Cardiovascular risk perception and evidence–practice gaps in Australian general practice (the AusHEART study)

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ABSTRACT

Objective: To examine the perception and management of cardiovascular disease (CVD) risk in Australian primary care.

Design, setting and participants: The Australian Hypertension and Absolute Risk Study (AusHEART) was a nationally representative, cluster-stratified, cross-sectional survey of 322 general practitioners. Each GP was asked to collect data on CVD risk factors and their management in 15–20 consecutive patients aged ⩾ 55 years who presented between April and June 2008, and to estimate each patient's absolute risk of a cardiovascular event in the next 5 years.

Main outcome measures: Estimated 5-year risk of a cardiovascular event, proportion of patients receiving appropriate treatment.

Results: Among 5293 patients, 29% (1548) had established CVD. A further 22% (1145), when categorised according to the 2009 National Vascular Disease Prevention Alliance guideline, to 42% (2211), when categorised according to National Heart Foundation (NHF) 2004 guideline, had a high (⩾ 15%) 5-year risk of a cardiovascular event. Of the 1548 patients with established CVD, 50% were prescribed a combination of a blood pressure (BP)-lowering medication, a statin and an antiplatelet agent, and 9% were prescribed a BP-lowering medication and a statin but not an antiplatelet agent. Among high-risk patients without established CVD, categorised using NHF 2004 adjustments, 34% were prescribed a combination of a BP-lowering medication and a statin. GPs estimated 60% of patients with established CVD as having a risk of less than 15%. The GPs' estimates of risk among patients without established CVD agreed with the centrally calculated estimate (according to the NHF 2004 guideline) in 48% of instances ($\kappa = 0.21$).

Conclusions: These data confirm substantial undertreatment of patients who are at high risk of a cardiovascular event. We recommend that GPs assess absolute risk for older patients and ensure that high-risk patients receive evidence-based pharmacotherapy.

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Cardiovascular disease (CVD) is the leading cause of death and disability worldwide.[1] In 2005, CVD was responsible for 35% of deaths in Australia and an estimated 1.4 million Australians (6.9% of the population) were living with a CVD-related disability.[2] Ninety percent of Australian adults have at least one modifiable CVD risk factor and 25% have three or more modifiable risk factors.[3] Because around 85% of Australians visit a general practitioner every year,[4] primary care is the ideal setting for CVD prevention. The federal government has targeted CVD as a priority area in its proposed National Primary Health Care Strategy[5] and has set specific performance benchmarks for the management of CVD risk and for the prevention of CVD.[6] As vascular health checks in primary health care have been shown to be highly cost-effective, improving the performance of these checks could reduce the rising costs of acute hospital care.[7,8]

Despite evidence that CVD management and prevention should be based on an individual's overall or absolute risk, there has been little analysis on how extensively this evidence is being implemented in primary health care. One qualitative study demonstrated that GPs do not routinely perform absolute CVD risk assessments.[9] Barriers identified include lack of understanding of the difference between absolute and relative risk, poor understanding of how to use CVD risk tools in clinical management, and lack of incorporation of risk tools into practice software. Several recently published studies have revealed substantial gaps in CVD risk management.[10-13] Potential barriers that have been identified include guidelines for single diseases and conflicts with the criteria for prescribing subsidised medications within the Pharmaceutical Benefits Scheme (PBS).

New guidelines for the assessment of absolute CVD risk were published by the National Vascular Disease Prevention Alliance (NVDPA) in March 2009.[14] In this study, we sought to describe the distribution of CVD risk according to various guidelines, to ascertain GPs' perceptions of their patients' CVD risks and to determine the proportion of patients whose CVD risk is being managed according to current Australian evidence-based guidelines.

