Gaps in cardiovascular disease risk management in Australian general practice

Ruth J Webster, Emma L Heeley, David P Peiris, Clare Bayram, Alan Cass and Anushka A Patel

ABSTRACT

Objective: To evaluate the management of cardiovascular disease (CVD) risk in Australian general practice.

Design, setting and participants: National cross-sectional survey of 99 Australian general practitioners participating in the Bettering the Evaluation and Care of Health (BEACH) program. Data on 2618 consecutive adult patients presenting to the participating GPs over a 5-week period from September to October 2006 were analysed.

Main outcome measures: Proportions of patients screened, treated and reaching targets according to (1) current Australian CVD risk guidelines and (2) overall or absolute CVD risk.

Results: Blood pressure (BP) had not been recorded for 13% of the sample. Of 1400 patients *not* prescribed antihypertensive medication, treatment was indicated for 8%. Of 821 patients already prescribed antihypertensive medication, 59% were achieving target BPs. Data on low-density lipoprotein (LDL) cholesterol levels were not available for 53% of the 2175 patients who should have had lipid screening according to the guidelines. Of 624 patients *not* prescribed a statin, treatment was indicated for 41%. Of 368 already prescribed a statin, 62% were achieving target LDL cholesterol levels. Sufficient data for calculation of absolute risk had been recorded for 74% of the 1736 patients for whom such calculation was recommended by the guidelines. The remaining 26% either had at least one required variable unmeasured (20%) or missing from the data collection (6%). For those at high absolute CVD risk (without established disease) and those with established CVD, 23% and 53%, respectively, had been prescribed both antihypertensive medication and a statin.

Conclusions: Gaps between guideline recommendations and practice in recording and managing BP were relatively low compared with gaps for lipids. When stratified by absolute risk, patients at high risk of a cardiovascular event were found to be substantially undertreated.

MJA 2009; 191: 324–329

In 2005, cardiovascular disease (CVD) was responsible for 35% of deaths in Australia, and in the financial year 2005–06, for more than 450 000 hospital admissions.[1] Prevention is a national health priority. With 88% of Australians estimated to have visited a general practitioner at least once in 2005–06,[2] the primary health care setting provides a clear opportunity for addressing CVD risk.

It is increasingly being recognised that management of an individual's risk factors should be based on the person's overall or absolute risk of experiencing a cardiovascular event, rather than on the levels of each risk factor.[3] Many tools are now available to estimate an individual's 5- or 10-year risk of coronary heart disease or CVD.[4-6] In Australia, many evidence-based guidelines are available to guide GPs in assessing and managing CVD risk. Although there is still a focus on publishing separate guidelines for single risk factors (eg, hypertension,[7] dyslipidaemia[8] and diabetes[9]), these guidelines increasingly incorporate an absolute risk approach. Such a strategy, by targeting individuals with the greatest potential for benefit, maximises the cost-effectiveness of pharmacological interventions.[10] In particular, an absolute risk strategy identifies people with mild or moderate abnormalities of a number of factors that, in combination, substantially increase their risk.

However, few data are available on the management of overall CVD risk in general practice. We sought to evaluate, in contemporary Australian general practice settings:

- the extent to which GPs have data available, at the time of consultation, to allow management of CVD risk factors, with a focus on absolute risk;
- where data are available, the level of adherence to current guidelines for managing individual risk factors; and
- patterns in current prescribing for patients with different levels of absolute risk.

METHODS

The Bettering the Evaluation and Care of Health (BEACH) program is a continuing national cross-sectional survey of general practice activity in Australia. A random sample of GPs who have claimed at least 375 general practice items of service in the preceding 3 months is regularly drawn from Health Insurance Commission (Medicare) data by the Primary and Ambulatory Care Division of the Department of Health and Ageing. These GPs are approached by letter and followed up by telephone. Participating GPs complete details for 100 consecutive patient encounters on structured paper forms and provide information about themselves and their practice. In the 2006–07 collection year, contact was attempted with 4576 GPs, of whom 4057 were contactable and 930 (23%) collected the data.[11] The reliability and validity of data collected via the BEACH methodology have been tested and described elsewhere.[12]

Data for our study were collected as a Supplementary Analysis of Nominated Data (SAND) substudy of the BEACH program from a random sample of 99 GPs over a 5-week period from September to October 2006. In each substudy, the GP, in discussion with the patient and using information from the patient's record, records information about aspects of the patient's health additional to BEACH encounter data. The full methodology of these substudies is reported elsewhere.[13]

In our study, GPs recorded, for a subsample of 30 of the 100 consecutive encounters (if the patient was aged 18 years or over), the presence, measurement and levels of CVD risk factors and relevant medication use (Box 1). All parameters used for calculation of CVD risk, estimation of indications for treatment and target levels for risk factors

1 Questions asked of general practitioners

Which best describes the patient's smoking status?
Current smoker
Quit < 12 months ago
Quit > 12 months ago
Never smoked

Does the patient have ... ? (yes/no/don't know)
Coronary heart disease
Cerebrovascular disease
Peripheral vascular disease
Overweight/obesity
Family history of heart disease
Proteinuria
Diabetes

