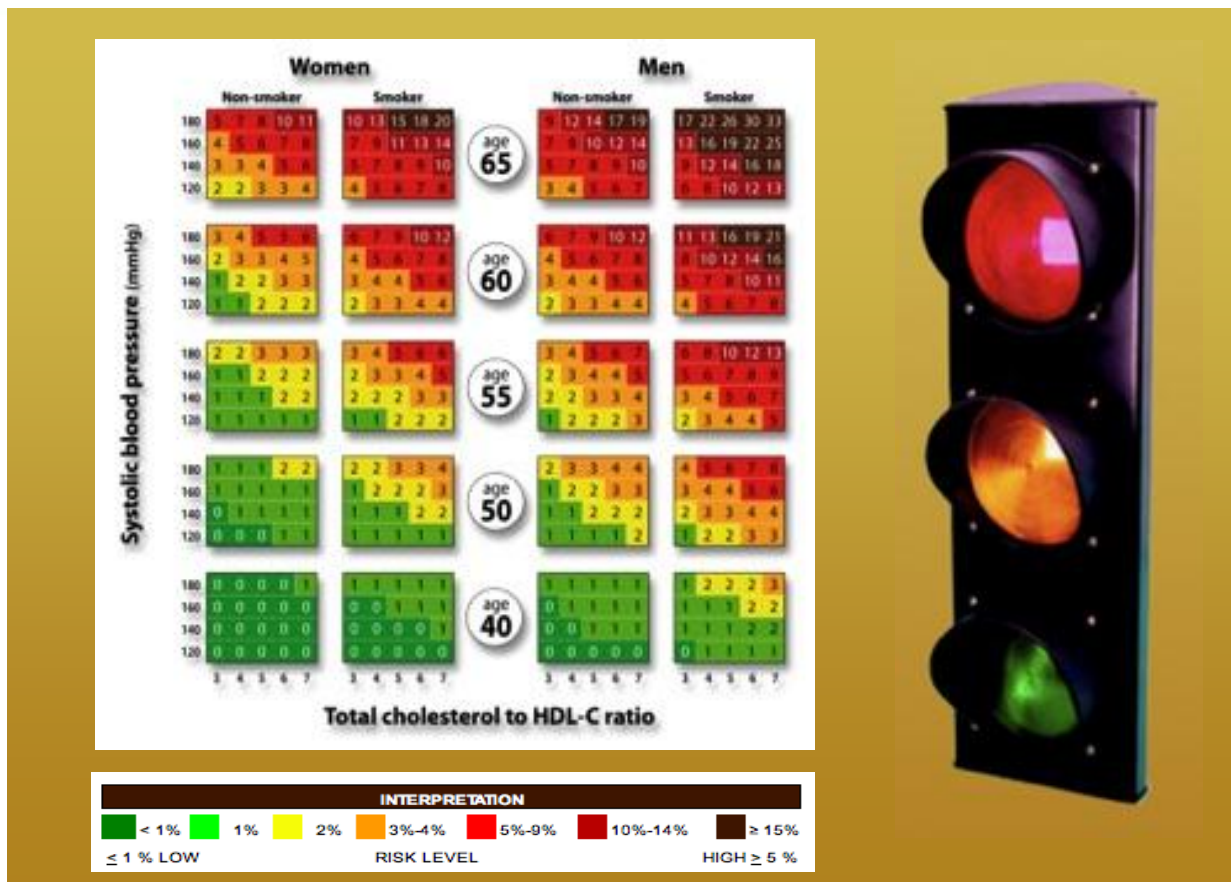
Canadian Working Group on Dyslipidemia

Year	%	Description
2003	30%	CHD (eg, death, MI, unstable angina and chest pain)
2006	20%	Hard CHD (eg, death or MI)
2009	20%	CVD: composite of CHD (coronary death, MI, coronary insufficiency, and angina), cerebrovascular events (including ischemic stroke, hemorrhagic stroke, and TIA), PAD (intermittent claudication), and heart failure

CHD: coronary heart disease; MI: myocardial infarction;

CVD: cardiovascular disease; TIA: transient ischemic attack; PAD: peripheral artery disease

# SCORE Canada: 10 Year Risk of CVD Mortality



**High**  
≥ 5%

**Moderate**  
2-4%

**Low**  
≤ 1%



CVD: cardiovascular disease; SCORE: Systematic Cerebrovascular and Coronary Risk Evaluation

# “CVD Risk for the Next 10 Years”

<b>Risk assessment method</b>	<b>Points</b>	<b>Risk estimate (%)</b>	<b>Interpretation</b>	<b>Description</b>
<b>Framingham</b>	14-16	11.7-15.9	Moderate	Risk of multiple CVD incidents
<b>SCORE Canada</b>	-	2-3	Moderate	Risk of CV death

CVD: cardiovascular disease; SCORE: Systematic Cerebrovascular and Coronary Risk Evaluation

## Based on Lab Findings and History, What is Pamela's CV Risk?

- A. Using Framingham, 10 year CV risk: >10% (moderate risk)
- B. Using Framingham, 10 year CV risk: <10% (low risk)
- C. Using Framingham, 10 year CV risk: >20% (high risk)
- D. Using SCORE Canada, 10 year risk of CVD mortality:  $\geq 5\%$  (high risk)
- E. Using SCORE Canada, 10 year risk of CVD mortality: 2-4% (moderate risk)

## Pamela: 3-Month Follow-Up

- Now 55 years old (was 54)
- TC: 5.2 mmol/L; HDL-C: 0.9 mmol/L; LDL-C: 3.3 mmol/L; TG: 1.7 mmol/L
- BP: 152/88 (148/88) mmHg with validated oscillometric device (BP-100)
- Non diabetic
- Smoker

