CARDIOVASCULAR DISEASE IN MALAYSIA:

Burden of Disease, Prevalence of Risk Factors and Preventative Strategies

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Subang Jaya Medical Centre
This presentation is a collaboration between:

the American College of Cardiology &

the National Heart Association of Malaysia

supported by Pfizer
No Conflicts of Interest related to this presentation
OBJECTIVES

- To review the Burden of Cardiovascular Disease and the prevalence of various CV risk factors.

- To determine what factors contribute to the burden of CVD in Malaysia.

- Current efforts to reduce the prevalence of CVD and risk of an acute event among the Malaysian population.
Burden of Cardiovascular Disease and the prevalence of various CV risk factors in Malaysia.
Burden of Cardiovascular Disease in Malaysia

Age-standardized death rates*

- Cardiovascular Diseases
- Cancers
- Chronic Respiratory Diseases
- Diabetes

Total deaths: 146,000
NCDs are estimated to account for 73% of total deaths.

Cardiovascular diseases 36%
Communicable, maternal, perinatal and nutritional conditions 16%
Injuries 11%
Cancers 15%
Other NCDs 12%
Chronic respiratory diseases 7%
**Principal Causes of Death, Malaysia, 2014**

- **Ischaemic heart diseases** was the principal cause of death in **2014 (13.5%)** with a decline of **0.2 percentage points** compared to **2013 (13.7%)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Causes</th>
<th>Percentage</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Ischaemic heart diseases</td>
<td>13.5% (10,432)</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>Ischaemic heart diseases</td>
<td>13.7% (10,169)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pneumonia</td>
<td>12.0% (9,250)</td>
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<tr>
<td></td>
<td>Cerebrovascular diseases</td>
<td>7.1% (5,474)</td>
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<tr>
<td></td>
<td>Septicaemia</td>
<td>6.1% (4,698)</td>
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</tr>
<tr>
<td></td>
<td>Transport accidents</td>
<td>5.6% (4,304)</td>
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</tr>
</tbody>
</table>

**Ischaemic heart diseases** was the principal cause of death for males in **2014 (15.2%)**

- Male: 1. Ischaemic heart diseases 15.2% (7,295) 2. Pneumonia 11.1% (5,333) 3. Transport accidents 7.6% (3,636) 4. Cerebrovascular diseases 6.6% (3,170) 5. Septicaemia 5.5% (2,627) (47,871)

**Pneumonia** was the principal cause of death for females in **2014 (13.3%)**

- Female: 1. Pneumonia 13.3% (3,917) 2. Ischaemic heart diseases 10.6% (3,137) 3. Cerebrovascular diseases 7.8% (2,304) 4. Septicaemia 7.0% (2,071) 5. Malignant neoplasm of breast 3.6% (1,060) (29,494)

CVD: 21.8% (IHD + CVA)

CVD: 18.4% (IHD + CVA)

PRESS RELEASE: DEPARTMENT OF STATISTICS MALAYSIA

STATISTICS ON CAUSES OF DEATH, MALAYSIA, 2014, Released on Monday, 5 December 2016
Causes of Premature Death

Premature mortality due to NCDs

The probability of dying from the 4 main NCDs between the ages 30-70 years is 20%

Years of Life Lost (YLL) : Malaysia 1990 vs 2010

Mean Age of ACS
Malaysia: 58.6 years
* Thailand: 63.5 years
** Singapore: (median: 68.3-69.2 years)

Age distribution of patients with ACS

Mean age: 58.6 (12.2) years

Number of ACS admissions = 17,771
Age-Gender distribution of patients with ACS

Mean Age of ACS
Malaysia: 58.5 years
* Thailand: 63.5 years
** Singapore: (median: 68.3-69.2 years)
### Prevalence of Cardiovascular Risk Factors

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Hypercholesterolemia*</td>
<td>20.7%</td>
<td>35.1%</td>
<td>47.7%</td>
</tr>
<tr>
<td>Hypertension**</td>
<td>32.2%</td>
<td>32.7%</td>
<td>30.3%</td>
</tr>
<tr>
<td>Diabetes***</td>
<td>11.5%</td>
<td>15.2%</td>
<td>17.5%</td>
</tr>
<tr>
<td>Smoking****</td>
<td>44.7%</td>
<td>43.9%</td>
<td>43%</td>
</tr>
<tr>
<td>Overweight /Obesity BMI &gt;25 kg/ m²</td>
<td>43.1%</td>
<td>44.5%</td>
<td>54.4%</td>
</tr>
</tbody>
</table>

*NHMS: National Health and Morbidity Surveys

* total cholesterol ≥5.2 mmol/L by finger prick test
**BP > 140/>90mmHg
***fasting blood glucose ≥6.1 mmol/L by finger prick
****current smokers ≥ 15 years of age, males only (females< 2%)
Clustering of these 5 CV risk factors is common, occurring in almost half of Malaysian adults. ¹

43.2% had at least 2 of the risk factors stated above.¹

47.0% of those ≥30 years were at increased CV risk; based on the FRS;²

- 26.7% were at high CV risk.
- 20.3% were at intermediate CV risk.

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## Prevalence of CV Risk Factors among Adults >18 years of age in Malaysia According to Age*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Hypercholesterolemia</th>
<th>Hypertension</th>
<th>Diabetes</th>
<th>Overweight BMI: 23-27.5 kg/m²</th>
<th>Obesity BMI: &gt;27.5 kg/m²</th>
<th>Current tobacco smoking** (Males only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-19</td>
<td>22.0</td>
<td>6.7</td>
<td>5.5</td>
<td>20.8</td>
<td>20.2</td>
<td>49.6</td>
</tr>
<tr>
<td>20-24</td>
<td>26.5</td>
<td>9.4</td>
<td>5.9</td>
<td>24.3</td>
<td>20.8</td>
<td>59.3</td>
</tr>
<tr>
<td>25-29</td>
<td>33.7</td>
<td>13.2</td>
<td>8.9</td>
<td>27.8</td>
<td>26.1</td>
<td></td>
</tr>
<tr>
<td>30-34</td>
<td>44.0</td>
<td>15.9</td>
<td>10.6</td>
<td>34.2</td>
<td>30.5</td>
<td>56.8</td>
</tr>
<tr>
<td>35-39</td>
<td>49.7</td>
<td>23.9</td>
<td>12.9</td>
<td>36.0</td>
<td>35.6</td>
<td></td>
</tr>
<tr>
<td>40-44</td>
<td>57.2</td>
<td>32.2</td>
<td>17.9</td>
<td>36.9</td>
<td>36.6</td>
<td>48.5</td>
</tr>
<tr>
<td>45-49</td>
<td>60.1</td>
<td>38.8</td>
<td>22.0</td>
<td>38.4</td>
<td>37.0</td>
<td></td>
</tr>
<tr>
<td>50-54</td>
<td>65.5</td>
<td>49.3</td>
<td>27.0</td>
<td>41.1</td>
<td>36.6</td>
<td>40.8</td>
</tr>
<tr>
<td>55-59</td>
<td>68.8</td>
<td>55.5</td>
<td>32.9</td>
<td>39.7</td>
<td>37.5</td>
<td></td>
</tr>
<tr>
<td>60-64</td>
<td>65.3</td>
<td>65.0</td>
<td>38.3</td>
<td>37.9</td>
<td>36.9</td>
<td>35</td>
</tr>
<tr>
<td>65-69</td>
<td>61.6</td>
<td>67.8</td>
<td>38.0</td>
<td>37.9</td>
<td>34.2</td>
<td></td>
</tr>
<tr>
<td>70-74</td>
<td>62.7</td>
<td>75.4</td>
<td>39.1</td>
<td>39.2</td>
<td>26.0</td>
<td></td>
</tr>
<tr>
<td>75+</td>
<td>58.3</td>
<td>73.4</td>
<td>37.0</td>
<td>37.3</td>
<td>15.1</td>
<td></td>
</tr>
</tbody>
</table>


Factors contributing to the burden of CVD in Malaysia.
Population “Lay Man” Factors

- Epidemiological transition and the Westernization of “lifestyle”
- “Tasty, exotic” Asian cuisine
- Hot humid climate that makes exercise difficult
- Misconceptions:
  - A “fat” child is a “healthy” child
  - SBP = 100 + Age
  - Cholesterol is not the cause of CVD
  - Diabetes and cholesterol are solely due to diet – “I control my food and I will be alright-I do not need drugs”
  - Traditional drugs can “cure” diabetes, cholesterol and “CVD”
- Not convinced that Primary Prevention strategies are effective in preventing CVD
EVIDENCE THAT GLOBAL CV RISK FACTOR REDUCTION REDUCES CVD MORTALITY RATES