METHODS

The Australian Hypertension and Absolute Risk Study (AusHEART) was a nationally representative, cluster-stratified, cross-sectional survey of CVD risk management practice in primary health care for patients aged 55 years or older. The study design is based on previously used methodology.[15]

Sampling and investigator selection

GPs were recruited on the basis of interest in participating in the study. Two mail-outs to all 21 074 registered GPs in Australia were conducted during January and February 2008. GPs who expressed an interest in participating in the study were stratified according to location within each state and territory and whether their practice was in a rural or urban area, using a classification derived from national rural, remote and metropolitan area categories.[16] We randomly selected interested GP investigators in a stratified manner to ensure that state and rural–urban splits reflected the distribution of the adult population according to 2004 census data. Characteristics of the selected GPs were compared with those who were not selected and with the Australian GP workforce for the 2007–08 financial year.[17]

Data collection

GP investigators were requested to recruit 15–20 consecutively-presenting consenting adults aged 55 years or older, irrespective of their reason for the consultation. All patients were given the option to consent to participate in a second component of the study, in which each patient's health care expenditure would be tracked across the next 5 years through linkage with their Medicare number.

1 Guideline-based adjustments to the Framingham risk estimates

NHF 2004 guideline[19]

Patients in whom the Framingham method is likely to underestimate risk (Aboriginal, Torres Strait Islander, Maori and Pacific Islander patients; patients aged ⩾ 75 years; patients with diabetes, chronic kidney disease, aortic disease, left ventricular hypertrophy, vascular disease, ultrasonic or radiological evidence of atherosclerotic plaque, or hypertensive retinopathy [Grade II or more]) were assigned a risk of 15% if the calculated risk was lower. In addition, risk was increased by 5% (once only) in patients where it is likely that the Framingham equations underestimate risk (patients with BMI ⩾ 30 kg/m^2, total cholesterol > 8.5 mmol/L, systolic BP > 170 mmHg and diastolic BP > 100 mmHg or first degree relative with CVD before 60 years of age).

NHF 2008 guideline[20]

Very similar to the NHF 2004 guideline except that patients with a family history of premature CVD and patients with hypercholesterolaemia (total cholesterol > 7.5 mmol/L) were also categorised as high risk (ie, assigned a risk of 15% if the calculated risk was lower).

NVDPA 2009 guideline[14]

Adults were classified into the high-risk category if they were considered to be at increased risk (high risk) and estimation of risk was not required due to: diabetes and age > 60 years; diabetes and microalbuminuria; moderate or severe CKD with eGFR < 45 mL/min/1.73m^2; systolic BP ⩾ 180 mmHg; diastolic BP ⩾ 110 mmHg; or serum cholesterol > 7.5 mmol/L.

NHF = National Heart Foundation. BMI = body mass index. BP = blood pressure. CVD = cardiovascular disease. CKD = chronic kidney disease. eGFR = estimated glomerular filtration rate. ◆

For each patient who was recruited, GPs completed a one-page questionnaire on CVD risk factors and currently prescribed medications. Included in this was a request to repeat tests for fasting blood lipids, fasting blood glucose and estimated glomerular filtration rate, if these had not been performed within the guideline-recommended time frame. Urinary dipsticks were supplied to assess albumin to creatinine ratio (ACR). Ninety percent of participating GPs were already using electronic blood pressure (BP) monitors or were provided with one, for use in this study, through the High Blood Pressure Research Council of Australia Better Blood Pressure Measurement Initiative. GPs also provided their estimate of each patient's absolute risk of having a cardiovascular event within the next 5 years. This was requested without specifying how the GP should come to this determination. Data were collected prospectively between April and June 2008. GPs were contacted to resolve illegible or missing information on the questionnaires. In cases where missing or unknown values were not resolved, we assumed, when calculating CVD risk, that the patient did not have the risk factor.

Estimation of absolute CVD risk

Following data collection, estimation of absolute 5-year risk of a cardiovascular event was calculated centrally (by one of us [E L H], using available data) for each patient without established CVD, using the 1991 Framingham risk equations.[18] This is based on age, sex, smoking status, BP, total and high-density lipoprotein cholesterol levels, diabetes and left ventricular hypertrophy to predict a first CVD event.