TC: total cholesterol; HDL: high-density lipoprotein; LDL: low-density lipoprotein; TG: triglycerides; BP: blood pressure

# CV Risk Estimation: The Framingham Heart Study

Estimation of 10-year risk of total cardiovascular disease in women (Framingham Heart Study)

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7	50-54				160+		
8	55-59						
9	60-64						
10	65-69						
11	70-74						
12	75+						
Points Allotted							TOTAL POINTS 17-19

CV: cardiovascular

Genest et al. *Can J Cardiol* 2009;25:567-79; Adapted from D'Agostino et al. *Circulation* 2008;117:743-53

# CV Risk Estimation: The Framingham Heart Study

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CV: cardiovascular

Genest et al. *Can J Cardiol* 2009;25:567-79; Adapted from D'Agostino et al. *Circulation* 2008;117:743-53



# “CVD Risk For the Next 10 Years”

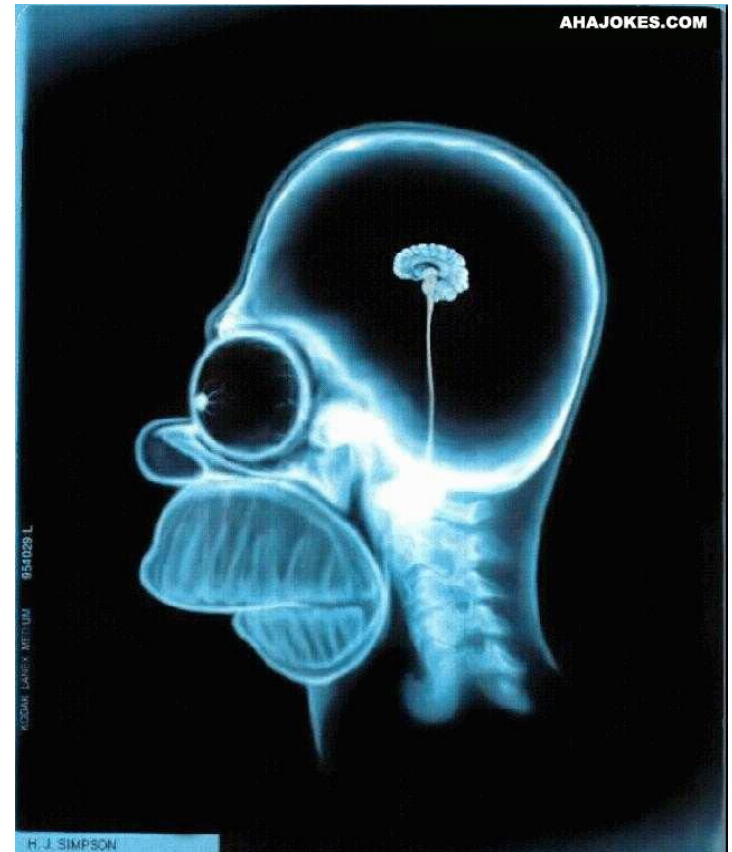
Risk assessment method	Points	Risk estimate (%)	Interpretation	Description
<b>FRAMINGHAM</b>				
<b>T - 0</b>	14-16	11.7-15.9	Moderate	Risk of multiple CVD incidents
<b>T + 3 months SBP + 4 mmHg</b>	17-19	18.5-25.8	Moderate - High	Risk of multiple CVD incidents
<b>SCORE Canada</b>				
<b>T - 0</b>	-	2-3	Moderate	Risk of CV death
<b>T + 3 months SBP + 4 mm Hg</b>	-	2-3	Moderate	Risk of CV death

CVD: cardiovascular disease; SCORE: Systematic Cerebrovascular and Coronary Risk Evaluation; SBP: systolic blood pressure



# CV Risk Assessment

- Science or art...
- Science and art...