Fig 2 | Predicted and observed reduction (%) in coronary heart disease mortality in men aged 35-64 years, 1972-2012

Fig 3 | Predicted and observed reduction (%) in coronary heart disease mortality in women aged 35-64 years, 1972-2012

EASTERN FINLAND

EVIDENCE THAT CV RISK FACTOR REDUCTION RESULTS IN AN INCREASE IN LIFE YEARS

**TABLE 2—Life-Years Gained From Changes in Population Cardiovascular Risk Factors:**
England and Wales, 1981–2000

<table>
<thead>
<tr>
<th>Population Risk Factors</th>
<th>Relative Change in Risk Factor, 1981–2000, %</th>
<th>No. of Deaths Prevented or Postponed*</th>
<th>Life-Years Gained, * Best Estimate (Range)</th>
<th>Proportion of Total Life-Years Gained From Risk Factor Changes, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>-34.0</td>
<td>29715</td>
<td>398,080 (304,020–446,260)</td>
<td>54.4</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>-7.5</td>
<td>5870</td>
<td>207,525 (197,870–288,445)</td>
<td>28.4</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>-5.6</td>
<td>7900</td>
<td>164,305 (128,310–188,145)</td>
<td>22.5</td>
</tr>
<tr>
<td>Socioeconomic deprivation</td>
<td>-6.6</td>
<td>2125</td>
<td>53,995 (40,845–57,350)</td>
<td>7.4</td>
</tr>
<tr>
<td>Obesity</td>
<td>186.2</td>
<td>-2095</td>
<td>-10,690 ([-8565]–[-13,470])</td>
<td>-1.5</td>
</tr>
<tr>
<td>Physical activity</td>
<td>-30.6</td>
<td>-2660</td>
<td>-37,055 ([-27,245]–[-39,450])</td>
<td>-5.1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>65.6</td>
<td>-2890</td>
<td>-44,895 ([-32,545]–[-47,850])</td>
<td>-6.1</td>
</tr>
<tr>
<td><strong>Total risk factor effects in 2000</strong></td>
<td></td>
<td>35,830</td>
<td>731,270 (602,695–879,430)</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*All model estimates were rounded to the nearest 5.

## Secondary Prevention Strategies

<table>
<thead>
<tr>
<th>Strategies</th>
<th>%RRR</th>
<th>ARR</th>
<th>Total deaths prevented or postponed*</th>
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<td>Smoking</td>
<td>0.36</td>
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<td>Cholesterol</td>
<td>0.05</td>
<td>0.021</td>
<td>383 (71-1859)</td>
<td>6%</td>
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<tr>
<td>Population BP</td>
<td>0.09</td>
<td>0.056</td>
<td>1015 (319-2202)</td>
<td>6%</td>
</tr>
<tr>
<td>Deprivation</td>
<td>0.07</td>
<td>0.012</td>
<td>213 (82-456)</td>
<td>3%</td>
</tr>
<tr>
<td>Other factors</td>
<td>0.033</td>
<td>0.060</td>
<td>600 (396-798)</td>
<td>9%</td>
</tr>
<tr>
<td>Total Risk factors</td>
<td></td>
<td></td>
<td>4025 (3417-4679)</td>
<td>60%</td>
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## Primary Prevention

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<td>Acute MI</td>
<td>0.069</td>
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<td>10%</td>
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<tr>
<td>Secondary prevention post MI</td>
<td>0.019</td>
<td>431 (152-877)</td>
<td>6%</td>
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<tr>
<td>Secondary prevention post CABG/PCI</td>
<td>0.019</td>
<td>114 (49-243)</td>
<td>2%</td>
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<td>Angina</td>
<td>0.004</td>
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<td>Total treatments</td>
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### Reductions in CV mortality in Scotland from 1975 – 1990

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**Primary Prevention**

**Secondary Prevention**

Reduction in major CV risk factors explained about \( \frac{1}{2} \) the decrease in coronary mortality

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National /Governmental Factors

- National health care efforts directed towards NCD only over the last decade – shift from Maternal & Child Heath to NCD.
- Misconception that $2^0$ prevention is more cost effective than $1^0$ Prevention
- Lack of a multidisciplinary approach involving Nutritionists, Public Health and Hospital Based practice
- Lack of a comprehensive Guideline for risk assessment and managing CV risk factors:
  - stressing on the importance of Global Risk
  - applicable and acceptable to our local population
  - utilizing available resources
  - Working within the existing Health Care framework
Current efforts being taken to reduce the prevalence of CVD and risk of an acute event among the Malaysian population.
Correcting Misconceptions

PUBLIC EDUCATION

Mass Media

Radio

On going Health Care Personnel* - Public Communication/Interaction

* Includes school health/dental teams, paediatricians, family physicians, nurses, counsellors, exercise therapists
National Efforts at Tackling NCDS

National Strategic Plan for Non-Communicable Diseases (NSP-NCD) 2010-2014

- Presented and approved by the Cabinet on 17 December 2010.
- Provides the framework for strengthening NCD prevention & control program in Malaysia.
- Adopts the “whole-of-government” (Multi Sectorial) and “whole-of-society” approach.
- Diabetes & obesity are used as the entry points.

Seven Strategies:
1. Prevention and Promotion
2. Clinical Management
3. Increasing Patient Compliance
4. Action with NGOs, Professional Bodies & Other Stakeholders
5. Monitoring, Research and Surveillance
6. Capacity Building
7. Policy and Regulatory interventions
Improving Management of CVD at the Primary Care level

- Multi-disciplinary care team
- Post-basic training for paramedics
- Clinical practice guidelines
- Quality improvement programs
- Clinical information systems
- Patient resource centres
- Community empowerment
CLINICAL PRACTICE GUIDELINES

Primary and Secondary Prevention of Cardiovascular Disease 2017
(1st Edition)
To tackle the CV epidemic in this country, efforts should be made to reduce global CV risk.

Population preventative strategies are more cost effective and needs to be encouraged.
Prevention of CVD includes:

- **Primary prevention** strategies directed at:
  - Healthy general population
  - Individuals with multiple CV risk factors or very high levels of a single CV risk Factor - Hypertension, Diabetes, Smoking, Hypercholesterolemia, Obesity
  - Individuals who are at high risk for a CV event - CKD, Connective tissue disease, HIV, Psychosocial stressors and Depression, Obstructive Sleep Apnoea, Erectile Dysfunction, Past history of PET / Eclampsia

- **Secondary prevention** strategies directed at individuals who:
  - Have established CVD.
In primary prevention, the committee advocates:

- Screening at >30 years of age.
- Opportunistic rather than mass screening.
- Risk Stratification - the intensity of risk reduction efforts will depend on the individual’s Global CV risk.
The intensity of risk reduction efforts will depend on the individual’s Global CV risk.
**Risk Stratification of Cardiovascular Risk**

- **Very High Risk** individuals are those with:
  - Established CVD
  - Diabetes with proteinuria or with a major risk factor such as smoking, hypertension or dyslipidaemia
  - CKD with GFR <30 ml/min/1.73 m²

- **High Risk** individuals include:
  - Diabetes without target organ damage
  - CKD with GFR ≥30 - <60 ml/min/1.73 m²
  - Very high levels of individual risk factors (LDL-C >4.9 mmol/L, BP >180/110 mmHg)
  - Multiple risk factors that confer a 10-year risk for CVD >20% based on the Framingham General (FRS)CVD Risk Score

- **Intermediate (Moderate) Risk** individuals:
  - Have a FRS-CVD score that confer a 10-year risk for CVD of 10-20%

- **Low Risk** individuals:
  - Have a FRS-CVD score that confer a 10-year risk for CVD <10%
The use of the **Framingham Risk Score (FRS)** General CVD Risk Score to assess future CV risk in individuals who *do not* have:

- CVD
- Chronic Kidney Disease (CKD) (Stage 3 – 5)
- Diabetes
- Very High BP ( > 180/110) or Very high Levels of LDL-C (> 4.9 mmol/l)


- Only the FRS has been validated in 2 independent local studies to be a better predictor of CV Risk in the multi-ethnic local population.¹,²

- The FRS has limitations and clinical judgement may sometimes be necessary.

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In *ALL* individuals, the **focus** should be on therapeutic lifestyle changes.

**Healthy well balanced Diet**
- A diet high in fibre, fruits and vegetables, wholegrain, low in salt and saturated/trans-fat is associated with lower CV risk

**Stop smoking**
- This is an independent and strong risk factor for CVD. There is no safe level of exposure to second-hand tobacco smoke.

