



National Prescribing Service Limited



***Results***  
**Case study 48:**  
**Achieving tight blood  
pressure control**

**July 2007**

NPS is an independent, non-profit organisation for Quality Use of Medicines,  
funded by the Australian Government Department of Health and Ageing.

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The information contained in this material is derived from a critical analysis of a wide range of authoritative evidence. Any treatment decision based on this information should be made in the context of the clinical circumstances of each patient. Declarations of interest have been sought from all commentators.

# Case study 48

## Achieving tight blood pressure control

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### Scenario

Tom is a 48-year-old marketing executive. He presents to have his blood pressure (BP) re-measured following readings of 160/88 mmHg and 165/90 mmHg two and four months ago, respectively, confirmed with home monitoring.

Tom currently takes atorvastatin 20 mg daily for hypercholesterolaemia but has no other medical conditions and no allergies. His father had a heart attack at age 53 and his mother has hypertension. There is no other significant family history. He does not smoke and has a body mass index (BMI) of 27 kg/m<sup>2</sup>. He lives with his wife and child. Over the past 4 months he has joined his wife on her evening walks (if he is not too tired) and has cut his alcohol intake (now 3 standard drinks on most days of the week).

Two months ago, Tom's total cholesterol was 4.1 mmol/L, high-density lipoprotein-cholesterol 0.6 mmol/L and low-density lipoprotein-cholesterol 2.8 mmol/L. Electrolytes, renal function, liver function, full blood count and glucose tests were normal.

Today, his BP is 172/92 mmHg. Physical examination is unremarkable. Other potential causes of secondary hypertension have been excluded.

A decision is made to treat Tom's hypertension.

**1. Which of the following antihypertensive drug classes would you consider as initial treatment for Tom's hypertension? Why/why not?**

- a) Low-dose thiazide/thiazide-like diuretic
- b) Beta blocker
- c) ACE inhibitor
- d) Angiotensin II-receptor antagonist
- e) Calcium-channel blocker
- f) Other (please specify)

**2. Tom has read that his systolic BP can be lowered by an average of 2 mmHg/kg weight loss. He is aiming for a BMI of < 25 kg/m<sup>2</sup>. What specific advice would you give on the following and what impact would it have on his BP?**

- a) Exercise
- b) Alcohol intake
- c) Salt intake

### Five years later, Tom returns from working overseas ...

He had an ST-segment-elevation myocardial infarction several months ago but has had no chest pain since. His current medications (all once daily) are aspirin 100 mg, atorvastatin 40 mg, ramipril 5 mg and verapamil (modified release) 240 mg. He reports no problems with any of his medications. Recent blood test results, including lipids, were within the normal range. His current BP is 134/84 mmHg.

**3. a) Would you recommend any changes to Tom's drugs? Why/why not?**

**b) If yes, list Tom's new drug regimen (include existing drugs if continuing).**

Drug

Dose

Frequency

# Summary of results

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At the time of publication, 988 responses had been received. This report summarises responses from 200 general practitioners.

## Case synopsis

Tom, a 48-year-old marketing executive, is diagnosed with hypertension after elevated readings over several months, which were confirmed with home monitoring. There is family history of premature cardiovascular disease and hypertension. Tom's only current medication is atorvastatin 20 mg daily for hypercholesterolaemia. Despite an adequate trial of lifestyle changes, his current BP is 172/92 mmHg. (See page 3 for more details.)

## Antihypertensive classes appropriate for initial treatment

- For the initial treatment of Tom's hypertension, 86% of respondents would consider an ACE inhibitor, 67.5% a low-dose thiazide, 49% a calcium-channel blocker, 41.5% an angiotensin II-receptor antagonist, and 29.5% a beta blocker.

### Reason for considering a class

- Many reasons were common to most classes (e.g. effective, well tolerated with few adverse effects, reduces risk of cardiovascular morbidity and mortality, and/or no contraindications).
- Other reasons were specific to certain class(es); notably, renal protection (ACE inhibitors and angiotensin II-receptor antagonist), low cost (low-dose thiazides and beta blockers), and protection from ischaemic heart disease (beta blockers).