CV: cardiovascular



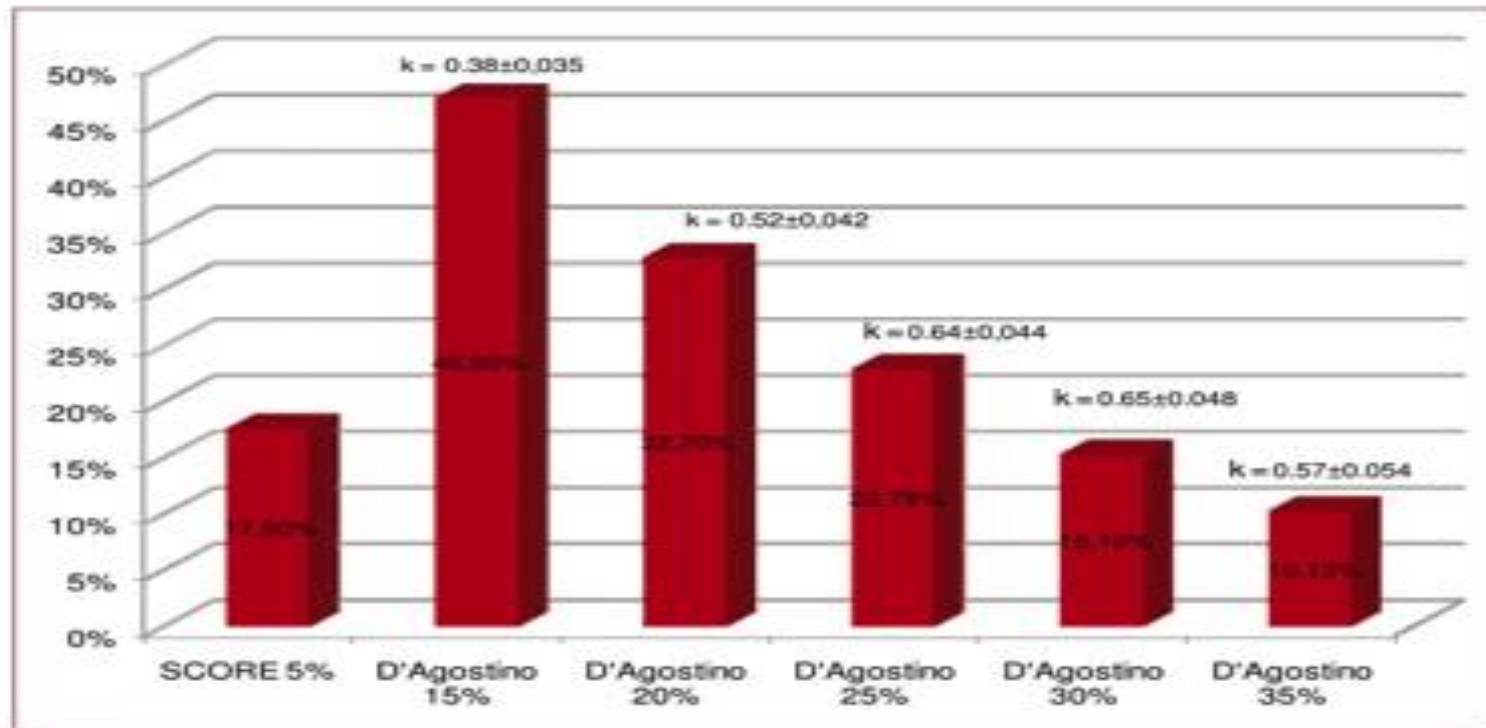
## Factors to Consider When Using SCORE Risk Prediction Method

- Person approaching next age category
- Pre-clinical evidence of atherosclerosis (imaging test)
- Strong family history of premature CVD
  - Multiply risk by 1.7 (men) or 2.0 (women)
- Obesity
  - BMI:  $>30 \text{ kg/m}^2$
  - Waist circumference:  $>102 \text{ cm}$  (men),  $>88 \text{ cm}$  (women)
- Sedentary lifestyle
- Diabetes
  - Multiply risk by 3 (men) or 5 (women)
- Raised serum TG level
- Raised level of CRP, fibrinogen, homocysteine, apoB, or Lp(a)

SCORE: Systematic Cerebrovascular and Coronary Risk Evaluation;

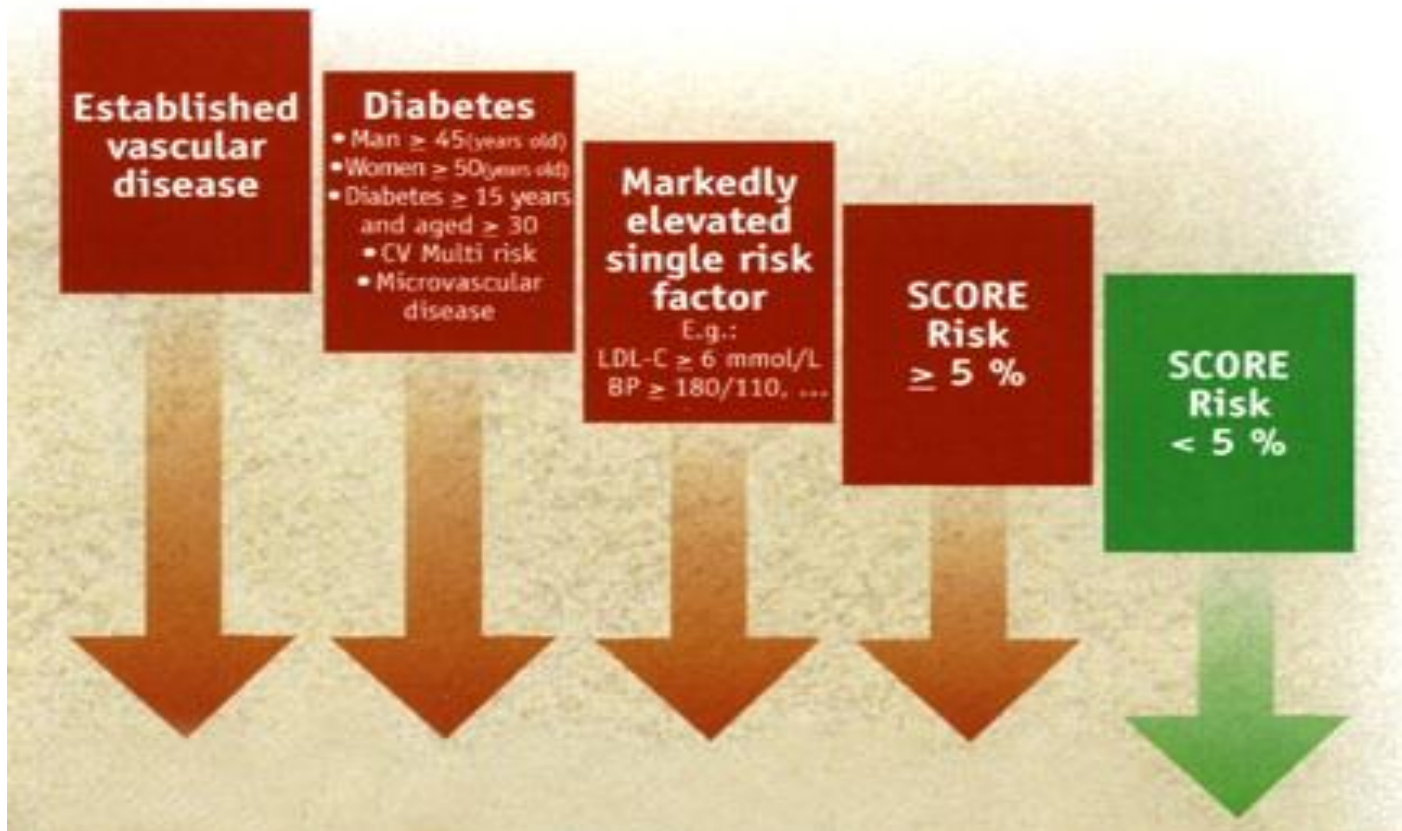
CVD: cardiovascular disease; BMI: body mass index; TG: triglycerides; CRP: c-reactive protein; apoB: apolipoprotein B; Lp(a): lipoprotein(a)