**Regular exercise**
- Any amount of PA is better than none. Regular PA reduces all-cause and CV mortality.

**Maintaining an ideal body weight**
**Recommended Nutrient Intake**

- Dietary fiber of 20-30 g fiber per day (vegetables, fruits, legumes and whole grain cereals are encouraged)
- Whole grain should form 50% of the total grain intake
- 5 servings of fruits and vegetables per day
- 30 gram unsalted nuts per day
- <10% of total energy intake from added sugar. This is equivalent to 50 g (or around 12 level teaspoons) for an adult of healthy body weight
- <5 g salt or 1 level teaspoon per day or (2000 mg sodium per day)
- Abstinence or not more than 1-2 standard servings of alcohol intake per day.
Malaysian Healthy Eating Recommendations

A diet high in fruits, vegetables, wholegrains and fish and low in salt and saturated/trans-fat is linked to a lower CV risk.

The #QuarterQuarterHalf plate recommendation of food portions consist of:

- **Quarter of the plate*** being carbohydrate – rice, noodles, bread, cereals and other cereal products and/or tubers.
- **Quarter of the plate*** being protein- fish, poultry, meat and/or legumes.
- **Half of the plate*** being fruits and vegetables.
- Drinking plain water (instead of sugary drinks).

Together with the following 5 key recommendations, consume:

1. 3 regular healthy main meals everyday.
2. 1-2 servings of healthy snacks when necessary.
3. At least half of your grains from whole grains.
4. Non-fried & coconut milk (santan) free dishes everyday.
5. Home cooked foods more often.

*The Disease Control Division and the National Coordinating Committee On Food and Nutrition(NCCFN), Ministry Of Health Malaysia. 2016

*10 inches or 25 cm plate
Remember and Practice Daily: **88888**

- Stop eating before you are full (approximately 80%).
- Have your dinner before 8 pm.
- Drink 8 glasses of water.
- Sleep 8 hours.
- Walk at least **8000** steps a day (10,000 steps are better).

Available at: www.moh.gov.my/images/gallery/publications/cny2013/Healthy_Eating2.pdf**
Legislation for Tobacco Control in Malaysia

- Control for Tobacco Products Regulations (CPTR) 2004, a component of the Food Act 1983
- Developed based on the WHO Framework Convention for Tobacco Control (FCTC).
- Malaysia became a signatory to this convention on 23 September 2003, ratified it on 16 September 2005, and officially became a party 90 days later on 15 December 2005.

The National Strategic Plan for Tobacco Control 2015-2020

- The global NCD target is a smoking prevalence of <15% by 2025.
- The eventual goal is a smoking prevalence of <5% and this is called the end game for tobacco consumption (The End Game).

There are four strategies outlined in this national plan in accordance with the WHO MPOWER Strategy:

- To strengthen tobacco control capacity
- To strengthen tobacco control enforcement and legislation
- To empower community and to increase multi-sectorial collaboration
- To strengthen tobacco control activities through MPOWER strategies
<table>
<thead>
<tr>
<th></th>
<th>Selected List of Tobacco Control Activities in Malaysia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Strengthening the Smoking Cessation Services-</td>
</tr>
<tr>
<td></td>
<td>- mQuit Services is a public-private initiative that aims to improve access to smoking cessation services</td>
</tr>
<tr>
<td></td>
<td>- a national Quitline was established to help and guide smokers to quit through behavioural intervention through telephone calls</td>
</tr>
<tr>
<td>2.</td>
<td>School programs to develop a Smokefree Malaysian Generation</td>
</tr>
<tr>
<td></td>
<td>- Implementation of the IMFree Program. This is an educational program for smoking prevention among primary school children age 7 to 12 years.</td>
</tr>
<tr>
<td></td>
<td>- The Kesihatan Oral Tanpa Asap rokoK (KOTAK) (Oral Hygiene Minus Cigarette Smoke)- is a new initiative but as an extension to the existing Incremental School Dental Care programme</td>
</tr>
<tr>
<td></td>
<td>- A new Guidance for Helping School Children Who Smoke was developed to give guidance to school counsellors on how to manage school children who smoke.</td>
</tr>
</tbody>
</table>
### Selected List of Tobacco Control Activities in Malaysia

<table>
<thead>
<tr>
<th></th>
<th>Empowering the community</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>KOSPEN is currently a flagship program led by the MOH for community-based NCD risk factor screening and intervention.</td>
</tr>
<tr>
<td></td>
<td>Specifically, for smoking, smokers identified through the screening are referred for quit smoking services available in their area.</td>
</tr>
<tr>
<td></td>
<td>The KOSPEN volunteers could have a great influence in encouraging their fellow community members</td>
</tr>
<tr>
<td>4.</td>
<td>Protecting the public from the dangers of tobacco smoke</td>
</tr>
<tr>
<td></td>
<td>Through volunteerism: To reduce exposure to second-hand smoke, houses in the KOSPEN area are encouraged to commit to “My Smokefree Home” declaration and all community events declared “Smoke-free”</td>
</tr>
<tr>
<td></td>
<td>the Blue Ribbon programme is a voluntarily smoke free declaration in public places such as businesses, eateries and other community places.</td>
</tr>
<tr>
<td></td>
<td>Gazettement of Smoke-Free Places by law.</td>
</tr>
</tbody>
</table>
## Selected List of Tobacco Control Activities in Malaysia

### 5. Other Tobacco Control Activities

- **Tobacco Packaging and Labeling:** Rotating combined picture and text health warnings are required to occupy 50% of the front and 60% of the back of the package. The text of the warning is in Malay on the front panel and English on the back panel. Misleading packaging and labeling, including terms such as “light” and “low tar” and other signs, is prohibited. Efforts are currently being undertaken to move towards “plain packaging”.

- **Increase in tobacco excise tax:** WHO FCTC encourages countries to raise their tobacco taxes to at least 75% of the retail price.
Practical Physical Activity Tips

• Spend 10 minutes a day walking up and down the stairs.
• Walk five minutes at least every two hours. Desk job workers, will get extra 20 minutes by end of the day.
• Make one social outing per week an active one eg bowling, cycling, badminton, nature walk.
• Hook on a step tracker, and aim for an extra 1,000 steps a day.
• Wash something thoroughly once a week. Scrub your bathroom tiles, floor, couple of windows, or your car for at least 30 min. This will burn 120 kcal. Equivalent to half-cup of vanilla frozen yogurt.
• Walk an extra mile. Park your car further away.
• Walk while talking on a phone.
• Reduce 1 hour of screen time (ipad/ tv/ video/or social media)
### National Activities: Modifying the Obesogenic Environment

<table>
<thead>
<tr>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.</strong> “Healthy schools”: Policy options for school setting. This includes:</td>
</tr>
<tr>
<td>- Revision of list of food and beverages allowed to be sold in school canteens.</td>
</tr>
<tr>
<td>- Ban selling of food and beverages within 40 meters outside of school perimeter (except for licensed vendor complying with the list of food and beverages allowed).</td>
</tr>
<tr>
<td>- Ban marketing of unhealthy food and beverages to children in print and fixed outdoor advertising within 300 metres of schools (media, bus stops, billboards).</td>
</tr>
<tr>
<td>- Mandatory to provide free, clean and safe water (water fountain/ dispenser) in schools.</td>
</tr>
</tbody>
</table>
2. **General setting**

- Increase consumption and access to affordable and fresh vegetables (including salad) and fruits by increasing the number of farmer’s market outlets.

- Banning advertising of foods and beverages high in fat and/or high in sugar that is appealing to children over the television.

- Excise and/or GST on unhealthy foods (foods high in fats, salt and sugars) e.g. sweetened creamer, condensed milk, sugar sweetened beverages, carbonated drinks, juices and processed foods.

- Increase availability of facilities in the community to promote PA and exercise in a safe environment (e.g. public parks, public sport complexes, jogging and cycling paths and public gymnasium).
2. General setting

- Mandatory for local authorities to provide cyclists and pedestrians safe and accessible sidewalks, walking paths and cycling paths.
- Mandatory for local media to allocate more airtime and advertisement space during appropriate time slot for promotion of PA.
- Mandatory to relocate street stalls to hawker centres for the purpose of ensuring opening time, food safety and healthier choices.
- Reduce cooking oil subsidies.
- Restrict the number of new food outlets including 24-hours food outlets within 400 metres radius of new residential areas.
In ALL individuals, the **primary focus** should be on therapeutic lifestyle changes.