Adjustments to the Framingham risk calculation were made according to three guidelines — the National Heart Foundation (NHF) *Hypertension management guide for doctors 2004*[19] (the prevailing guideline at the time of data collection), the NHF *Guide to management of hypertension 2008*,[20] and the NVDPA *Guidelines for the assessment of absolute cardiovascular disease risk* (published in 2009).[14] The adjustment criteria are summarised in Box 1. The NVDPA 2009 guideline also states that the Framingham method is likely to underestimate absolute risk in certain patients (Aboriginal and Torres Strait Islander patients, patients with diabetes who are younger than 60 years and do not have microalbuminuria, overweight or obese patients, and patients aged 75 years or older), for whom clinical judgement is required. However, we did not make any further automatic adjustments to the Framingham method of calculating risk in response to the NVDPA suggestion of groups in whom risk might be underestimated.

Unadjusted and adjusted 5-year risks of a cardiovascular event were then classified into low (< 10%), moderate (10% to < 15%) and high (⩾ 15%) categories, as specified in the NHF 2004,[19] NHF 2008[20] and NVDPA 2009[14] guidelines. Patients with established CVD (defined as previous myocardial infarction, stroke, peripheral arterial disease, revascularisation, transient ischaemic attack or angina) were classified into a separate category.

Statistical analyses

Differences between data on participating GPs and data on the GP workforce[17] were tested using the χ^2 test. Sex differences were tested using the χ^2 test for categorical variables and the independent *t* test for differences between means. Agreement between GP estimates of risk and centrally calculated estimates of risk was evaluated using κ statistics. Data entry and manipulations were carried out using SAS version 9.1 (SAS Institute, Cary, NC, USA). Statistical analyses were conducted using STATA version 9.2 (Stata Corporation, College Station, Tex, USA).

Ethics approval

The study was approved by the Royal Australian College of General Practitioners (RACGP) National Research and Evaluation Ethics Committee. All patients gave written informed consent to participate in the study.

RESULTS

GP characteristics and completion of questionnaires

A total of 1416 GPs expressed interest in participating in the AusHEART study, of whom 534 were selected to participate. Of those selected, 322 GPs (60%) provided data for an average of 16 patients each; the remaining 212 did not contribute data or formally withdrew before contributing data. Characteristics of the actively participating GPs, compared with non-participating GPs and the Australian GP workforce, are shown in Box 2. When compared with the Australian GP workforce, the actively participating GPs were more likely to be older and located in a rural area.

At the time of data lock on 28 November 2008, less than 5% of data were missing for most variables on questionnaires completed by GPs. Variables with greater than 5% missing data (ie, data field not completed or indicated as "unknown") were: first degree relative with CVD at < 60 years (9%), left ventricular hypertrophy (8%), hypertensive retinopathy (7%), ultrasound or radiological evidence of atherosclerotic plaque (13%) and estimate of cardiovascular risk in the next 5 years (11%).