# Rx Implications of SCORE Spain vs. Framingham (D'Agostino Revision) in Hypertensive Patients



**Figure 2**  
Proportions of subjects classified as high risk with SCORE (5%) and D'AGOSTINO at different cut-off points and agreement with SCORE. κ: Kappa index.

# Practical Recommendations for CV Risk Assessment

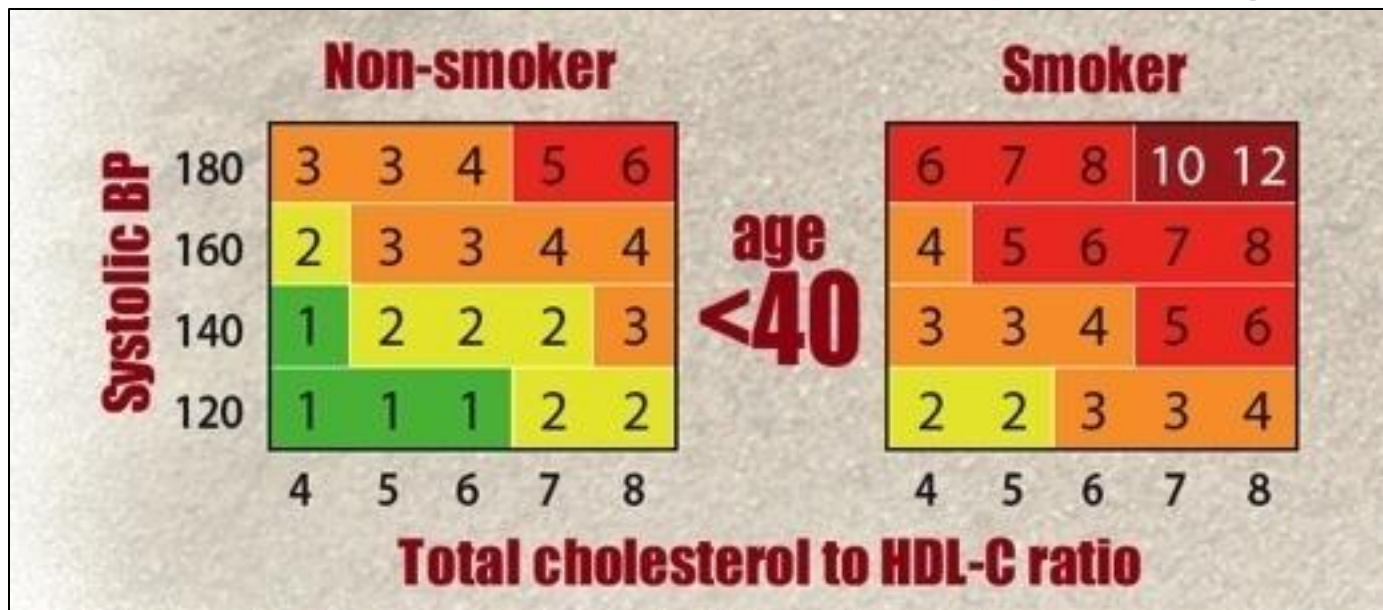


SCORE: Systematic Cerebrovascular and Coronary Risk Evaluation;  
CV: cardiovascular; LDL-C: low density lipoprotein-cholesterol; BP: blood pressure

# How to Use SCORE Canada

*What if the patient was <40 years of age?*

Relative risk table for patients <40 years of age



SCORE: Systematic Cerebrovascular and Coronary Risk Evaluation;  
HDL-C: high density lipoprotein-cholesterol; BP: blood pressure

# Assessment of Overall CV Risk

## ***Treat hypertension in the context of overall CV risk***

1. Overall cardiovascular risk should be assessed. In hypertensive patients consider using calculations that include cerebrovascular events
2. In the absence of Canadian data to determine the accuracy of risk calculations, avoid using absolute levels of risk to support treatment decisions at specific risk thresholds

***Simply counting risk factors may underestimate risk***

CV: cardiovascular



# Pamela: Discussing CV Risk

- Review of Pamela's risk factors
  - 54-yo, smoker, and approaching next age category
  - Family history of intermittent claudication (mother)
  - Systolic BP: 148 mmHg
  - TC/HDL-C ratio: 5.78
  - Framingham: moderate-high; SCORE: moderate
- Discussing CVD risk
  - Pamela listens and repeats what you said about her risk
  - She says that she has tried to quit smoking before but has always restarted
  - She dislikes the idea of taking pills, asking: “Does that mean I would have to take a pill for the rest of my life?”
  - She also asks: “How will this affect me over time?”