- In individuals at **Low** and **Intermediate (Moderate)** risk, therapeutic lifestyle changes alone may suffice in some cases. *Occasionally* drug therapy may be necessary to achieve target levels. (Lipids, BP, glucose)

- In individuals at **Very High** and **High** CV risk, drug therapy **should be initiated at the outset** in conjunction with therapeutic lifestyle changes. (Lipids, BP, glucose)
In ALL individuals, the **primary focus** should be on therapeutic lifestyle changes.

Management of Individual CV Risk Factors to **Target** according to the Guidelines
<table>
<thead>
<tr>
<th>Global Risk</th>
<th>LDL-C Levels to Initiate Drug Therapy (mmol/L)</th>
<th>Target LDL-C Levels (mmol/L)</th>
<th>Non HDL-C Level corresponding to LDL-C targets in individuals with TG &gt; 4.5 mmol/L</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low CV Risk</strong></td>
<td>clinical judgement**</td>
<td>&lt;3.0</td>
<td>&lt;3.8</td>
</tr>
<tr>
<td><strong>Intermediate (Moderate) CV Risk</strong></td>
<td>&gt;3.4 **</td>
<td>&lt;3.0</td>
<td>&lt;3.8</td>
</tr>
<tr>
<td><strong>High CV risk</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ &gt; 20% 10-year CVD risk</td>
<td></td>
<td>&gt; 2.6</td>
<td>≤2.6 or a reduction of &gt;50% from baseline***</td>
</tr>
<tr>
<td>➢ diabetes without target organ damage</td>
<td></td>
<td></td>
<td>≤ 3.4 or a reduction of &gt;50% from baseline***</td>
</tr>
<tr>
<td>➢ CKD with GFR 30-&lt;60 Ml / min⁻¹ /1.73 m²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Very high CV risk</strong></td>
<td></td>
<td>&gt;1.8</td>
<td>&lt;1.8 or a reduction of &gt; 50% from baseline***</td>
</tr>
<tr>
<td>➢ established CVD,</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ diabetes with proteinuria or with a major risk factor such as smoking, hypertension or dyslipidaemia</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>➢ CKD with GFR &lt;30 Ml / min⁻¹ /1.73 m² but not dialysis dependent)****</td>
<td></td>
<td>&gt;1.8</td>
<td>&lt;1.8 or a reduction of &gt; 50% from baseline***</td>
</tr>
</tbody>
</table>

*Low and Intermediate (Moderate) CV risk is assessed using the Framingham General CVD Risk Score
**After a therapeutic trial of 8-12 weeks of TLC and following discussion of the risk: benefit ratio of drug therapy with the patient
***whichever results in a lower level of LDL-C
****In dialysis dependent patients, drug therapy is not indicated for primary prevention of CVD.
The probability of dying from the 4 main NCDs between the ages 30-70 years is **20%**

The **Greater the Number of CV Risk Factors**, the **Greater the Life Time Risk for CVD** and the **Lower the Survival**.

The intensity of CVD Risk Reduction efforts will depend on the **Baseline Global CV Risk**.

**Risk assessment** helps determine baseline CV Risk and allows discussion with the patient about risk, and plan for risk reduction.

**Patient – clinician discussion** should occur on an **ongoing basis** to encourage patient adherence to medications and therapeutic life style changes.
Risk Factor Burden and Risk Assessment of Cardiovascular Disease

Salim S. Virani, M.D. Ph.D.
Associate Professor, Section of Cardiovascular Research
Associate Director for Research, Cardiology Fellowship Training Program
Baylor College of Medicine
Staff Cardiologist, Michael E. DeBakey Veterans Affairs Medical Center
This presentation is supported by Pfizer through a collaboration with the American College of Cardiology.
Disclosures

• Research Support: American Heart Association, American Diabetes Association, Baylor Global Initiatives, Department of Veterans Affairs

• Honorarium: American College of Cardiology (Associate Editor for Innovations, ACC.org)
Objectives

The importance of multiple risk factors in the assessment of cardiovascular risk

How to apply cardiovascular risk calculators in patient assessment

How to apply best practices for shared decision making
BURDEN OF CARDIOVASCULAR DISEASE AND CARDIOVASCULAR DISEASE RISK FACTORS
17.9 million people die each year from CVD

Global CVD mortality rose by 12.5% between 2005-2015

CVD Mortality: Malaysia

Proportional mortality (% of total deaths, all ages, both sexes)*

- Cardiovascular diseases 35%
- Chronic respiratory diseases 7%
- Cancers 19%
- Other NCDs 12%
- Diabetes 3%
- Communicable, maternal, perinatal and nutritional conditions 16%
- Injuries 11%

Total deaths: 146,000
NCDs are estimated to account for 73% of total deaths.
CVD Mortality: USA 1900-2013

Major Shifts in Population Risks and Expanded Treatment, U.S.

Risk Factors worse: +17%
- Obesity (increase) +7%
- Diabetes (increase) +10%

Risk Factors better: -65%
- Population BP fall -20%
- Smoking -12%
- Cholesterol (diet) -24%
- Physical activity -5%

Treatments: -47%
- AMI treatments -10%
- Secondary prevention -11%
- Heart failure -9%
- Angina: CABG & PTCA -5%
- Hypertension therapies -7%
- Statins (primary prevention) -5%

341,745 fewer deaths in 2000

PRIMARY PREVENTION IN ASCVD: TARGETING MULTIPLE RISK FACTORS
INTERHEART: Multiple Risk Factors

>90% of population attributable AMI burden is from 9 risk factors

AMI = acute myocardial infarction
Primary Prevention: As Easy as ABCDE

<table>
<thead>
<tr>
<th>ABCDE Component</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assess risk</td>
<td>Multiple risk estimators available</td>
</tr>
<tr>
<td>Antithrombotic therapy</td>
<td>Aspirin 81 mg/d if &gt;10% 10-year risk</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>Lifestyle interventions ± pharmacotherapy</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Lifestyle interventions ± pharmacotherapy</td>
</tr>
<tr>
<td>Cigarette/tobacco cessation</td>
<td>Assessment, counseling, pharmacotherapy</td>
</tr>
<tr>
<td>Diet/weight management</td>
<td>Heart healthy, Mediterranean-style diet</td>
</tr>
<tr>
<td>Diabetes prevention + treatment</td>
<td>Lifestyle interventions, oral hypoglycemic, insulin</td>
</tr>
<tr>
<td>Exercise</td>
<td>Regular physical activity</td>
</tr>
</tbody>
</table>

Intensity of prevention efforts should be calibrated to the absolute ASCVD risk.
Impact of Multiple Risk Factors on ASCVD Risk

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age (years)</th>
<th>Cholesterol (mmol/L)</th>
<th>SBP (mmHg)</th>
<th>Smoker</th>
<th>Risk (10 year risk of fatal CVD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>60</td>
<td>7</td>
<td>120</td>
<td>No</td>
<td>2%</td>
</tr>
<tr>
<td>F</td>
<td>60</td>
<td>7</td>
<td>140</td>
<td>Yes</td>
<td>5%</td>
</tr>
<tr>
<td>M</td>
<td>60</td>
<td>6</td>
<td>160</td>
<td>No</td>
<td>9%</td>
</tr>
<tr>
<td>M</td>
<td>60</td>
<td>5</td>
<td>180</td>
<td>Yes</td>
<td>21%</td>
</tr>
</tbody>
</table>

Lifetime risk with aggregate risk factor burden is more discriminating than any single risk factor alone.

It is preferable to estimate global risk vs single risk factors to make treatment decisions.

ASCVD Risk Reduction Is Proportional To Baseline Risk: Statins as an Example

• Reduction in ASCVD events is *proportionally similar* in pts at all levels of risk
• Greatest *absolute* number of events avoided in pts at greatest risk
• Reduction in ASCVD events is related to the extent of LDL-C reduction

![Effects of Lowering LDL-C with Statin Therapy in Patients at Variable Risk of Vascular Disease: Meta-analysis of Individual Data from 27 Randomized Trials](image)

RRR ~22% per mmol/L

Principles of Risk Assessment

Goal is to identify patients most likely to benefit from primary prevention interventions.

Global risk assessment tools can help identify low-, moderate-, and high-risk patients.

Focus on those at moderate to high risk of developing CVD events to optimize the benefit of interventions while reducing unnecessary treatment.

Although relative risk reduction is the same, absolute risk reduction is higher for those with higher baseline 10-year ASCVD risk.
Which Risk Estimating Tool do you use in your practice?

1. Framingham CHD Risk Score
2. Framingham General CVD Risk Score
3. ACC/AHA 10-year ASCVD Pooled Cohort Risk Calculator
4. Systemic Coronary Risk Evaluation (SCORE)
5. None of the Above
A 60-year-old male patient without ASCVD

1. Smoker, hypertension (on meds), non-diabetic SBP 160 mm Hg, TC 200 mg/dL (5.2 mmol/L), HDL-C 40 mg/dL (~1 mmol/L), LDL-C 140 mg/dL (3.6 mmol/L).