### Reason for not considering a class

- Two reasons were common to most classes (not indicated by comorbidities and/or not considered as first-line therapy).
- Other reasons were specific to certain class(es), including acknowledgement that ACE inhibitors should be tried before considering angiotensin II-receptor antagonists, high cost (ACE inhibitors and angiotensin II-receptor antagonists), and less protection from stroke (beta blockers). Interestingly, potential adverse effects were prominent reasons for not considering low-dose thiazides, beta blockers, and to a lesser extent, calcium-channel blockers.

## Lifestyle recommendations and impact on BP

- Recommendations on exercise, alcohol intake and salt intake varied widely. For exercise, about half the respondents provided advice that met or exceeded recommendations by the National Heart Foundation (NHF). For alcohol and salt intake, most respondents provided advice consistent with the NHF (see pages 9–10).
- In terms of the impact on BP, most agreed that increased exercise and/or reduced salt intake could reduce BP, but there was variation on the potential size of this impact. Respondents were divided on the impact of reduced alcohol intake on BP.

### **Five years later ...**

Tom had an ST-segment elevation myocardial infarction (MI) several months ago. Current medications (all once daily) are aspirin 100 mg, atorvastatin 40 mg, ramipril 5 mg and verapamil (modified release) 240 mg. Current BP is 134/84 mmHg. (See page 3 for more details.)

### **Review of medicines five years later**

- 88% of respondents suggested changes to the medications, mainly focusing on secondary prevention and better protection post MI, and the need for better BP control.
- Of those who suggested changes (n = 176), 49.4% replaced verapamil with a beta blocker (mainly atenolol or metoprolol), 19.3% continued the current medications but increased the dose of ramipril and/or atorvastatin, and 11.4% added a beta blocker to the existing regimen.

# Results in detail

## Antihypertensive classes appropriate for initial treatment

- Respondents were asked which antihypertensive class(es) they would consider appropriate as initial treatment for Tom's hypertension. Table 1 summarises the main choices.

Table 1	
Class(es) considered as initial treatment for Tom's hypertension*	% of respondents (n = 200)
Low-dose thiazides, ACE inhibitors, angiotensin II-receptor antagonists or calcium-channel blockers (i.e. all classes except beta blockers)	12.5
Low-dose thiazides or ACE inhibitors only	12.0
ACE inhibitors only	12.0
Any of the five major classes	8.5
Low-dose thiazides, ACE inhibitors or calcium-channel blockers	7.5
Low-dose thiazides only	7.0
ACE inhibitors or angiotensin II-receptor antagonists only	6.0
Any of the five major classes except angiotensin II-receptor antagonists	5.0
ACE inhibitors, angiotensin II-receptor antagonists or calcium-channel blockers	5.0
Miscellaneous	24.5

\* While there was the option of specifying other classes (e.g. alpha blockers), all respondents chose from the five major classes (low-dose thiazides, beta blockers, ACE inhibitors, angiotensin II-receptor antagonists, calcium-channel blockers)

- Overall, of the 200 respondents:
  - 86% would consider an ACE inhibitor
  - 67.5% would consider a low-dose thiazide
  - 49% would consider a calcium-channel blocker
  - 41.5% would consider an angiotensin II-receptor antagonist
  - 29.5% would consider a beta blocker.
- Main reasons for these decisions are summarised in Tables 2–6.