SCORE: Systematic Cerebrovascular and Coronary Risk Evaluation;

CVD: cardiovascular disease; BP: blood pressure; TC/HDL-C: total cholesterol high-density lipoprotein ratio

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## Discussion Question 2

How would you explain to Pamela what her CV risk score means?



How would you explain to Pamela what her CV risk score means?

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- A. Use fear to shake Pamela into changing her behaviour
- B. Discuss important risk assessment points (e.g., risk, benefit, communication) with Pamela
- C. Inform Pamela of her global risk
- D. Talk to Pamela about her cardiovascular risk age
- E. Show Pamela how the SCORE Canada risk calculator can estimate her vascular age

# A) Use Fear to Shake Pamela Into Changing Her Behaviour

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**Your 10-year risk  
of CVD is 18-25%  
and of mortality is  
2-3%**

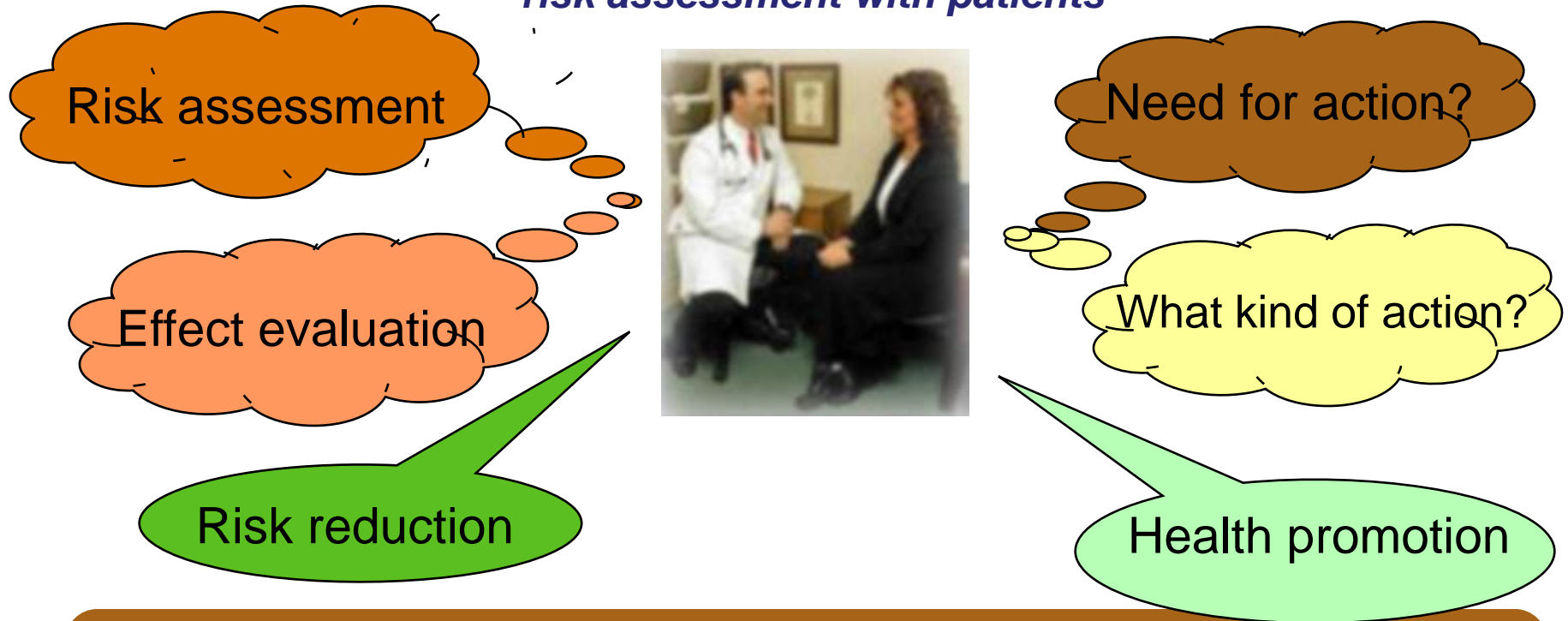


CVD: cardiovascular disease

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## B) Discuss Important Risk Assessment Points with Pamela

*Risk, benefit, communication – important points when discussing risk assessment with patients*



Epidemiology

RCCT

Behavioural Science

# CHEP Recommendations

## Assessing CV Risk to Improve Adherence

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### C) Inform Pamela of her global risk

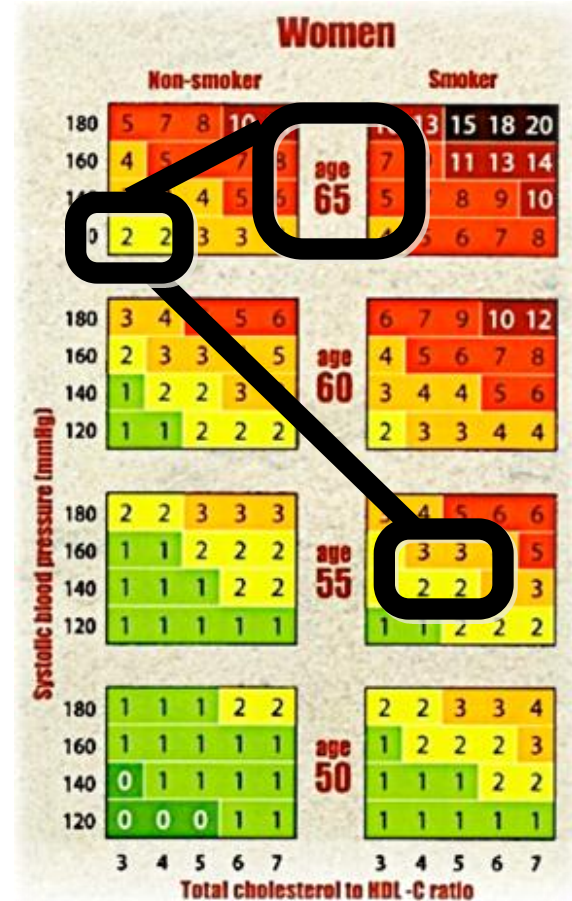
- Consider informing patients of their global risk to improve the effectiveness of risk factor modification (Grade B)