Is the patient currently taking ... ? (yes/no)
Statin
Antiplatelet therapy
ACE inhibitor
Angiotensin receptor blocker
β-Blocker
Other antihypertensive agent

What was the patient's most recent BP reading?
Systolic BP/diastolic BP/don't know

What was the most recent serum creatinine level?
.....μmol/L/don't know

What were the most recent levels of total cholesterol/HDL cholesterol/triglycerides?
..... mmol/L/don't know

The patient's most recent tests for each of total cholesterol/HDL cholesterol/ triglycerides were
< 12 months ago
> 12 months ago

ACE = angiotensin-converting enzyme. BP = blood pressure. HDL = high-density lipoprotein. ◆

were taken from Australian guidelines current at the time of data collection.[7,8,14,15]

Estimation of cardiovascular disease risk

Because CVD risk assessment tools are validated only for people aged 30 years and over, patients under 30 years were excluded from the calculation of risk. For eligible patients for whom there were sufficient data, the estimated 5-year risk of a cardiovascular event was calculated using the Framingham equation.[4] As data on left ventricular hypertrophy were not collected, this was assumed to be absent in all patients.

National Heart Foundation of Australia (NHF) guidelines were followed in applying adjustments to the Framingham equation.[7] For patients with diabetes and for patients aged 75 years and over, the estimated 5-year risk was adjusted to a minimum of 15%. Estimated risk was increased by 5% in the presence of a family history of coronary heart disease, identification as Aboriginal or Torres Strait Islander, systolic blood pressure (BP) > 170 mmHg, diastolic BP > 100 mmHg, or total cholesterol level > 8 mmol/L. This 5% increment was applied only once for any individual patient. Patients with established coronary heart disease, cerebrovascular disease or peripheral vascular disease were categorised in a separate high-risk group — those with "established CVD".

Patients for whom the GP had indicated "don't know" for at least one risk factor required for calculation of absolute risk were put in the category of "data not measured/unknown". A further category, "data missing", encompassed patients about whom at least one risk factor required for calculating absolute risk had not been provided by the GP and "don't know" had not been selected.

Patients whose data were "missing" or for whom the GP had indicated "don't know" for variables indicating clinical conditions (eg, proteinuria, diabetes) were assumed not to have the clinical condition.

Determination of indications for measuring blood pressure, lipid levels and absolute risk

NHF guidelines recommend BP measurement for all people aged 18 years and over. Thus, all patients in our study should have had their BP measured.[7]

For lipid screening, NHF guidelines recommend measurement for people who have established CVD, BP > 140/90 mmHg, diabetes, chronic renal failure, proteinuria or a family history of coronary heart disease; or who are current smokers, obese, of Aboriginal or Torres Strait Islander descent, or aged over 45 years.[8,16]

For absolute risk screening, various guidelines recommend measurement for people who are of Aboriginal or Torres Strait Islander descent or aged over 50 years, or who have established CVD, BP > 140/90 mmHg, low-density lipoprotein (LDL) cholesterol level > 2.5 mmol/L, triglyceride level > 2 mmol/L, diabetes or estimated glomerular filtration rate < 60 mL/min/1.73m^2.[7,8,14,15] Because of space limitations on the BEACH form, we could not ask GPs to indicate whether they had actually calculated absolute risk.

Determination of indications for pharmacological treatment

For patients currently not prescribed statins or antihypertensive medication, indications for treatment were determined for those for whom data were available.[7,8,14,15,17] In addition, for these patients, we determined whether the 2006 Pharmaceutical Benefits Scheme (PBS) criteria (which were current for the period of data collection) for subsidised prescription of statin therapy were met.

Ascertainment of target levels for patients already prescribed medication

For patients already taking a statin or antihypertensive medication, we assessed the attainment of NHF-recommended BP and lipid (LDL cholesterol < 2.5 mmol/L) targets.[8]

Statistical analyses

Data are presented as means (SDs) or proportions, as appropriate. The difference in mean age between participating GPs and all Australian GPs was assessed using a paired *t* test. χ^2 tests were used to compare the age and sex distribution of GPs in our study with the 17 628 Australian GPs (defined as vocationally registered GPs and GP registrars) who claimed at least 375 general practice items of service in the comparable 3-month Medicare data period. Statistical analyses were carried out using SAS software, version 9.1 (SAS Institute, Cary, NC, USA).

Ethics approval

Ethics approval was obtained from the Ethics Committee of the Australian Institute of Health and Welfare.

RESULTS

Ninety-nine GPs provided data for 2618 patients aged 18 years and over. GPs agreeing to participate in the BEACH program have previously been shown to be generally representative of the current GP workforce, apart from having a higher mean age.[18] Our sample had fewer GPs aged under 45 years than the broader GP workforce (13% v 34%; $\chi^2 = 20.5$; $P < 0.001$),[18] but was representative with regard to the proportion of male GPs (68% v 65%, respectively; $P = 0.61$).