2. How do you determine this patient’s 10-year risk for ASCVD.

3. Will you treat this patient with a statin?

4. How about other therapies?

5. How will you talk about statin therapy with this patient?
HOW DO WE ASSESS ASCVD RISK?
Framingham General CVD Risk Calculator (2008)

**Risk Factors**
- Age
- Gender
- Total and HDL cholesterol
- Systolic blood pressure
- Blood pressure treatment
- Diabetes mellitus
- Current smoking

**Endpoints**
- Fatal and non fatal MI, angina
- Fatal or nonfatal ischemic or hemorrhagic stroke
- TIA
- Claudication
- Heart failure

### Table 1A: Estimation of 10-year CVD Points for MEN
(Framingham Point Scores)

<table>
<thead>
<tr>
<th>Points</th>
<th>Age, yr</th>
<th>HDL-C</th>
<th>TC</th>
<th>SBP (not treated)</th>
<th>SBP (treated)</th>
<th>Smoker</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>30-34</td>
<td>1.6+</td>
<td>&lt;120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td>1.3-1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>35-39</td>
<td>1.2-&lt;1.3</td>
<td>&lt;4.2</td>
<td>120-129</td>
<td>&lt;120</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4</td>
<td>40-44</td>
<td>0.9-&lt;1.2</td>
<td>4.2-&lt;5.2</td>
<td>130-139</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>35-39</td>
<td>&lt;0.9</td>
<td>5.2-&lt;6.3</td>
<td>140-159</td>
<td>120-129</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>45-49</td>
<td>6.3-&lt;7.4</td>
<td>160+</td>
<td>130-139</td>
<td></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>50-54</td>
<td></td>
<td>&gt;7.4</td>
<td>140-159</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>55-59</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>60-64</td>
<td>7.0-&lt;7.4</td>
<td>160+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>65-69</td>
<td>7.0-&lt;7.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>70-74</td>
<td>7.0-&lt;7.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Points allotted</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Grand Total:** __________points

### Table 1B: CVD Risk for Men

<table>
<thead>
<tr>
<th>Total Points</th>
<th>10-year Risk %</th>
<th>Total Points</th>
<th>10-year Risk %</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤3</td>
<td>&lt;1</td>
<td>8</td>
<td>6.7</td>
</tr>
<tr>
<td>-2</td>
<td>1.1</td>
<td>9</td>
<td>7.9</td>
</tr>
<tr>
<td>-1</td>
<td>1.4</td>
<td>10</td>
<td>9.4</td>
</tr>
<tr>
<td>0</td>
<td>1.6</td>
<td>11</td>
<td>11.2</td>
</tr>
<tr>
<td>1</td>
<td>1.9</td>
<td>12</td>
<td>13.2</td>
</tr>
<tr>
<td>2</td>
<td>2.3</td>
<td>13</td>
<td>15.6</td>
</tr>
<tr>
<td>3</td>
<td>2.8</td>
<td>14</td>
<td>18.4</td>
</tr>
<tr>
<td>4</td>
<td>3.3</td>
<td>15</td>
<td>21.6</td>
</tr>
<tr>
<td>5</td>
<td>3.9</td>
<td>16</td>
<td>25.3</td>
</tr>
<tr>
<td>6</td>
<td>4.7</td>
<td>17</td>
<td>29.4</td>
</tr>
<tr>
<td>7</td>
<td>5.6</td>
<td>18+</td>
<td>&gt;30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Very High Risk</th>
<th>High Risk</th>
<th>Intermediate (Moderate) Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>A FRS-CVD score that confer a 10-year risk for CVD of &gt;30%</td>
<td>Established CVD</td>
<td>Have a FRS-CVD score that confer a 10-year risk for CVD of &gt;20%</td>
<td>Have a FRS-CVD score that confer a 10-year risk for CVD of 10-20%</td>
</tr>
<tr>
<td>Established CVD</td>
<td>Diabetes mellitus with proteinuria</td>
<td>Diabetes mellitus without target organ damage</td>
<td></td>
</tr>
<tr>
<td>Diabetes mellitus with proteinuria</td>
<td>CKD with glomerular filtration rate (GFR) &lt;30 Ml/ min⁻¹/ 1.73 m² (Stage ≥4)</td>
<td>CKD with GFR &gt;30 - &lt;60 Ml/ min⁻¹/ 1.73 m² (Stage 3)</td>
<td></td>
</tr>
<tr>
<td>CKD with glomerular filtration rate (GFR) &lt;30 Ml/ min⁻¹/ 1.73 m² (Stage ≥4)</td>
<td>Very high levels of individual risk factors (LDL-C &gt;4.9 mmol/L, BP &gt;160/110 mmHg)</td>
<td>Very high levels of individual risk factors (LDL-C &gt;4.9 mmol/L, BP &gt;160/110 mmHg)</td>
<td></td>
</tr>
<tr>
<td>Very high levels of individual risk factors (LDL-C &gt;4.9 mmol/L, BP &gt;160/110 mmHg)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Optimal risk factors

→ TC = 170 mg/dL
→ HDL-C = 50 mg/dL
→ Systolic BP = 110 mmHg
→ Not taking medications for HTN
→ Not a diabetic
→ Not a smoker

10-year risk of non-fatal MI, coronary heart disease death, and fatal and non-fatal stroke

Intended for use if no ASCVD and LDL-C is <190 mg/dL
SCORE CVD Risk Calculation

Asymptomatic Persons
1. Find cell nearest to patient age, cholesterol, BP
2. Check the qualifiers
3. Establish 10-year risk for fatal CVD

10-year risk of fatal atherosclerotic events (MI, stroke, other occlusive disease) including sudden cardiac death

## Risk Assessment Tools: Summary

<table>
<thead>
<tr>
<th>Risk Score</th>
<th>Risk Components</th>
<th>Predicts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framingham CHD Risk Score</td>
<td>Age, sex, total cholesterol, HDL, smoking, SBP, medications for BP.</td>
<td>10-year risk of MI or CHD-related death</td>
</tr>
<tr>
<td>Framingham CVD Risk Score</td>
<td>Age, sex, total cholesterol, HDL, smoking, diabetes, SBP, medications for BP.</td>
<td>10-year risk of MI, angina, CHD related death, fatal or non-fatal ischemic or hemorrhagic stroke, TIA, Claudication, or HF</td>
</tr>
<tr>
<td>ACC/AHA 10-year ASCVD Pooled Cohort</td>
<td>Age, sex, race (white, black, other), smoking, total cholesterol, HDL, SBP, treatment of HTN, DM</td>
<td>10-year risk and lifetime risk of ASCVD (coronary death, MI, stroke)</td>
</tr>
<tr>
<td>SCORE CVD</td>
<td>Age, sex, total cholesterol, smoking, SBP</td>
<td>10-year risk for fatal CVD</td>
</tr>
</tbody>
</table>

FRS = Framingham Risk Score; CHD = coronary heart disease; CVD = cardiovascular disease; PAD = peripheral artery disease; HF = heart failure

Which one of the following variables is not included in Framingham CVD, SCORE or the 2013 ACC/AHA Pooled Cohort Risk Equation:

1. Sex
2. Total Cholesterol
3. Age
4. Family History of premature cardiovascular disease
5. Systolic Blood Pressure
Limitations of ASCVD Risk Scores

Not all include family history

May not accurately assess risk in all ethnic groups

Based on risk factors at a single point in time

Risk of other CV events (PAD, HF)/revascularization

When uncertainty arises, strategies needed for more precise risk prediction (e.g. imaging)

PUTTING RISK MANAGEMENT INTO PRACTICE
Case Discussion

A 60-year-old patient without ASCVD

1. Male, smoker, hypertension (on meds), non-diabetic SBP 160 mm Hg, TC 200 mg/dL (5.2 mmol/L), HDL-C 40 mg/dL (1 mmol/L), LDL-C 140 mg/dL (3.6 mmol/L).
2. Establish 10-year risk for ASCVD.
3. Will you treat this patient with a statin?
4. How about other therapies?
5. How will you talk about statin therapy with this patient?