### D) Talk to Pamela about her cardiovascular risk age

- Consider also using analogies that describe comparative risk such as “Cardiovascular Age”, “Vascular Age” or “Heart Age” to inform patients of their risk status (Grade B)

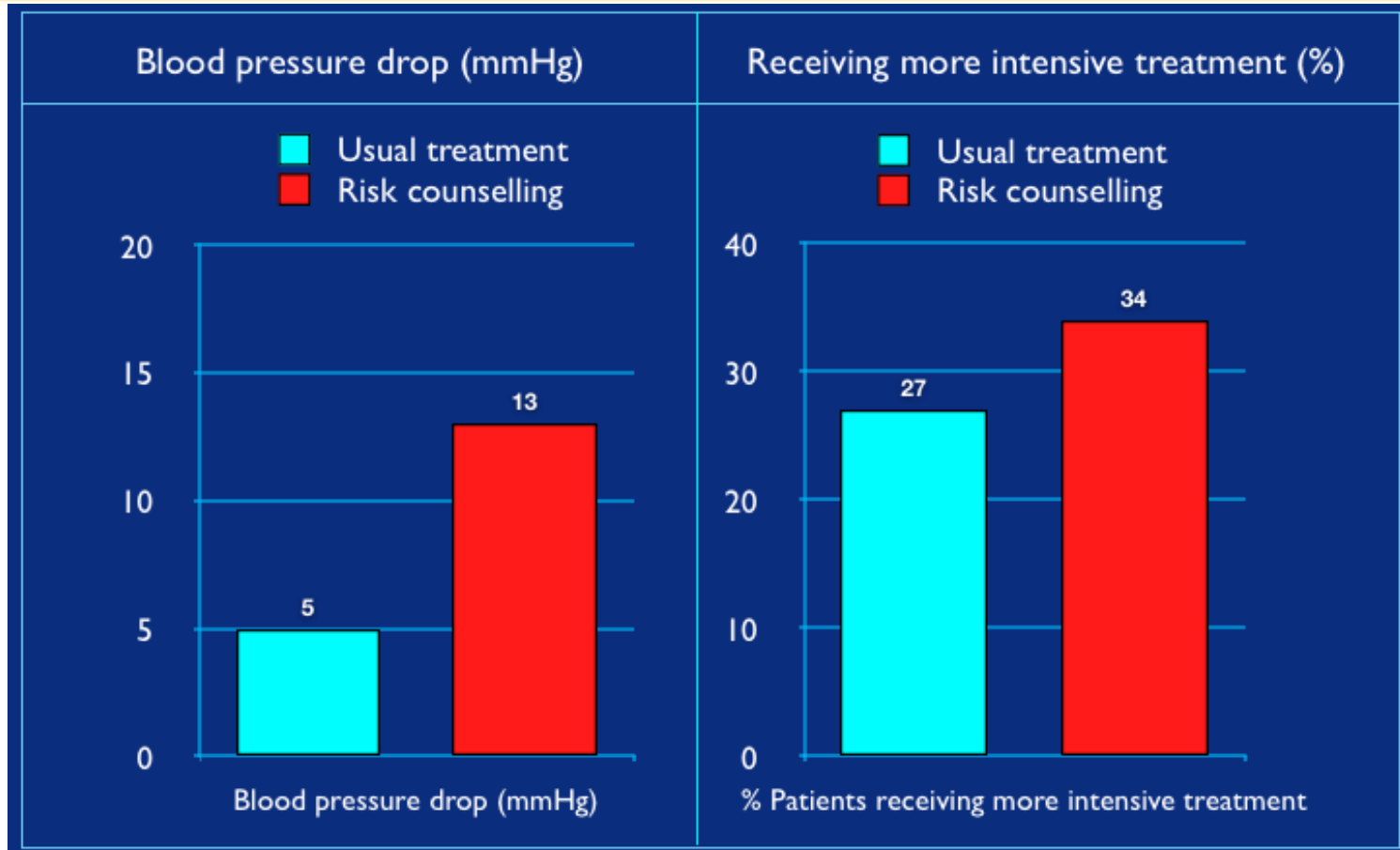
## E) Pamela: Estimating Vascular Age with SCORE Canada

- Female, age 55
  - Smoker
  - SBP 152/88 mmHg
  - TC/HDL-C ratio 5.9
  - Non diabetic
  - **10-year CVD risk of death is 2-3%**
- Female, age 55
  - Non smoker
  - SBP 130mmHg
  - TC/HDL-C ratio 3
- **Vascular age: 65**



SCORE: Systematic Cerebrovascular and Coronary Risk Evaluation; BP: blood pressure; TC/HDL-C: total cholesterol high-density lipoprotein ratio

# Impact of Discussing Coronary Risk with Patients Receiving BP Treatment



BP: blood pressure

Grover et al. *J Gen Intern Med* 2009;24:33-9

# Patient Education Components

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- Patients need to understand and be involved in decision making
- Patients need to know:
  - What the purpose is of the treatment
  - Why lifestyle modification and medication are needed
  - How long the treatment regimen is
  - How to take the medication
  - What to do if they have side effects
  - What to do if they forget to take their medication
  - That they have to refill their medication until asked otherwise
- Patients need to be motivated
- Patients need to feel empowered & that they can do something

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## Discussion Question 3

What are the possible next steps in managing her CV risk?