Table 2: ACE inhibitors as initial treatment	
Reason for considering	% of respondents* (n = 172)
Effective	44.8
Well tolerated with few adverse effects	29.7
Renal protection	11.6
Reduces risk of cardiovascular morbidity and mortality	9.3
Cardiac protection	8.1
No contraindications	8.1
Good first choice	7.0
Reason for not considering	% of respondents* (n = 28)
Not indicated by any comorbidities (e.g. diabetes, heart failure, renal problems)	57.1
Would not use as first line (may consider as second line or add-on)	25.0
Expensive	17.9

\* Respondents may have more than one response

<b>Table 3: Low-dose thiazides as initial treatment</b>	
<b>Reason for considering</b>	<b>% of respondents* (n = 135)</b>
Effective	46.7
Cheap	25.9
Reduces risk of cardiovascular morbidity and mortality	23.7
Well tolerated with few adverse effects	12.6
No contraindications	8.1
No history/family history of diabetes	7.4
As effective as any other class	5.9
<b>Reason for not considering</b>	<b>% of respondents* (n = 65)</b>
May worsen lipid control	27.7
Potential adverse effects (unspecified)	12.3
Would not use as first line (may consider as second line or add-on)	10.8
May increase the risk of developing type 2 diabetes	9.2
Increased diuresis can be annoying or inconvenient	9.2
Not effective enough	7.7
May cause electrolyte disturbance	7.7
May increase uric acid and predispose to gout	7.7
May cause sexual dysfunction	7.7

\* Respondents may have more than one response

<b>Table 4: Calcium channel blockers as initial treatment</b>	
<b>Reason for considering<sup>†</sup></b>	<b>% of respondents* (n = 98)</b>
Effective	52.0
No contraindications	18.4
Well tolerated with few adverse effects	17.3
As effective as any other class	6.1
Reduces risk of cardiovascular morbidity and mortality	5.1
<b>Reason for not considering</b>	<b>% of respondents* (n = 102)</b>
Would not use as first line (may consider as second line or add-on)	46.9
Potential adverse effects (unspecified)	24.5
May cause peripheral oedema	14.2
Not indicated by any comorbidities (e.g. angina, arrhythmia)	12.7

\* Respondents may have more than one response

<sup>†</sup> While they would consider it, 5.1% of respondents noted the adverse effects associated with this class

<b>Table 5: Angiotensin II-receptor antagonists as initial treatment</b>	
<b>Reason for considering<sup>†</sup></b>	<b>% of respondents* (n = 83)</b>
Effective	42.1
Well tolerated with few adverse effects	37.3
Renal protection	10.8
No contraindications	9.6
Reduces risk of cardiovascular morbidity and mortality	7.2
Does not cause cough (compared with ACE inhibitors)	7.2
<b>Reason for not considering</b>	<b>% of respondents* (n = 117)</b>
Should try ACE inhibitors first and consider only if ACE inhibitors not tolerated	43.6
Would not use as first line (may consider as second line or add-on)	20.5
Not indicated by any comorbidities (e.g. diabetes, renal problems, heart failure)	15.4
Expensive	14.5

\* Respondents may have more than one response

<sup>†</sup> While they would consider it, 6% of respondents noted that this class is more expensive

<b>Table 6: Beta blockers as initial treatment</b>	
<b>Reason for considering<sup>†</sup></b>	<b>% of respondents* (n = 59)</b>
Effective	49.1
No contraindications	28.8
Protection from ischaemic heart disease (has family history)	25.4
Cheap	13.6
<b>Reason for not considering</b>	<b>% of respondents* (n = 141)</b>
May cause tiredness and lethargy (which may impact on exercise capacity)	31.2
Provides less protection from stroke	22.7
May cause sexual dysfunction	14.9
Potential adverse effects (unspecified)	13.5
Not indicated by any comorbidities (e.g. ischaemic heart disease)	12.8
Would not use as first line	9.2
Potential negative effect on lipid profile	5.0

\* Respondents may have more than one response

<sup>†</sup> While they would consider it, 11.9% of respondents noted that tiredness and lethargy are common adverse effects