- 10-year Framingham CVD Risk ~ 53%
- 2013 ACC/AHA ASCVD Risk ~ 26%
- SCORE risk ~ 14%
Table 1A: Estimation of 10-year CVD Points for MEN
(Framingham Point Scores)

<table>
<thead>
<tr>
<th>Points</th>
<th>Age, yr</th>
<th>HDL-C</th>
<th>TC</th>
<th>SBP (not treated)</th>
<th>SBP (treated)</th>
<th>Smoker</th>
<th>Diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>1.6+</td>
<td>&lt;120</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td>1.3-1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>30-34</td>
<td>1.2-1.3</td>
<td>&lt;4.2</td>
<td>120-129</td>
<td>&lt;120</td>
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<td>No</td>
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<td>1</td>
<td>0.9-1.2</td>
<td>4.2-5.2</td>
<td>130-139</td>
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</tr>
<tr>
<td>2</td>
<td>35-39</td>
<td>&lt;0.9</td>
<td>5.2-6.3</td>
<td>140-159</td>
<td>120-129</td>
<td>Yes</td>
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<tr>
<td>3</td>
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<td>6.3-7.4</td>
<td>160+</td>
<td>130-139</td>
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<td>4</td>
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<td>&gt;7.4</td>
<td>140-159</td>
<td>160+</td>
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<td>40-44</td>
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<td>45-49</td>
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<td>7</td>
<td>50-54</td>
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<td>8</td>
<td>55-59</td>
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<td>9</td>
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<td>10</td>
<td>65-69</td>
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<tr>
<td>11</td>
<td>70-74</td>
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<td>12</td>
<td>75+</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Grand Total: 23

Table 1B: CVD Risk for Men

<table>
<thead>
<tr>
<th>Total Points</th>
<th>10-year Risk %</th>
<th>Total Points</th>
<th>10-year Risk %</th>
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</thead>
<tbody>
<tr>
<td>≤3</td>
<td>&lt;1</td>
<td>8</td>
<td>6.7</td>
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<td>0</td>
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<td>1</td>
<td>1.9</td>
<td>12</td>
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<td>13</td>
<td>15.6</td>
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<td>2.8</td>
<td>14</td>
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<td>4</td>
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<td>15</td>
<td>21.6</td>
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<td>5</td>
<td>3.9</td>
<td>16</td>
<td>25.3</td>
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<tr>
<td>6</td>
<td>4.7</td>
<td>17</td>
<td>29.4</td>
</tr>
<tr>
<td>7</td>
<td>5.6</td>
<td>18+</td>
<td>&gt;30</td>
</tr>
</tbody>
</table>

General CVD Risk Prediction Using Lipids

Sex:
- M
- F

Age (years): 60

Systolic Blood Pressure (mmHg): 160

Treatment for Hypertension:
- Yes
- No

Current smoker:
- Yes
- No

Diabetes:
- Yes
- No

HDL: 40

Total Cholesterol: 200

[Calculate]

Your Heart/Vascular Age: 86

10 Year Risk

- Total risk: 53.1%
- Normal: 13%
- Optimal: 7%

### Table 3: Risk Stratification of Cardiovascular Risk

**Very High Risk** individuals are those with:
- A FRS-CVD score that confer a 10-year risk for CVD of >30%
- Established CVD
- Diabetes mellitus with proteinuria
- CKD with glomerular filtration rate (GFR) <30 mL/ min\(^{-1}\) / 1.73 m\(^2\) (Stage ≥4)

- **High Risk** Individuals include:
  - Have a FRS-CVD score that confer a 10-year risk for CVD of >20%
  - Diabetes mellitus without target organ damage
  - CKD with GFR >30 - <60 mL/ min\(^{-1}\) / 1.73 m\(^2\) (Stage 3)
  - Very high levels of individual risk factors (LDL-C >4.9 mmol/L, BP >180/110 mmHg)

- **Intermediate (Moderate) Risk** Individuals:
  - Have a FRS-CVD score that confer a 10-year risk for CVD of 10-20%

- **Low Risk** Individuals:
  - Have a FRS-CVD score that confer a 10-year risk for CVD <10%
## Clinician-Patient Risk Discussion (CPRD)

### Components

1. Assess patient priorities
2. Assess ASCVD risk and determine recommendations
3. Communicate ASCVD risk and benefits of lifestyle, statin therapy, and other therapies
4. Arrive at Shared decision making

### 5 Ps

<table>
<thead>
<tr>
<th>Variable</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preference</td>
<td>What does patient prefer based on his/her values and priority?</td>
</tr>
<tr>
<td>Precision</td>
<td>How precise is patient’s risk estimate, and is further testing warranted to refine it?</td>
</tr>
<tr>
<td>Participation</td>
<td>How motivated is patient to participate in ongoing care and improve lifestyle habits?</td>
</tr>
<tr>
<td>Potency</td>
<td>What treatment and dose are proposed?</td>
</tr>
<tr>
<td>Price</td>
<td>Can patient afford proposed treatment?</td>
</tr>
</tbody>
</table>

Clinician-Patient Risk Discussion in our patient

Of 100 patients like you, 53 would be expected to have a stroke or heart attack in the next 10 years or die from a stroke or heart attack.

Use simple language

Use visual aids

Comprehensive risk factor reduction is key to primary ASCVD prevention

Intensity of prevention efforts should be calibrated to the absolute ASCVD risk

Risk scores serve as a tool to open the door for discussion with patient about risk, and to discuss plan for risk reduction

Risk discussion in CVD prevention should occur on an ongoing basis to encourage patient adherence to medications and life style recommendations
Framingham General CHD Risk Calculator (2001)

Risk Factors

→ Age
→ Gender
→ Total and HDL cholesterol
→ Systolic blood pressure
→ On Medication for Hypertension
→ Current smoking

Endpoints

▪ 10-year risk of myocardial infarction
▪ 10-year risk of coronary heart disease death

Guidelines for the Treatment of Blood Cholesterol to Reduce ASCVD Risk in Adults

Best Practices in the U.S. and Malaysia

Pamela B. Morris, MD, FACC, FAHA, FASPC, FNLA
Chair, ACC Prevention of Cardiovascular Disease Leadership Council and Section
Associate Professor, Medicine (Cardiology)
Director, Seinsheimer Cardiovascular Health Program
Co-director, Women’s Heart Care
The Medical University of South Carolina
This presentation is supported by Pfizer through a collaboration with the American College of Cardiology and the National Heart Association of Malaysia.

Pfizer does not encourage the use of its products in any off label manner
The opinions expressed in this presentation are those of the speaker
Disclosures

• Advisory Board: Amgen, Sanofi/Regeneron
• Steering Committee: Esperion, Amgen
Objectives

1. Improve implementation of guidelines to create evidence-based management strategies for patients

2. Discuss clinical care plans for comprehensive lipid lowering therapy in primary prevention patients
THE RATIONALE FOR GUIDELINES IN ASCVD PREVENTION
Which of the following statements reflects your use of ASCVD guideline recommendations?

1. I am not familiar with the data supporting Malaysia CPG 2017, ESC/EAS, or ACC/AHA guidelines
2. I do not have time to follow guidelines in my practice
3. I do not agree with all of the guideline recommendations for ASCVD prevention
4. I try to follow Malaysia Clinical Practice Guideline 2017 recommendations
5. I try to follow ESC/EAS guideline recommendations
6. I try to follow ACC/AHA guideline recommendations
The Rationale for ASCVD Guidelines

**Foundational Recommendations for Clinical Practice**
- Based decisions on clinical evidence
- Emphasize randomized controlled clinical trials
- Distribute knowledge written by experts

**Suboptimal Implementation**
- Low awareness of guideline recommendations
- Lack of agreement with guideline recommendation
- Clinical inertia
- Cognitive overload

MODIFIABLE TARGETS IN PRIMARY PREVENTION
Etiologic Role of LDL-C in the Pathogenesis of ASCVD

Quillard, Libby. CircRes. 2012;111:231-244
Etiologic Role of LDL-C in the Pathogenesis of ASCVD

Landmark statin clinical trials show that LDL-C is strongly associated with increased CVD risk.