# What are the possible next steps in managing her CV risk?

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- A. Consider smoking cessation strategies
- B. Address dyslipidemia
- C. Manage hypertension with lifestyle changes
- D. Manage hypertension with drug therapy

CV: cardiovascular; CVD: cardiovascular disease

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# Impact of Risk Factors on Relative Risks for CVD Mortality

	<b>Hazard ratio (95%CI)</b>
Systolic BP (10 mmHg)	1.21 (1.19, 1.24)
TC or TC/HDL (1 mmol/L or one unit )	1.20 (1.19, 1.20)
Smoking	2.00 (1.90, 1.21)

CVD: cardiovascular disease; BP: blood pressure; TC: total cholesterol;  
TC/HDL-C: total cholesterol high-density lipoprotein ratio

Conroy et al. *Eur Heart J* 2003;24:987-1003

## A) Consider Smoking Cessation Strategies

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- CV risk would decrease by 50% in 1 year & 90% in 2 years, also cancer risk...
  - Smoking cessation therapies
    - Nicotine replacement therapy
    - Bupropion
    - Varenicline
  - In conjunction with structured smoking cessation counseling

CV: cardiovascular

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## B) Address Dyslipidemia

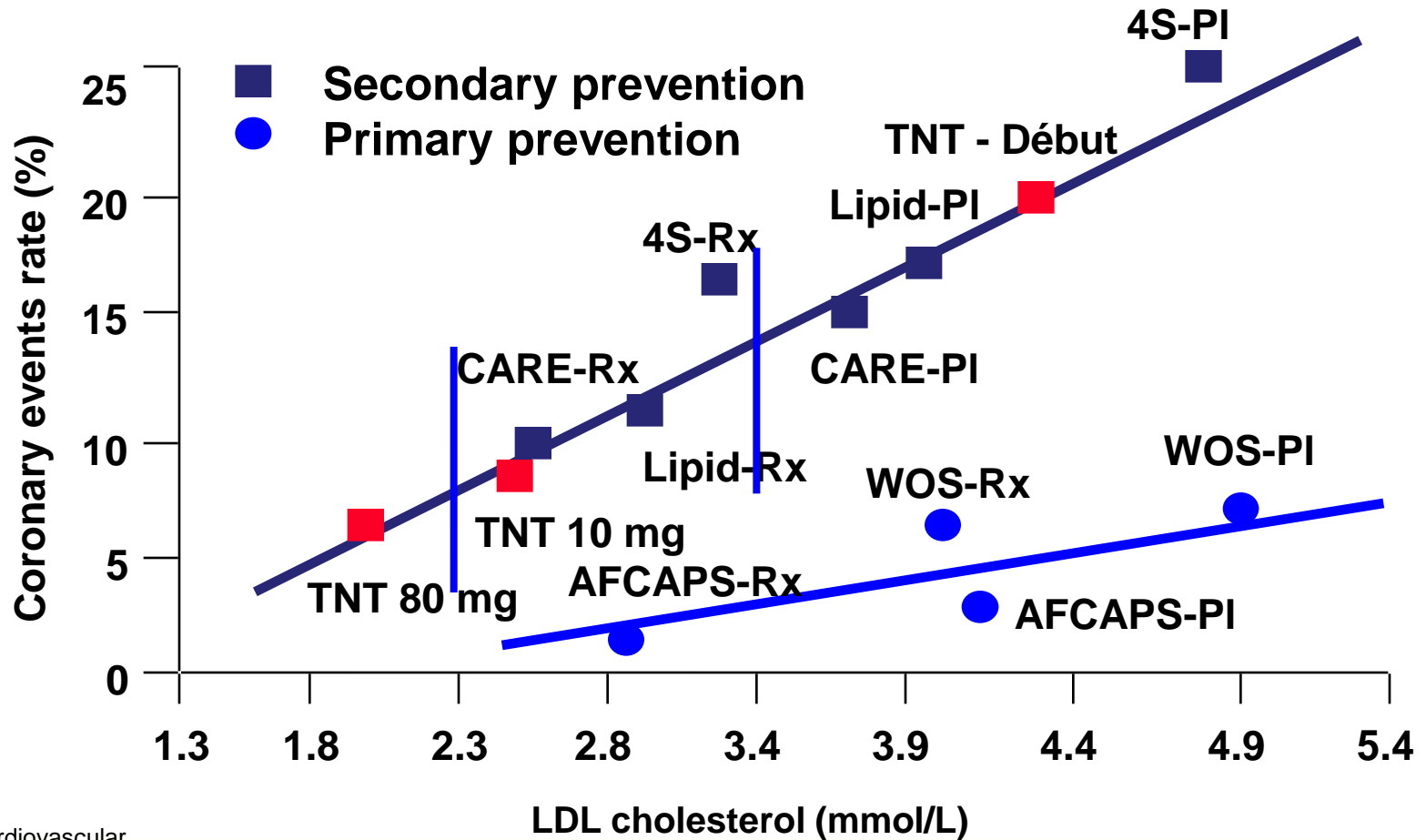
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- Dyslipidemia treatment
  - Risk would decrease 20% per 1 mmol of TC or 1 unit of TC/HDL, over next 4-5 years
  - Lifestyle intervention
  - Monotherapy
  - Combination therapy may be needed for some patients