2 Characteristics of general practitioners in the AusHEART study compared with the Australian GP workforce

	Australian GP workforce ($n = 24\,903$)*	GPs who expressed an interest in participating			P†
		Total ($n = 1416$)	Non-participating GPs ($n = 212$)	Participating GPs ($n = 322$)	
Women	9636 (39%)	504 (36%)	70 (33%)	129 (40%)	0.59
Age (years)‡					< 0.001
< 35	2370 (10%)	57 (4%)	11 (5%)	9 (3%)	
35–44	6080 (24%)	252 (18%)	39 (18%)	57 (18%)	
45–54	8076 (32%)	506 (36%)	72 (34%)	138 (43%)	
⩾ 55	8377 (34%)	574 (41%)	88 (42%)	112 (35%)	
State					0.66
Australian Capital Territory	383 (2%)	28 (2%)	2 (1%)	7 (2%)	
New South Wales	7948 (32%)	528 (37%)	67 (32%)	113 (35%)	
Northern Territory	345 (1%)	8 (0.6%)	3 (1%)	2 (0.6%)	
Queensland	5051 (20%)	271 (19%)	41 (19%)	61 (19%)	
South Australia	2100 (8%)	100 (7%)	20 (9%)	21 (7%)	
Tasmania	660 (3%)	31 (2%)	5 (2%)	8 (2%)	
Victoria	6057 (24%)	311 (22%)	51 (24%)	81 (25%)	
Western Australia	2359 (9%)	139 (10%)	23 (11%)	29 (9%)	
Practice in rural area§	7097 (28%)	335 (24%)	68 (32%)	115 (36%)	0.004
Practice uses computerised records	na	1138 (80%)	185 (87%)	260 (81%)	
Cardiovascular risk calculators used¶	na	885 (63%)	137 (65%)	209 (65%)	
Paper risk charts	na	554 (39%)	135 (42%)	83 (39%)	
Online or downloaded calculators	na	73 (5%)	22 (7%)	10 (5%)	
Calculators within electronic record system	na	420 (30%)	96 (30%)	68 (32%)	

* Number of GPs for 2007–08 financial year, and data from the Australian Government Department of Health and Ageing.[17] † P values represent χ^2 test comparing actively participating GPs with Australian GP workforce; P values for age and state data represent tests for differences in distribution in age and state categories, respectively. ‡ Some GPs did not declare their age. § Includes practices in remote areas. ¶ Some GPs used more than one calculator. na = not available. ◆

Patient characteristics and risk distribution

Data were obtained from 5293 patients whose sex was recorded and who were aged 55 or older, of whom 3462 (65%) consented to participate in the longitudinal follow-up component of the study. Their demographic and CVD risk factor details are summarised in Box 3. Box 4 shows the distribution of risk categories using Framingham-based risk estimates alone, as well as the distribution using adjustments from the three different Australian guidelines. Using the NHF 2004, NHF 2008 and NVDPA 2009 guideline adjustments, 2211 (42%), 2465 (47%) and 1145 (22%) patients, respectively, were classified as high risk. The NVDPA guideline did, however, state that risk might be underestimated in 793 of the 2026 low-risk patients (39%) and 241 of the 458 moderate-risk patients (53%). If these patients were all categorised as high risk, this would result in a similar risk distribution to that resulting from NHF 2004 adjustments.

GP perception of risk

Of 1548 patients with established CVD, GPs provided an estimated 5-year risk of a cardiovascular event for 1345 patients (87%). For this group, the mean 5-year risk was estimated to be 17%. However, GPs categorised 805 patients with established CVD (60%) as having a 5-year risk of less than 15%.

For the 3745 patients without established CVD, GPs estimated the 5-year risk of a cardiovascular event for 3364 (90%) of patients. Comparison of GP estimates of risk category with centrally calculated estimates showed 48% agreement with estimates calculated using the NHF 2004 guideline ($\kappa = 0.21$), 47% agreement with estimates calculated using the NHF 2008 guideline ($\kappa = 0.20$), and 58% agreement with estimates calculated using the NVDPA 2009 guideline ($\kappa = 0.31$). GP risk categorisation had the strongest agreement with risk calculated using the unadjusted Framingham risk calculation — 60% agreement ($\kappa = 0.33$). By comparison with NHF and NVDPA guideline-based estimation of risk, GPs tended to underestimate their patients' risks.

