Secondary prevention patterns in persons with pre-existing coronary artery disease: Are we getting it right?

Muhammad Imran Abdul Hafidz¹, Lily Diana Zainudin², Zhen-Vin Lee¹, Mohd Firdaus Hadi¹ and Ahmad Syadi Mahmood Zuhdi¹

Abstract

Background: Cardiovascular diseases are the main cause of death globally. Individuals with evidence of coronary artery disease are at increased risk of further cardiovascular events. However, with good secondary prevention, which consists broadly of lifestyle changes, medical therapy and revascularisation, this risk can be reduced. The true extent of secondary prevention in individuals who are re-admitted with a myocardial infarction in such a high-risk cohort has never been explored in Malaysia.

Methods: We performed a retrospective, observational study in a tertiary hospital in 100 individuals with previously diagnosed coronary artery disease admitted with a myocardial infarction from August 2016 to February 2017.

Results: Twenty-nine per cent of patients were still smoking; 15% and 47% were not taking antiplatelet or beta-blocker therapy, respectively. A further 45% and 20% of patients were not on any renin–angiotensin–aldosterone inhibition or lipid-lowering therapy, respectively.

Conclusion: In our high-risk cohort, secondary prevention practices were sub-optimal. Poor physician–patient communication was frequently listed as a major factor. Simple strategies taken at various levels of care should be implemented and audited to improve these practices.

Keywords
Secondary prevention, myocardial infarction, coronary artery disease, beta-blocker, ACE inhibitor

Introduction

Cardiovascular disease is the main cause of death in Malaysia, responsible for 36% of all deaths in 2014. Coronary artery disease (CAD), which is the major cause of cardiovascular morbidity and mortality, requires a multifaceted management plan with medical therapy, lifestyle change and revascularisation procedures. For patients who have suffered myocardial infarctions or have documented CAD, secondary prevention with evidence-based medicine is essential to reduce the risk of further cardiovascular events. Despite the proven benefits of these therapies, many studies have highlighted gaps in secondary prevention for this high-risk group.

Malaysian Clinical Practice Guidelines (CPGs), along with American and European guidelines, are clear in their recommendations for secondary prevention. Antiplatelet therapy, beta-blockers, inhibitors of the renin–angiotensin–aldosterone system (RAAS) and lipid-lowering therapy are all proven to be beneficial as secondary prevention and Grade I recommended with Class A evidence.

In our experience, the practice of secondary prevention prescribing and compliance in our local Malaysian population are suboptimal. This finding has been found in other populations. Reasons for this are multifactorial but include poor prescribing knowledge, financial constraints and poor medication understanding.

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As far as we are aware, this is the first retrospective study exploring secondary prevention patterns in Malaysian patients with pre-existing CAD re-presenting with a myocardial infarction.

**Methods**

This was a retrospective study done to examine the demographics, medication, lipid profile and glycated haemoglobin (HbA1c) levels (if diabetic) of individuals with pre-existing CAD admitted with a myocardial infarction (non-ST and ST elevation myocardial infarction) admitted into University of Malaya Medical Centre (UMMC), Kuala Lumpur, Malaysia between August 2016 and February 2017.

Individuals admitted with a myocardial infarction (MI) were identified from the admissions register on the cardiology wards. Within this list, individuals with pre-existing CAD were identified. Pre-existing CAD was defined as a previous MI or having undergone prior angioplasty, coronary artery bypass grafting (CABG) or a coronary angiogram showing CAD regardless of revascularisation status. All consecutive patients admitted during the period of study were included, which amounted to 100 patients. Current medication was taken as what was reported by the individual on admission regardless of whether this had been affected by prescription gaps or individual non-adherence. Lipid profiles and HbA1c levels were taken within the same admission.

**Results**

A total of 100 individuals were included. The mean age was 65.0 (SD = 11.3) years. Table 1 displays the subject characteristics. Most subjects were male and did not smoke. Most patients were ethnically Malay. The majority of subjects were admitted with a non-ST elevation MI and had previous angioplasty as their criterion of pre-existing CAD. The mean duration from the initial diagnosis of CAD until re-admission with a MI was 1789.61 (SD = 1998.94) days.

The majority of subjects were on either aspirin or clopidogrel monotherapy and beta-blockers. Most were also on angiotensin-converting enzyme inhibitors or angiotensin receptor blockers and taking lipid-lowering therapy. Table 2 summarises the pattern of secondary prevention therapy and Table 3 lists the cardiovascular risk factors.