LDL: low-density lipoprotein; TC: total cholesterol; TC/HDL-C: total cholesterol high-density lipoprotein ratio

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# Impact of Statin Therapy on CV Risk



CV: cardiovascular

## C) Manage Hypertension with Lifestyle Changes

### *Lifestyle therapies in adults with hypertension*

<b>Intervention</b>	<b>Target</b>
Reduce foods with added sodium	<2000 mg/day
Weight loss	BMI <25 kg/m <sup>2</sup>
Alcohol restriction	≤2 drinks/day
Physical activity	30-60 minutes 4-7 days/week
Dietary patterns	DASH diet
Smoking cessation	Smoke free environment
Waist circumference	Men <102 cm      Women <88 cm

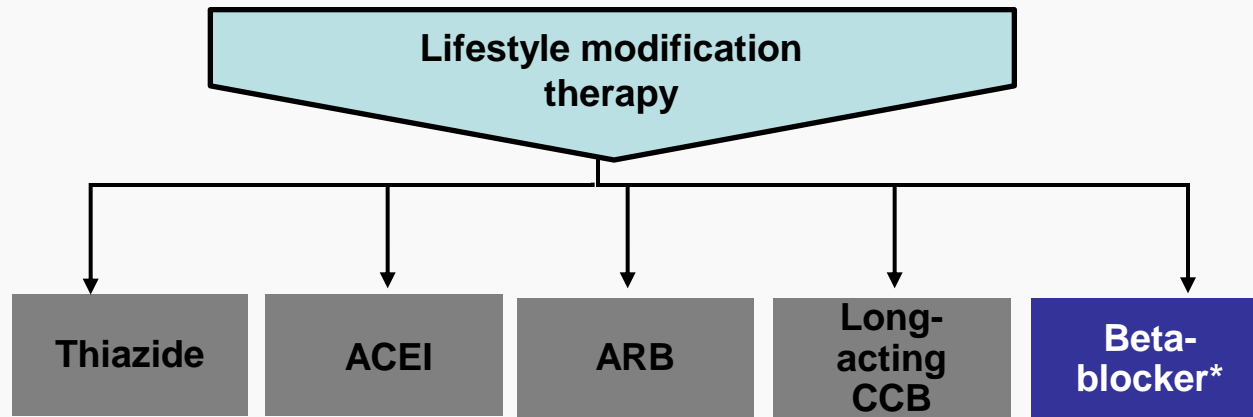
## D) Manage Hypertension with Drug Therapy

- Hypertensive treatment of systolic BP  $<140/90$  mmHg
  - Stroke risk would decrease 35% and CHD risk by 25%, for each reduction of 10 mmHg systolic
  - Monotherapy with lifestyle intervention (combination of 2 first line drugs may be considered as initial therapy if BP is  $>20$  mmHg systolic or  $>10$  mmHg diastolic above target)

BP: blood pressure; CHD: coronary heart disease

# Treatment of Adults with Systolic/Diastolic Hypertension Without Other Compelling Indications

**Target <140/90 mm/Hg**  
**Initial treatment and monotherapy**



A combination of 2 first line drugs may be considered as initial therapy if the blood pressure is  $\geq 20$  mmHg systolic or  $\geq 10$  mmHg diastolic above target

• \*BBs are not indicated as first line therapy for age 60 and above

ACEI, ARB and direct renin inhibitors are contraindicated in pregnancy and caution is required in prescribing to women of child bearing potential

ACEI: angiotensin converting enzyme inhibitor; ARB: angiotensin II receptor blocker; CCB: calcium channel blocker; BB: beta blocker



# Pamela: Case Progression

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- After a number of visits in your clinic, one of the nurses on your team initiates patient education and motivational interviewing with Pamela
- Pamela has agreed to start anti-hypertensives, attend a smoking cessation program and is starting a lifestyle intervention to help improve her dyslipidemia
- “Out of the office” BP measurement could help the patient to self monitor BP

BP: blood pressure

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## Discussion Question 4

What is your follow-up plan for this patient?

# What is your follow-up plan for this patient?

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A. Review Pamela's BP in clinic 3-4 times/year

B. Monitor global CV risk factors

C. Continue lifestyle modifications & consider self-monitoring of BP

BP: blood pressure; CV: cardiovascular

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## A) Review Pamela's BP in Clinic 3-4 Times/Year

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- Patients with BP above target are recommended to be followed at least every 2<sup>nd</sup> month
- Follow-up visits are used to increase the intensity of lifestyle and drug therapy, monitor the response to therapy and assess adherence

BP: blood pressure

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## B) Monitor Global CV Risk Factors

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- Ensure her BP remains controlled
  - Target: <140/90 mmHg/office, <135/85 home
- Smoking cessation
- Consider lipid Rx as per response to lifestyle and global CV risk

**Risk engines cannot be taken at face value for CV reduction, but they can be effective in motivating patients**

CV: cardiovascular; BP: blood pressure

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## C) Continue Lifestyle Modifications & Consider Self-monitoring of BP

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- Frequent brief interventions double the rate of lifestyle changes
- All hypertensives require ongoing support to initiate and maintain lifestyle changes
- Self monitoring of BP can enhance adherence

BP: blood pressure

# Key Learnings

- ✓ Significant gender gap in management of atherosclerotic disease and atherosclerotic risk factors
- ✓ Women with CAD and atherosclerotic risk factors undertreated
- ✓ Key to management: initial global CV risk assessment translated to CV age
- ✓ CV risk assessment a science, to be modulated with art of medicine
- ✓ Global CV risk reduction implies reduction in multiple CV risk factors

CAD: coronary artery disease; CV: cardiovascular