Prescribing gaps

Box 5 shows prescribing patterns for major cardiovascular medication groups stratified by categories of risk estimated using NHF 2004 guideline adjustments. Of the 1548 patients with established CVD, 780 (50%) were prescribed a combination of a BP-lowering medication, a statin and an antiplatelet agent, and 143 (9%) were prescribed a BP-lowering medication and a statin without an antiplatelet agent. Using unadjusted Framingham risk estimates as well as estimates calculated using the NHF 2004, NHF 2008 and NVDPA 2009 guideline adjustments, 39%, 34%, 32% and 42%, respectively, of patients at high risk of a cardiovascular event in the next 5 years (but without established CVD) were prescribed a combination of a BP-lowering medication and a statin (with or without an antiplatelet

3 Characteristics of patients in the AusHEART study*

Variable	Total ($n = 5293$)	Men ($n = 2325$)	Women ($n = 2968$)
Age (years)	68 ± 9	68 ± 8	68 ± 9
Current smoker	425 (8%)	208 (9%)	217 (7%)†
Body mass index ⩾ 30 kg/m^2	1705 (33%)	721 (32%)	984 (34%)
Diabetes	1163 (22%)	616 (27%)	547 (19%)
Established cardiovascular disease	1548 (29%)	870 (37%)	678 (23%)†
Previously documented chronic kidney disease	312 (6%)	151 (6%)	161 (5%)
Systolic blood pressure (mmHg)	136 ± 17	136 ± 17	135 ± 17
Diastolic blood pressure (mmHg)	76 ± 11	76 ± 11	76 ± 11
Cholesterol			
Total cholesterol (mmol/L)	4.97 ± 1.04	4.70 ± 1.03	5.18 ± 1.00†
Low-density lipoprotein cholesterol (mmol/L)	2.85 ± 0.92	2.72 ± 0.91	2.96 ± 0.92†
High -density lipoprotein cholesterol (mmol/L)	1.43 ± 0.44	1.26 ± 0.37	1.56 ± 0.45†
Albuminuria			
Microalbuminuria‡	1121 (22%)	586 (26%)	535 (19%)
Macroalbuminuria or proteinuria§	203 (4%)	110 (5%)	93 (3%)
eGFR ⩽ 45 mL/min/1.73m^2	229 (4%)	99 (4%)	130 (5%)

* Data are mean ± SD or number (%), and percentages are based on non-missing values. † $P < 0.001$ difference between men and women. ‡ Microalbuminuria defined as: ACR laboratory result, 2.5–25 mg/mmol (men) or 3.5–35 mg/mmol (women); or ACR urinary dipstick result, 3.4–18.2 mg/mmol. § Macroalbuminuria or proteinuria defined as: ACR laboratory result, > 25 mg/mmol (men) or > 35 mg/mmol (women); or ACR urinary dipstick result, > 33 mg/mmol. eGFR = estimated glomerular filtration rate. ACR = albumin to creatinine ratio. ◆

agent). When applying the criteria for PBS statin subsidy for high-risk patients without established CVD (using NHF 2004 guideline adjustments), treatment would not be recommended to 1537 of 2211 patients (70%) despite being at high risk. An estimated 64% (429 of 674 patients) of high-risk patients eligible for a statin subsidy under the PBS were prescribed a statin.

Of the 1799 patients with and without CVD not prescribed at least one BP-lowering medication, treatment was indicated for 802 (45%), according to the NHF 2004 guidelines. Statin treatment was indicated for 892 (34%) of the 2597 patients not prescribed a statin, according to the 2005 NHF and Cardiac Society of Australia and New Zealand guidelines.[21]

Achieving target levels of cholesterol and blood pressure

Of the 2364 patients with and without established CVD who were prescribed a statin, 1250 (53%) were not achieving target low-density lipoprotein cholesterol levels (defined as < 2 mmol/L for patients with CVD or < 2.5 mmol/L for all others). Among the 3342 patients with and without established CVD who were prescribed a BP-lowering agent, 1956 (59%) were not achieving target BP levels (defined as ⩽ 125/75 mmHg for patients with proteinuria, ⩽ 130/85 mmHg for those with coronary heart disease, diabetes, stroke, transient ischaemic attack, macroalbuminuria or known chronic kidney disease, or ⩽ 140/90 mmHg for all others).