**Discussion**

Individuals with documented CAD are categorised as very high risk for developing further cardiovascular events. This group includes those with previous MI, CAD diagnosed on coronary angiography and those who have undergone revascularisation procedures such as angioplasty and CABG. A multifaceted strategy of secondary prevention has been studied extensively and recommended in the Malaysian CPG and major cardiovascular guidelines from the European Society of Cardiology (ESC), United Kingdom National Institute of Clinical Excellence and the American Heart Association/American College of Cardiology Foundation (AHA/ACCA). Class I recommendations include lifestyle modifications (exercise, weight management, smoking cessation), cardiac rehabilitation, control of risk factors (lipid profile, blood pressure, glycaemic control) and specific drug therapy (antiplatelet, RAAS antagonists, beta-blockers).

Our study found a sub-optimal pattern of secondary prevention across the spectrum. There was a significant proportion of individuals still smoking (29%) despite smoking cessation having been shown to cause a major reduction of all cause mortality (relative risk (RR) = 0.64) and non-fatal MIs (RR = 0.68) in individuals with prior CAD.3 Factors to stop smoking were unfortunately not determined in this study but referral to a cardiac rehabilitation programme or treatment at a hospital with inpatient smoking cessation

<table>
<thead>
<tr>
<th>Variable</th>
<th>n (%)</th>
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<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>75 (75)</td>
</tr>
<tr>
<td>Female</td>
<td>25 (25)</td>
</tr>
<tr>
<td>Age, years (SD)</td>
<td></td>
</tr>
<tr>
<td>65.0 (11.3)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Malay</td>
<td>39</td>
</tr>
<tr>
<td>Indian</td>
<td>33</td>
</tr>
<tr>
<td>Chinese</td>
<td>25</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
</tr>
<tr>
<td>Current smoker</td>
<td>29 (29)</td>
</tr>
<tr>
<td>Never smoked/ex-smoker</td>
<td>71 (71)</td>
</tr>
<tr>
<td>Criterion of pre-existing CAD</td>
<td></td>
</tr>
<tr>
<td>Previous angioplasty</td>
<td>48 (48)</td>
</tr>
<tr>
<td>Previous myocardial infarction</td>
<td>22 (22)</td>
</tr>
<tr>
<td>Previous CABG</td>
<td>14 (14)</td>
</tr>
<tr>
<td>Angiography showing CAD</td>
<td>16 (16)</td>
</tr>
<tr>
<td>Duration in days from initial diagnosis of CAD to re-admission, mean (SD)</td>
<td>1789.61 (1998.94)</td>
</tr>
<tr>
<td>Admission diagnosis</td>
<td></td>
</tr>
<tr>
<td>NSTEMI</td>
<td>79 (79)</td>
</tr>
<tr>
<td>STEMI</td>
<td>21 (21)</td>
</tr>
</tbody>
</table>

CAD: coronary artery disease; CABG: coronary artery bypass grafting; NSTEMI: non-ST elevation myocardial infarction; STEMI: ST elevation myocardial infarction
services has been associated with better cessation rates.\textsuperscript{4} Pharmacotherapy, referral to smoking cessation services and avoidance of environmental smoke are steps recommended in guidelines. In the AHA/ACCA guidelines, asking about smoking status and giving cessation advice at every clinic visit have strong supporting evidence and are given a Class I grade of recommendation.\textsuperscript{5}

The mean low-density lipoprotein (LDL) level in our studied population was 2.62 mmol/l. Malaysian and AHA/ACCA guidelines published in 2011 recommend a target level of 2.6 mmol/l with an ‘option of < 2.0 mmol/l’. However, more recent guidelines from the ESC have recommended a stricter LDL goal of < 1.8 mmol/l for these individuals classified as ‘very high risk’ for further cardiovascular events, which would deem the mean LDL level in our population as sub-optimal.\textsuperscript{6} The mean HbA\textsubscript{1c} level in diabetic individuals in our cohort was 8.05%, also above target levels of < 7.0% recommended in guidelines. Blood pressure targets of 140/90 mmHg were, however, met in our cohort.

Medication therapy is a major part of secondary prevention. Unfortunately, there was a poor rate of prescription and adherence rates in all medication classes. Antiplatelet therapy was absent in 15% of individuals; 47% and 45% of our cohort were not taking beta-blockers or RAAS antagonists. Lipid-lowering therapy was found in only 80% of individuals. Poor adherence increases mortality rates in this high-risk cohort. For example, statin non-adherence is associated with a 25% mortality increase whereas mortality rates have been found to halve with good adherence to beta-blockers.\textsuperscript{7,8} Discontinuation of clopidogrel within 12 months of an acute coronary syndrome was also associated with a significant increase in mortality rates.\textsuperscript{9} Based on these findings, the importance of good secondary prevention therapy rates is obvious for reduction in events.