## Practice points

- All 5 major classes of antihypertensive drugs (low-dose thiazides, beta blockers, ACE inhibitors, angiotensin II-receptor antagonists and calcium-channel blockers) reduce blood pressure to a similar extent, and this is their key contribution to preventing cardiovascular events.<sup>1-3</sup>
  - Based on the New Zealand cardiovascular risk calculator<sup>4</sup>, Tom is at high risk (15–20%) of a cardiovascular event in the next 5 years. Reducing his blood pressure to a target level of < 130/85 mmHg will reduce this risk by 5%.
- When choosing an antihypertensive drug, consider:<sup>3,5</sup>
  - the patient's cardiovascular risk profile
  - presence of coexisting conditions that may favour or limit the use of a particular class
  - presence of target-organ disease, clinical cardiovascular disease or renal disease
  - potential interactions with other prescribed medications
  - potential adverse effects
  - strength of evidence for the reduction of cardiovascular events with individual drugs
  - cost.
- The role of beta blockers (particularly atenolol) in treating hypertension has been questioned after recent meta-analyses suggested that they provide less protection from stroke compared with other antihypertensive drug classes;<sup>6,7</sup> however, there was no difference for myocardial infarction or mortality.<sup>6</sup> Questions remain and at this stage it is unknown whether Australian guidelines for the management of hypertension will change as a result of these findings. Beta blockers remain an option if indicated due to a favourable effect on comorbidity (e.g. myocardial infarction, heart failure).<sup>8</sup>
- Worsening lipid control was cited as a common reason for not considering thiazide diuretics (Table 3). At the current recommended low doses, adverse effects on plasma lipids attributed to thiazide diuretics are minimal.<sup>9</sup>

## Lifestyle recommendations and impact on BP

### Exercise

- Respondents provided varying advice regarding exercise, ranging from 20 minutes three times a week to 90 minutes daily. There was a general appreciation that the exercise had to be at least of moderate intensity to be beneficial.
- About half the respondents provided advice that meets or exceeds the recommendation of the NHF for patients with hypertension<sup>3</sup> which is at least 30 minutes of moderate intensity physical activity on five or more days of the week.
- Most respondents agreed that increased exercise can lead to a reduction in BP. However, there was variation on the reported size of the impact.

### Alcohol intake

- Advice regarding alcohol intake ranged from total abstinence to four or less standard drinks per day with two alcohol-free days per week.
- Many raised the concept of having alcohol-free days each week, with suggestions ranging from at least one to four alcohol-free days each week.
- Most recommendations were equivalent to those provided by the NHF<sup>3</sup>, which is to limit alcohol intake to two standard drinks per day or less for a male.
- Respondents were divided on the impact of reduced alcohol intake on BP. Many stated that reduced alcohol intake can reduce BP, but there was no consensus on how big the impact could be. Others were more sceptical on whether reduced alcohol intake could reduce BP.

## Salt intake

- Respondents advised Tom to reduce his salt intake in various ways, including not adding salt to food at the table or when cooking, avoiding high-salt-content foods and/or processed food, going on a low-salt diet, or avoiding salt altogether.
- Most of the recommendations are consistent with the advice by the NHF<sup>3</sup>, which are to encourage patients to use 'low salt' (< 120 mg sodium/100 g) or 'no added salt' processed foods, and not to add salt to food at the table or in cooking.
- Most respondents agreed that reduced salt intake can lead to reduced BP. However, once again, there was variation on how big the impact could be — descriptions ranged from 'small' to 'great' impact, and from 2 mmHg to 8 mmHg.



## Practice points

- Lifestyle modifications (Table 7) form an integral part in the management of hypertension irrespective of whether pharmacological therapy is involved.<sup>3</sup>

Table 7: Recommended lifestyle modifications and impact on blood pressure		
Lifestyle intervention	NHF recommendation for patients with hypertension <sup>3,10</sup>	Approximate reduction in systolic blood pressure* <sup>3,10-12</sup>
Reducing weight	BMI <25 kg/m <sup>2</sup> Waist circumference: males ≤ 94 cm; females ≤ 80 cm	5–20 mmHg/10 kg weight loss
Increasing physical activity	30 minutes on ≥ 5 days of the week	4–9 mmHg
Moderating alcohol consumption	Daily intake: males ≤ 2 standard drinks; females ≤ 1 standard drink <sup>†</sup>	2–4 mmHg
Reducing salt intake	< 4 g salt per day (about 1 teaspoon [~1550 mg sodium])	2–8 mmHg

\* Reductions are based on results of clinical studies, and effect size will vary depending on the exact nature of the intervention.