DISCUSSION

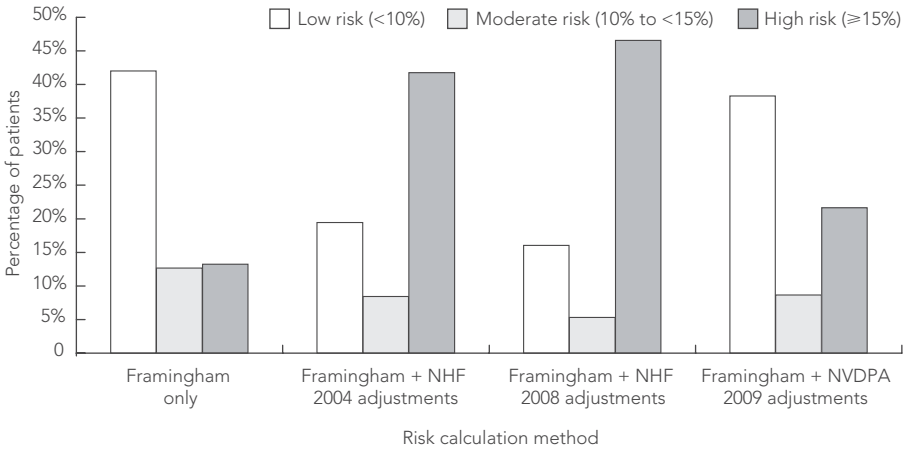
The AusHEART study shows that large evidence–practice gaps exist in primary and secondary prevention of CVD for older Australians. Our findings are similar to those of our previous cross-sectional studies involving younger adults in mainstream and Indigenous health settings,[10,13] and are consistent with recent findings by other investigators.[11,12] The consistency of outcomes suggests that these gaps are entrenched in primary care.

A clear outcome of this study is that uptake of the paradigm for care based on absolute risk is limited. The infrequent use of absolute risk assessments to guide care was shown in three distinct ways. First, about 60% of participating GPs reported using CVD risk calculators. Second, there was substantial disagreement between patients' risks as perceived by GPs and as derived from Framingham-based algorithms. This discordance was prevalent regardless of which guideline adjustment method was used, and GPs tended to substantially underestimate their patients' absolute risks. Third, when stratified by absolute risk category, around two-thirds of patients at high risk of a first CVD event were not prescribed a combination of a BP-lowering medication and a statin.

These evidence–practice gaps are not only related to low uptake of absolute risk-based care. Around half of the patients with established CVD, for whom the evidence for benefits of combination BP-lowering, statin and anti-platelet therapy are well established, were not prescribed this combination. Given that the risk of a subsequent CVD event is very high in patients with established CVD, there are substantial health gains to be made by specifically targeting improved management in this group of patients alone. With around one-third of the sample having established CVD and up to a further 40% assessed as being at high risk of a first CVD event, as well as evidence of substantial evidence–practice gaps, prevention efforts targeted to patients at highest risk might prove highly cost-effective.