AFCAPS/TEXCAPS, Air Force/Texas Coronary Atherosclerosis Prevention Study
CARE, Cholesterol and Current Events study
4S, Scandinavian Simvastatin Survival Study; HPS, Heart Protection Study; LIPID, Long-Term Intervention With Pravastatin in Ischaemic Disease study; PROVE IT-TIMI 22, Pravastatin or Atorvastatin Evaluation and Infection Therapy-Thrombolysis in Myocardial Infarction 22; WOSCOPS, West of Scotland Coronary Prevention Study.
## Lowering LDL-C Reduces ASCVD

<table>
<thead>
<tr>
<th>Study</th>
<th>Statin</th>
<th>Mean Baseline LDL-C (mg/dL)</th>
<th>Mean LDL-C Reduction (%)</th>
<th>% Reduction in Coronary Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>WOSCOPS</td>
<td>Pravastatin 40mg</td>
<td>192</td>
<td>26</td>
<td>31 (P &lt;0.001)</td>
</tr>
<tr>
<td>AFCAPS/TEXCAPS</td>
<td>Lovastatin 20-40mg</td>
<td>150</td>
<td>25</td>
<td>37 (P &lt;0.001)</td>
</tr>
<tr>
<td>ASCOT</td>
<td>Atorvastatin 10mg</td>
<td>133</td>
<td>35</td>
<td>36 (P &lt;0.001)</td>
</tr>
<tr>
<td>HOPE-3</td>
<td>Rosuvastatin 10mg</td>
<td>128</td>
<td>26</td>
<td>24 (P &lt;0.002)</td>
</tr>
<tr>
<td>JUPITER</td>
<td>Rosuvastatin 20mg</td>
<td>108</td>
<td>44</td>
<td>44 (P &lt;0.000001)</td>
</tr>
<tr>
<td>4S</td>
<td>Simvastatin 20-40mg</td>
<td>188</td>
<td>35</td>
<td>34 (P &lt;0.0001)</td>
</tr>
<tr>
<td>CARE</td>
<td>Pravastatin 40mg</td>
<td>139</td>
<td>32</td>
<td>24 (P = 0.003)</td>
</tr>
<tr>
<td>LIPID</td>
<td>Pravastatin 40mg</td>
<td>150</td>
<td>25</td>
<td>24 (P &lt;0.0001)</td>
</tr>
</tbody>
</table>

Table adapted from Maron DJ, et al. *Circulation*. 2000;101:207-213

*CTTC. *Lancet*. 2010; 376(9753):1670-1681

Meta-analysis showed 20%-25% reduction in major CV end points for every 1 mmol/liter reduction in LDL-C*
CURRENT GUIDELINES FOR MANAGING ASCVD RISK
ACC/AHA cholesterol management guidelines recommend discussing statin therapy with which of the following patients?

1. Without CVD or diabetes, aged 40-75 years, with advanced heart failure
2. Without CVD or diabetes, aged 40-75 years, with 10-year ASCVD risk <5%
3. Without CVD or diabetes, aged 40-75 years, with 10-year ASCVD risk ≥7.5%
4. Without CVD or diabetes, aged 40-75 years, with end-stage kidney disease on dialysis
Current ASCVD Prevention Guidelines
Areas of Concordance in ASCVD Prevention Guidelines

- Healthy lifestyle as foundation of ASCVD prevention
- Etiologic importance of LDL-related ASCVD risk
- Intensity of therapy should be matched to the risk of ASCVD events
- Statin therapy is the mainstay for reduction of LDL-related ASCVD risk
- Response to therapy should be monitored
- Inadequate response to therapy should be addressed

Guidelines are not rules. Clinical judgment remains key.

Healthy Lifestyle: The Foundation of ASCVD Prevention

Diet: DASH, Mediterranean

Available at www.moh.gov.my


Lifestyle can reduce atherogenic cholesterol by 10%-15%

Weight reduction if overweight (BMI ≥25-30kg/m²)

Smoking cessation

Alcohol consumption: moderation advised (~20g/day for men and ~10g/day for women)

Physical activity: 30-40 mins daily
Tenets of Lipid Lowering Therapy:

2013 ACC/AHA Blood Cholesterol Guideline

- Statins as cornerstone of pharmacologic therapy
- Absolute risk is key criterion for therapy intensity and allocation in ACC/AHA 2013 cholesterol management guidelines
- 4 statin benefit groups in ACC/AHA 2013 cholesterol management guidelines
- In primary prevention initiate statin if 10-year ASCVD risk >7.5%, may consider if 5 to <7.5%
- Lipid lowering therapy should be individualized

2013 ACC/AHA Guidelines:

Statin Benefit Groups

Clinical ASCVD

Primary elevations of LDL-C ≥190 mg/dL
[≥5 mmol/L]

40-75 years of age with diabetes
(10-year ASCVD risk by PCE)

Without clinical ASCVD or diabetes who are 40-75 years of age with
10-yr ASCVD risk ≥7.5%

Threshold for risk discussion to consider statin therapy in primary prevention

Cardiovascular Risk Assessment: Malaysian CPG 2017

- **Very High Risk**
  - Established CVD
  - *Diabetes and proteinuria or major risk factor (smoking, hypertension or dyslipidemia)*
  - CKD with GFR <30 MI / min^-1 / 1.73 m^2

- **High Risk**
  - *Diabetes without target organ damage*
  - CKD with GFR ≥30 - <60 MI / min^-1 / 1.73 m^2
  - Very high levels of individual risk factors (LDL-C >4.9 mmol/L, BP >180/110 mmHg)
  - Multiple risk factors with 10-year risk for CVD >20% (FRS CVD Risk Score)

- **Intermediate (Moderate) Risk**
  - FRS CVD score 10-year risk 10-20%

- **Low Risk** Individuals:
  - FRS CVD 10-year risk for CVD <10%
Cardiovascular Risk Assessment: Malaysian CPG 2017

- **Very High Risk**
  - Established CVD
  - *Diabetes and proteinuria or major risk factor (smoking, hypertension or dyslipidemia)*
  - CKD with GFR <30 Ml / min$^{-1}$/1.73 m$^2$

- **High Risk**
  - Diabetes without target organ damage
  - CKD with GFR ≥30 - <60 Ml / min$^{-1}$/1.73 m$^2$
  - Very high levels of individual risk factors (LDL-C >4.9 mmol/L, BP >180/110 mmHg)
  - Multiple risk factors with 10-year risk for CVD >20% (FRS CVD Risk Score)

- **Intermediate (Moderate) Risk**
  - FRS CVD score 10-year risk 10-20%

- **Low Risk** Individuals:
  - FRS CVD 10-year risk for CVD <10%

Available at www.moh.gov.my
What percentage of LDL-C reduction would you expect from low, moderate, or high intensity statin according to the 2013 ACC/AHA cholesterol management guideline and as demonstrated in randomized controlled trials of statin therapy?

1. Low = <20%, moderate = 20-39%, high = ≥40%
2. Low = <20%, moderate = 20-34%, high = ≥35%
3. Low = <30%, moderate = 30-39%, high = ≥40%
4. Low = <30%, moderate = 30-49%, high = ≥50%
Heart-healthy lifestyle is the foundation of ASCVD prevention.
In individuals at **Low** and **Intermediate (Moderate)** risk, therapeutic lifestyle changes alone should suffice in most cases. **Occasionally** drug therapy may be necessary to achieve target levels. (Lipids, BP, glucose)

In individuals at **Very High** and **High** CV risk, drug therapy **should be initiated at the outset** in conjunction with therapeutic lifestyle changes. (Lipids, BP, glucose)
**Lipoprotein targets of therapy: 2013 ACC/AHA**

<table>
<thead>
<tr>
<th>High-intensity statin therapy</th>
<th>Moderate-intensity statin therapy</th>
<th>Low-intensity statin therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily dose lowers LDL-C on average, by approximately ≥50%</td>
<td>Daily dose lowers LDL-C on average, by approximately 30 to &lt;50%</td>
<td>Daily dose lowers LDL-C on average by approximately &lt;30%</td>
</tr>
<tr>
<td>Atorvastatin 40*-80* mg Rosuvastatin 20*-40** mg</td>
<td>Atorvastatin 10* (20**) mg Rosuvastatin (5**) 10* mg Simvastatin 20*-40* mg Pravastatin 40* (80**) mg Lovastatin 40* mg Fluvastatin XL 80** mg Fluvastatin 40 mg BID* Pitavastatin 2-4** mg</td>
<td>Simvastatin 10** mg Pravastatin 10*-20* mg Lovastatin 20* mg Fluvastatin 20**-40** mg Pitavastatin 1** mg</td>
</tr>
</tbody>
</table>

- “RCT evidence to support the use of specific LDL-C or non-HDL-C targets was not identified.