<sup>†</sup> The Australian Alcohol Guidelines<sup>13</sup> recommend 1 or 2 alcohol-free days a week to help drinkers to remain in control of their drinking and reduce its habit-forming potential. Note, however, that this recommendation of alcohol-free days is set in the context of recommendations for the whole Australian population, and not specifically for patients with hypertension.

## Review of medicines five years later

- Respondents were asked if they would make any changes to Tom's medicines. He had an ST-segment-elevation myocardial infarction (MI) several months ago and is currently using (all once daily) aspirin 100 mg, atorvastatin 40 mg, ramipril 5 mg and verapamil (modified release) 240 mg. His current blood pressure (BP) is 134/84 mmHg.
- 88% of respondents recommended changes; 12% did not. Table 8 summarises the main reasons given for these decisions.

Table 8	
Reason for recommending changes	% of respondents* (n = 176)
Add a beta blocker — secondary prevention and better protection post MI	42.6
Replace verapamil with a beta blocker — beta blocker offers better protection post MI and the combination is not recommended	36.4
Increase ramipril dose — better BP control and/or better protection post MI	35.8
BP still too high — suggested targets include 130/85 and 125/75 mmHg	28.4
Increase atorvastatin dose — higher dose offers more benefit (especially post MI)	7.4
Reason for not recommending changes	% of respondents* (n = 24)
Patient is stable and well controlled — reassess BP in 2–3 months	41.7
Blood test results (including lipids) and BP are normal	33.3
Need to assess BP again and change medications only if BP is still elevated	29.2

\* Respondents may have more than one response

- Respondents who would recommend changes were asked to list Tom's new medication regimen. Of the 176 respondents, main new medication regimens were:
  - Aspirin, statin, ACE inhibitor and beta blocker (49.4%), i.e. replaced verapamil with a beta blocker
  - Aspirin, statin, ACE inhibitor and calcium-channel blocker (verapamil) (19.3%), i.e. the original regimen but increased the dose of the statin and ACE inhibitor
  - Aspirin, statin, ACE inhibitor, calcium-channel blocker (verapamil) and beta blocker (11.4%), i.e. added a beta blocker
- Table 9 lists the main medications and common dosages recommended by these respondents.

Table 9	
Medication	% of respondents (n = 176)
Aspirin (100 mg once daily, i.e. original dose)	96.0
Atorvastatin (mostly 40 mg once daily, i.e. original dose)	96.0
Ramipril (mostly 5 mg once daily, i.e. original dose, or 10 mg once daily)	97.7
Atenolol (mostly 50 mg once daily)	43.2
Verapamil (mostly 240 mg once daily, i.e. original dose)	36.9
Metoprolol (mostly 50 mg twice daily, or 25 mg twice daily)	26.7
Miscellaneous*	17.6

\* Includes low-dose thiazides/thiazide-like diuretics (indapamide, hydrochlorothiazide — alone or as part of a combination product), clopidogrel and amlodipine



### Practice points

- All patients who have had a previous cardiovascular event (e.g. myocardial infarction) are considered to be at a very high risk of a further cardiovascular event (> 20% over 5 years).<sup>4</sup> Ongoing tight control of blood pressure is critical.
- Unless contraindicated, treatment for all patients post MI should include a beta blocker and an ACE inhibitor<sup>9,14</sup>, as both classes reduce mortality and the risk of reinfarction.<sup>9</sup>
- Concurrent use of a beta blocker and verapamil should be avoided<sup>9</sup> or this combination used with caution<sup>3</sup> because of the risk of bradycardia and heart block.<sup>3,9</sup>

# Commentary 1

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## Tom's case at baseline

We often see people like Tom in general practice. He has multiple risk factors for cardiovascular disease (male gender, hypertension, first-degree family history of IHD before age 60, overweight, and dyslipidaemia) although he is currently only receiving a statin as pharmacological therapy. He has had an appropriate level of behavioural change advice. The NHF recommendations would be to assess Tom's absolute cardiovascular risk before starting antihypertensive medication<sup>3</sup>, but his level of blood pressure warrants immediate initiation of therapy.