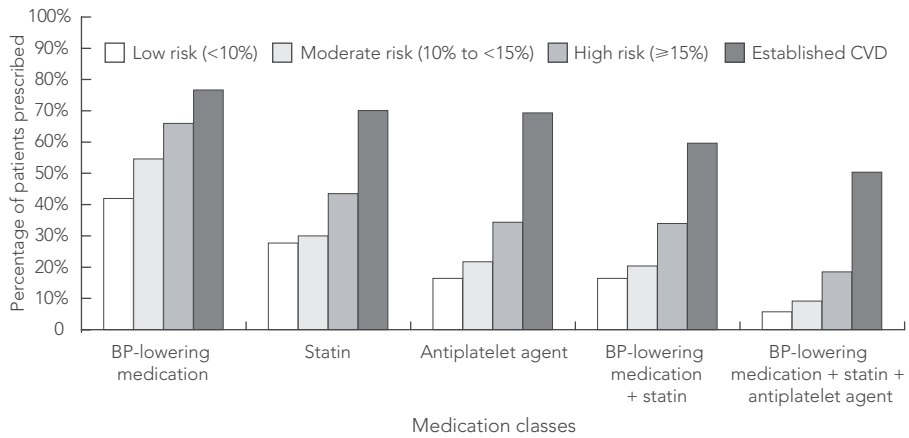
It is possible that this study is not fully representative of the evidence–practice gaps in general practice. Some study factors suggest that the actual gaps might be wider. First, although the sampling method was random, the final group of GPs who participated might represent those more likely to have a specific interest in CVD risk management. Second, the study design prompted the measurement of risk factors if these had not been assessed recently. Such additional measurements might not otherwise have occurred in routine clinical care. Other study factors suggest that the actual gaps might be narrower. First, GPs participating in this study were older than the broader GP workforce and more likely to be practising in a rural area. Second, prescribing pattern assessments were based on a single consultation and therefore did not include new prescriptions provided at subsequent consultations. The planned 5-year follow-up of a large proportion of the cohort will address this limitation and provide data on patients' use of prescribed medications throughout the follow-up period.

4 Distribution of CVD risk categories for patients in the AusHEART study ($n = 5293$), calculated using Framingham risk equations[18] and different guideline adjustments[14,19,20]



CVD = cardiovascular disease. NHF = National Heart Foundation. NVDPA = National Vascular Disease Prevention Alliance. ◆

5 Prescription of major cardiovascular medication groups by CVD risk category, calculated using NHF 2004 guidelines,[19] for patients in the AusHEART study ($n = 5293$)



CVD = cardiovascular disease. NHF = National Heart Foundation. BP = blood pressure. ◆

The evidence–practice gaps found in this study are not only the domain of individual clinicians, they also relate to system failure. A stronger effort to rationalise the many guidelines for assessment and management of CVD risk factors is needed. The NVDPA guideline for CVD risk assessment and future plans for an accompanying management guideline are important advances in creating a standardised approach in primary health care. In addition, the NVDPA is aiming to raise awareness about CVD risk assessment in the general population by providing a simple online risk calculator.[22] A departure from the many existing guidelines for individual diseases might also simplify management options. Harmonisation of guidelines with the PBS is a key accompanying step. The development of point-of-care decision support tools might be another way to increase the use of guidelines.[23] Practice nurses and other non-GP care providers could also play a role in supporting CVD risk management.[24]

This survey highlighted that most patients aged 55 or older who attend GPs are at high risk of CVD. It also revealed significant evidence–practice gaps and, in light of the availability of known and effective therapies to reduce risk, we should give priority to strategies for improving CVD risk management in primary care. We recommend that GPs assess the absolute CVD risk of their older patients and ensure that high-risk patients receive evidence-based pharmacotherapy.

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COMPETING INTERESTS

The AusHEART study was conducted as a collaborative project between the George Institute for International Health and Servier Australia. Emma Heeley received a travel grant from Servier to present AusHEART findings at the European Stroke Conference. Anushka Patel has received speaker fees and travel assistance from Servier. Alan Cass has received an honorarium for speaking at a national education meeting sponsored by Servier. Andrew Weekes and Claire Morgan are employed by Servier Australia and collaborated with the George Institute investigators in the study design and review of the submitted article. Craig Anderson has received speaker fees and educational grants from Boehringer Ingelheim, Servier, Pfizer and Genzyme, and travel assistance to attend meetings from Sanofi-Aventis, Boehringer Ingelheim, Mayo Clinic and the Korean Stroke Society. John Chalmers has received research grants from Servier for the Perindopril Protection Against Recurrent Stroke Study (PROGRESS), the Action in Diabetes and Vascular Disease Preterax and Diamicron MR Controlled Evaluation (ADVANCE) and the AusHEART study, and has received lecture fees for speaking at scientific meetings from Servier.

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