- The focus is on the intensity of the statin therapy....”
Lipoprotein goals of therapy: 2013 ACC/AHA

Heart healthy lifestyle habits are the foundation of ASCVD prevention
(See 2013 AHA/ACC Lifestyle Management Guideline)

Regularly monitor adherence to lifestyle and drug therapy with lipid and safety assessments
(See Fig 5)

Diabetes
LDL-C 70-189 mg/dL
Age 40-75 y

Yes
Moderate-intensity statin

Yes
Estimated 10-y ASCVD risk ≥7.5%†
High-intensity statin

No

Primary prevention
(No diabetes, LDL-C 70 to 189 mg/dL, and not receiving statin therapy)

DM age <40 or >75 y or LDL-C <70 mg/dL

<5% 10-y ASCVD risk‡

Yes

Age <40 or >75 y and LDL-C <190 mg/dL‡

≥7.5% 10-y ASCVD risk (Moderate- or high-intensity statin)

5% to <7.5% 10-y ASCVD risk (Moderate-intensity statin)

No
## Matching Intensity of Risk-Reducing Therapy to Absolute CVD Risk: ACC/AHA

<table>
<thead>
<tr>
<th>High-intensity</th>
<th>Moderate-intensity</th>
<th>Low-intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily dose lowers LDL-C on average, by ≥50%</td>
<td>Daily dose lowers LDL-C on average, by 30% to &lt;50%</td>
<td>Daily dose lowers LDL-C on average by &lt;30%</td>
</tr>
<tr>
<td>Atorvastatin 40*-80* mg</td>
<td>Atorvastatin 10* (20**)mg</td>
<td>Simvastatin 10** mg</td>
</tr>
<tr>
<td>Rosuvastatin 20*-40**mg</td>
<td>Rosuvastatin (5**)10* mg</td>
<td>Pravastatin 10*-20* mg</td>
</tr>
<tr>
<td>Simvastatin 20*-40* mg</td>
<td>Simvastatin 20* mg</td>
<td>Lovastatin 20* mg</td>
</tr>
<tr>
<td>Pravastatin 40* (80**)mg</td>
<td>Pravastatin 40* mg</td>
<td>Fluvastatin 20**-40** mg</td>
</tr>
<tr>
<td>Lovastatin 40* mg</td>
<td>Lovastatin 40* mg</td>
<td>Pitavastatin 1** mg</td>
</tr>
<tr>
<td>Fluvastatin XL 80** mg</td>
<td>Fluvastatin 40 mg BID*</td>
<td></td>
</tr>
<tr>
<td>Pitavastatin 2-4** mg</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- *Statins demonstrated reduction in major CVD events
- **FDA approved doses not tested in clinical trials

Malaysian CPG 2017

• **Targets of therapy**
  
  – LDL-C is the primary target of therapy.
    • The target LDL-C level will depend on the individual’s global risk.
    • Both the absolute on treatment LDL-C level and the percentage LDL-C reduction achieved have been found to correlate with the observed CV benefits.
  
  – Non-HDL-C may be considered as a secondary target when treating patients with:
    • Combined hyperlipidaemias
    • Diabetes
    • Cardiometabolic Risk
    • CKD

Available at www.moh.gov.my
Malaysia CPG 2017:
LDL-C Goals of Therapy

<table>
<thead>
<tr>
<th>GLOBAL RISK</th>
<th>LDL-C Levels to initiate Drug therapy (mmol/L)</th>
<th>Target LDL-C levels (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low CV Risk*</td>
<td>clinical judgement**</td>
<td>&lt;3.0</td>
</tr>
<tr>
<td>Intermediate (Moderate) CV Risk*</td>
<td>&gt;3.4 **</td>
<td>&lt;3.0</td>
</tr>
<tr>
<td>High CV risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 20% 10-year CVD risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes without target organ damage,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CKD with GFR 30-&lt;60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very high CV risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Established CVD,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes with proteinuria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CKD with GFR &lt;30 but not dialysis dependent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Low and Intermediate (Moderate) CV risk is assessed using the Framingham General CVD Risk Score*31
**After a trial of 8-12 weeks of Therapeutic Lifestyle Changes (TLC) and following discussion of the risk: benefit ratio of drug therapy with the patient
***whichever results in a lower level of LDL-C
Role of Non-statin Therapies in ASCVD Risk Reduction
The Role of Non-Statins in ASCVD Prevention

Statins are typically safe for long-term use

Muscle-related symptoms and diabetes are known, but uncommon, adverse effects

Non-statin agents can be considered in statin intolerant individuals or patients with inadequate response to maximally tolerated statin

Ahmad A. Am J Cardiol. 2014;113:1765-1771.
When added to statin therapy, ezetimibe resulted in incremental lowering of LDL-C levels and improved CV outcomes.

Supports consideration of addition of non-statin therapy with ezetimibe in high-risk ACS patients.

Uncertain generalizability to other patient populations.
27,564 patients randomized at 1242 sites in 49 countries between 2/2013-6/2015
LDL Cholesterol

Placebo

59% mean reduction (95% CI 58-60), P<0.00001

Absolute reduction: 56 mg/dl (95% CI 55-57)

Evolocumab
(median 30 mg/dl, IQR 19-46 mg/dl)
Primary Endpoint

Hazard ratio 0.85
(95% CI, 0.79-0.92)
P<0.0001

Placebo

Evolocumab

0% 2% 4% 6% 8% 10% 12% 14% 16%

CV Death, MI, Stroke, Hosp for UA, or Cor Revasc

Months from Randomization

0 6 12 18 24 30 36

14.6%
12.6%
Landmark Analysis

16% RRR

HR 0.84 (95%CI 0.74-0.96)
P=0.008

25% RRR

HR 0.75 (95%CI 0.66-0.85)
P<0.00001
2017 Focused Update of the 2016 ACC Expert Consensus Decision Pathway on the Role of Non-Statin Therapies for LDL-Cholesterol Lowering in the Management of Atherosclerotic Cardiovascular Disease Risk

A Report of the American College of Cardiology Task Force on Expert Consensus Decision Pathways

Endorsed by the National Lipid Association

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*National Lipid Association Representative.
2017 Focused Update of the Expert Consensus Decision Pathway on the Role of non-statin therapies in ASCVD risk reduction

Primary Prevention in Patients with Diabetes
2017 Focused Update of the Expert Consensus Decision Pathway on the role of non-statin therapies in ASCVD risk reduction

Primary Prevention in Patients without Diabetes and 10-year ASCVD risk > 7.5%
Clinical Practice Guidelines on Primary and Secondary Prevention of CVD 2017

The Primary Target of Therapy is LDL-C:
The target will depend on the Individuals’ CV Risk (Table 1 & 2, pg 18-19)

<table>
<thead>
<tr>
<th>Pharmacotherapy</th>
<th>Indication</th>
<th>Grade of Recommendation, Level Of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statins</td>
<td>Very High and High CV Risk</td>
<td>I,A</td>
</tr>
<tr>
<td></td>
<td>Intermediate (Moderate) and Low CV risk*</td>
<td>I,A</td>
</tr>
<tr>
<td>Statins + ezetimibe</td>
<td>Failure to achieve LDL-C goals</td>
<td>I,B</td>
</tr>
<tr>
<td>Statins + PCSK-9 inhibitors</td>
<td>Familial hypercholesterolemia</td>
<td>I,A</td>
</tr>
<tr>
<td></td>
<td>Failure to achieve LDL-C goals</td>
<td>Ila,B</td>
</tr>
<tr>
<td>Statins + fibrates</td>
<td>Diabetic patients on maximally tolerated statins who have achieved the LDL-C target but have low HDL-C and high TG</td>
<td>IIb,B</td>
</tr>
<tr>
<td>Ezetimibe</td>
<td>Statin intolerance</td>
<td>Ila,C</td>
</tr>
<tr>
<td>PCSK-9 inhibitors</td>
<td>Very High and High CV risk with statin intolerance</td>
<td>Ila,B</td>
</tr>
<tr>
<td>Fibrates</td>
<td>Very High TG despite non-pharmacological measures</td>
<td>Ila,C</td>
</tr>
</tbody>
</table>
PUTTING RISK MANAGEMENT INTO PRACTICE
May improve adherence to therapeutic interventions and yield better health outcomes

Patients want to take an active role in treatment decisions with their physicians

Shared decision-making hinges on 2-way communication

Shared Decision-Making

Summary
Areas of Concordance in ASCVD Prevention Guidelines

- Healthy lifestyle as foundation of ASCVD prevention
- Etiologic importance of LDL-related ASCVD risk
- Intensity of therapy should be matched to the risk of ASCVD events
- Statin therapy is the mainstay for reduction of LDL-related ASCVD risk
- Response to therapy should be monitored
- Inadequate response to therapy should be addressed

Guidelines are not rules.
Clinical judgment remains key.
Global guidelines recommend statins as first-line lipid-lowering therapy to reduce ASCVD events.

Non-statin therapies may play a role in select high-risk patients or when response to maximally-tolerated statin therapy is less-than-anticipated.

Follow-up LDL-C monitoring remains important to document adherence.

Shared decision-making and clinician-patient risk discussion is key to successful guideline implementation.