The current recommendation for initiating antihypertensive medication is, in the absence of indications or contraindications for specific agents, to use any of the five major agents.<sup>3</sup> This advice is likely to change, as a recent meta-analysis of beta blockers (dominated by atenolol) shows poorer outcomes for this agent.<sup>6</sup> However, from the perspective of the current recommendation, all the preferences are appropriate.

Reasons given by the respondents for agent choice are illuminating. ACE inhibitors remain first in respondents' consideration for initiation, but low-dose thiazides are second. In the current case scenario, respondents showed no blood-pressure-lowering efficacy bias for newer over older agents, contrary to findings from a previous study.<sup>15</sup> This may be because NPS case study respondents are better informed than the general GP population. The reno-protection of ACE inhibitors and angiotensin II-receptor antagonists is probably overstated by respondents, as this has only been demonstrated in the presence of renal disease (e.g. microalbuminuria in diabetes).<sup>16</sup>

As always there is a tendency to overstate adverse effects of older agents. With the exception of angiotensin II-receptor antagonists (these are the newest agents and hence those with the least safety data), all agents have similar burdens of side effects, varying only in their particular manifestations.<sup>17</sup>

There was good recognition of the benefits of alcohol and salt restriction, and exercise. If these lifestyle factors are not attended to, reaching blood pressure goals with medication is difficult.

## Tom's case at 5 years

Tom has moved from primary to secondary prevention with the occurrence of a myocardial infarction. He now has established disease and requires aggressive drug and non-drug therapy. Such drug therapy comprises an antiplatelet agent, a beta blocker, an ACE inhibitor, and a statin. About 70% of respondents who suggested changes to Tom's medication regimen added a beta blocker, and about half recognised the potential harmful interaction of this agent with a non-dihydropyridine calcium-channel blocker (verapamil in this case).

Tom's blood pressure goal remains <130/85 mmHg. If this goal is not attained after replacing the non-dihydropyridine calcium-channel blocker with a beta blocker, it is reasonable to titrate his ACE inhibitor to achieve this.

Adjusting Tom's statin dose is difficult to judge, as his lipids are stated to be 'within the normal range', which begs the question 'For whom?'. If his LDL level is  $\geq 2.0$  mmol/L, HDL  $\leq 1.0$  mmol/L, or his triglycerides  $\geq 1.5$  mmol/L, his statin dose should be increased.

## Commentary 2

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### Key points

- Beta blockers are unlikely to remain a first-line option for the treatment of essential uncomplicated hypertension because in head-to-head trials they were less effective than the comparator drug at reducing cardiovascular events, in particular, stroke. However, beta blockers remain a very effective choice if there is coexisting ischaemic heart disease and/or congestive heart failure.
- Most trials have shown a greater incidence of new-onset diabetes in patients treated with thiazide diuretics and/or beta blockers compared with ACE inhibitors, angiotensin II-receptor antagonists or calcium-channel blockers. While caution is warranted in interpreting these results, thiazide diuretics and beta blockers should be used with care in patients with glucose intolerance, metabolic syndrome or frank diabetes.
- ACE inhibitors (or angiotensin II-receptor antagonists if ACE inhibitors are contra-indicated or not tolerated) and beta blockers are the preferred antihypertensive drugs in patients after myocardial infarction.

### Which first-line antihypertensive drug?

The respondents selected any of the five main drug classes as first-line agents for the treatment of Tom's hypertension, i.e. low-dose thiazide diuretics, beta blockers, calcium-channel blockers, ACE inhibitors, and angiotensin II-receptor antagonists, in accordance with the current Australian and European guidelines.<sup>3,12</sup> ACE inhibitors and beta blockers were the most and the least preferred option, respectively. I agree with these choices for several reasons.