Several causes were identified in most of our cases, which reflect other observational studies.\textsuperscript{10} They can be broadly divided into patient, physician and organisational causes. Patients frequently reported medication side effects, financial cost and polypharmacy as common reasons for non-adherence. A review of available repeat prescription scripts identified gaps in prescription of evidence-based medicines although reasons for these were not obvious from notes. Poor physician awareness of secondary prevention regimes, failure to set treatment goals and shortage of time have been identified from other studies as contributing factors. Lack of hospital clinical guidelines, prescribing audit activities and oversubscription of clinic services may be organisational factors compounding this problem. Overall the most common factor quoted by individuals in our cohort was poor communication between physician and patient. This was determined qualitatively through patient reasons for non-adherence during admission clerking. Unclear benefits and emphasis on secondary prevention, lack of agreed treatment goals, information on side effects of medication and lack of smoking cessation advice were all listed as examples of poor communication. Communication and adherence have been shown to be closely associated.\textsuperscript{11}

Improvement in secondary prevention will reduce morbidity and reduce mortality. Many studies have proven the economic benefit of effective secondary prevention strategies.\textsuperscript{12–14} Table 4 displays possible steps that have been introduced elsewhere to improve secondary prevention practices.\textsuperscript{15–19}

We recognise that steps like referrals to smoking cessation or cardiac rehabilitation may be challenging due to lack of providers in our healthcare system. Nonetheless we have introduced simple and practical improvements in our own hospital that we believe are also achievable for smaller hospitals. Increased participation of a pharmacist during ward rounds, a discharge checklist ensuring the prescription of secondary prevention medication and a more extensive discharge summary are among the new improvements that are currently being audited but have shown early promise.

As with all retrospective studies, our study has weaknesses. Our small number of studied individuals and potential for reporting bias limit its potential for generalisation. Despite this, it does have its advantages. To our knowledge, this is the first study done in a Malaysian population exploring secondary prevention in this high-risk group. Furthermore, it has shown that secondary prevention in this Malaysian cohort is sub-optimal and reflects the findings of other observational studies done elsewhere.\textsuperscript{20–22}

### Conclusion

Secondary prevention is important in reducing morbidity and mortality in individuals with pre-existing CAD. These include...
Acknowledgements

Cardiovascular disease has a profound impact on our society. There are many opportunities to improve practices, which would reduce the cardiovascular disease impact on our society. Strategies at the individual, physician and organisational levels can be taken to improve practices, which would reduce the cardiovascular disease impact on our society.

References

Data is available on request from the corresponding author. Informed consent was not required for this study.

Author contribution

Author 1: conceptualisation, data collection, data analysis and writing of the manuscript; author 2: conceptualisation, writing and editing the manuscript; author 3: data collection, data analysis and interpretation; author 4: data collection, data analysis and interpretation; author 5: conceptualisation, data interpretation and editing the manuscript.

Declaration of conflicting interests

The authors declare that there are no conflicts of interest.

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Table 4. Proposed steps to improve secondary prevention in cardiovascular disease.

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Specific steps</th>
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| Patient     | • Gain ‘ownership’ of own medication plans.  
• Adhere to and participate in recommended regimes. |
| Physician   | • Adhere to guideline-based therapy.  
• Seek opportunities to improve and update knowledge on new evidence or practices.  
• Improve physician–patient communication.  
• Encourage decision-making and questions regarding disease and therapy.  
• Give clear instructions on discharge summaries on medication doses, clinic follow-ups and referrals to services such as smoking cessation and cardiac rehabilitation.  
• Communicate plans with primary care providers.  
• Work with pharmacists for medication reviews. |
| Organisation| • Promote audit activities to ensure compliance with published clinical guidelines.  
• Appoint clinical ‘champions’ who can influence practices of other colleagues. |

Author 1: conceptualisation, data collection, data analysis and writing of the manuscript. Author 2: conceptualisation, writing and editing the manuscript. Author 3: data collection, data analysis and interpretation. Author 4: data collection, data analysis and interpretation. Author 5: conceptualisation, data interpretation and editing the manuscript.

Declarations of conflict of interest

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