First, Tom is likely to meet the diagnostic criteria for the metabolic syndrome. His raised body mass index suggests that he has central obesity.

Moreover, he has hypertension and HDL-cholesterol levels  $< 1.03$  mmol/L.<sup>18</sup> According to the recently published European guidelines for the management of hypertension, ACE inhibitors and angiotensin II-receptor antagonists are the preferred treatment options in patients with hypertension and the metabolic syndrome because of their favourable effects on glucose metabolism and target-organ damage.<sup>12</sup> We do not know at this stage whether this recommendation will be incorporated in the next Australian guidelines due to be released in 2008.

Although the presence of microalbuminuria was not assessed in Tom, there is a strong association between metabolic syndrome and microalbuminuria.<sup>19</sup> Microalbuminuria confers a significant increase in cardiovascular morbidity and mortality in patients with hypertension without diabetes.<sup>20</sup> In the presence of microalbuminuria, there is good evidence that ACE inhibitors are both cardio- and reno-protective.<sup>16</sup>

The second reason I agree with ACE inhibitors and beta blockers as the most- and least-preferred options is that both thiazide diuretics and beta blockers have been shown to increase the risk of new-onset diabetes, compared with ACE inhibitors, angiotensin II-receptor antagonists, and calcium-channel blockers.<sup>21</sup> However, caution is warranted when interpreting these studies, as higher doses of thiazide diuretics were often used.<sup>21</sup> Also, newer beta blockers such as nebivolol and carvedilol have a reduced incidence of new-onset diabetes, compared with classic beta blockers.<sup>22,23</sup>

Finally, beta blockers are unlikely to remain a first-line option for the treatment of essential uncomplicated hypertension in future guidelines because in head-to-head trials they were less effective than the comparator drug at reducing cardiovascular events, in particular, stroke.<sup>6</sup>

## **Lifestyle and blood pressure**

Most of the respondents' recommendations are in line with the lifestyle advice provided by the current national guidelines for the management of hypertension.<sup>3</sup> Regular physical activity, i.e. at least 30 minutes of moderate intensity physical activity on five or more days of the week, can lower systolic and diastolic blood pressure by an average of about 4.0 and 2.5 mmHg, respectively.<sup>24</sup>

Hypertensive male patients such as Tom should limit their alcohol intake to two standard drinks per day or less.<sup>3</sup>

Studies have shown an average reduction in systolic blood pressure of 3.6 mmHg in patients with hypertension when sodium intake is reduced to < 90 mmol/day by a 'no added salt' low-salt eating pattern, although there is an inter-individual variability in the blood pressure response to dietary salt restriction.<sup>3,25</sup>

## **Secondary cardiovascular prevention**

Nearly 50% of respondents suggested replacing verapamil with a beta blocker for Tom's secondary cardiovascular prevention. I agree

with this approach. Verapamil has been shown to reduce mortality and cardiovascular events after myocardial infarction.<sup>26</sup> However, the evidence supporting the use of beta blockers is far more compelling in this setting.<sup>27</sup>

Tom's blood pressure control is inadequate, as the target in patients < 65 years is < 130/85 mmHg.<sup>3</sup> If switching from verapamil to a beta blocker does not adequately control blood pressure, either increasing the dose of ramipril to 10 mg/day and/or introducing a low-dose thiazide diuretic are two suitable options to optimise Tom's blood pressure control.

Interestingly, 11% of respondents suggested combining verapamil with a beta blocker. This combination is not recommended and should be monitored with extreme caution because of the risk of symptomatic bradycardia, conduction disturbances, and negative inotropic effects.<sup>3</sup>

Although it is stated that Tom's lipid profile was reported as 'within the normal range' it should be remembered that LDL-cholesterol targets for patients after myocardial infarction have been changing during the last few years and are now set at < 2 mmol/L.<sup>28</sup>

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