2 Patient characteristics*

Variable	Men (*n* = 1034)	Women (*n* = 1571)	Total (*n* = 2618)†
Mean age in years (SD)	54.7 (18.7)	52.5 (20.2)	53.3 (19.6)
Location of practice‡§			
Metropolitan	720 (70%)	1094 (70%)	1820 (70%)
Rural or remote	295 (29%)	448 (29%)	743 (28%)
Unknown	19 (2%)	29 (2%)	55 (2%)
Reported diabetes	125 (12%)	127 (8%)	253 (10%)
Current smoker¶	254 (25%)	280 (18%)	537 (21%)
Risk of CVD§			
Established CVD	225 (22%)	203 (13%)	428 (16%)
High risk (> 15%) (excluding patients with established CVD)	150 (15%)	229 (15%)	380 (15%)
Moderate risk (10%–15%)	49 (5%)	25 (2%)	74 (3%)
Low risk (< 10%)	138 (13%)	327 (21%)	465 (18%)
Unable to estimate risk:	472 (46%)	787 (50%)	1271 (49%)
At least one variable not measured by/unknown to GP	304 (29%)	448 (29%)	755 (29%)
At least one variable missing in data collection	45 (4%)	74 (5%)	128 (5%)
Age < 30 years	123 (12%)	265 (19%)	388 (15%)
Medication use			
Statin	247 (24%)	266 (17%)	513 (20%)
Antiplatelet therapy	225 (22%)	222 (14%)	449 (17%)
Antihypertensive therapy	385 (37%)	460 (29%)	849 (32%)

CVD = cardiovascular disease. GP = general practitioner. * Figures are number (%) of patients, except where otherwise specified. † Data on sex were missing for 13 patients. ‡ Data on sex were missing for six patients in metropolitan areas and seven patients in "unknown" areas. § Percentages may not add up to 100% due to rounding. ¶ Current smoker or quit within past 12 months. ◆

Missing data

Proportions of missing data for each variable were small (1%–6%).

Patient characteristics

Patient characteristics are shown in Box 2. The sex distribution and location (rural/metropolitan) of respondents were similar to the distributions for all BEACH encounters.

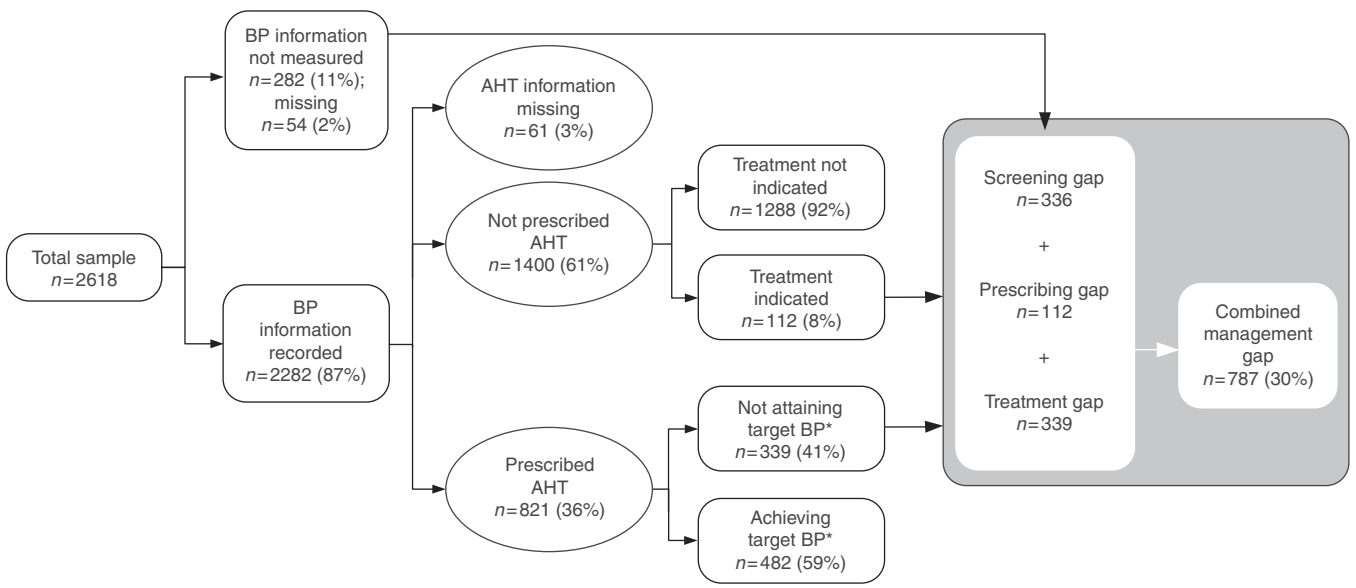
Blood pressure management

Gaps relating to antihypertensive treatment are shown in Box 3. Of patients not being treated, 112 (8%) qualified for treatment according to the 2004 NHF hypertension management guidelines.[7] When the data were re-analysed using the recommendations of the updated 2008 NHF hypertension guidelines,[19] this figure rose to 482 (34%).

Lipid management

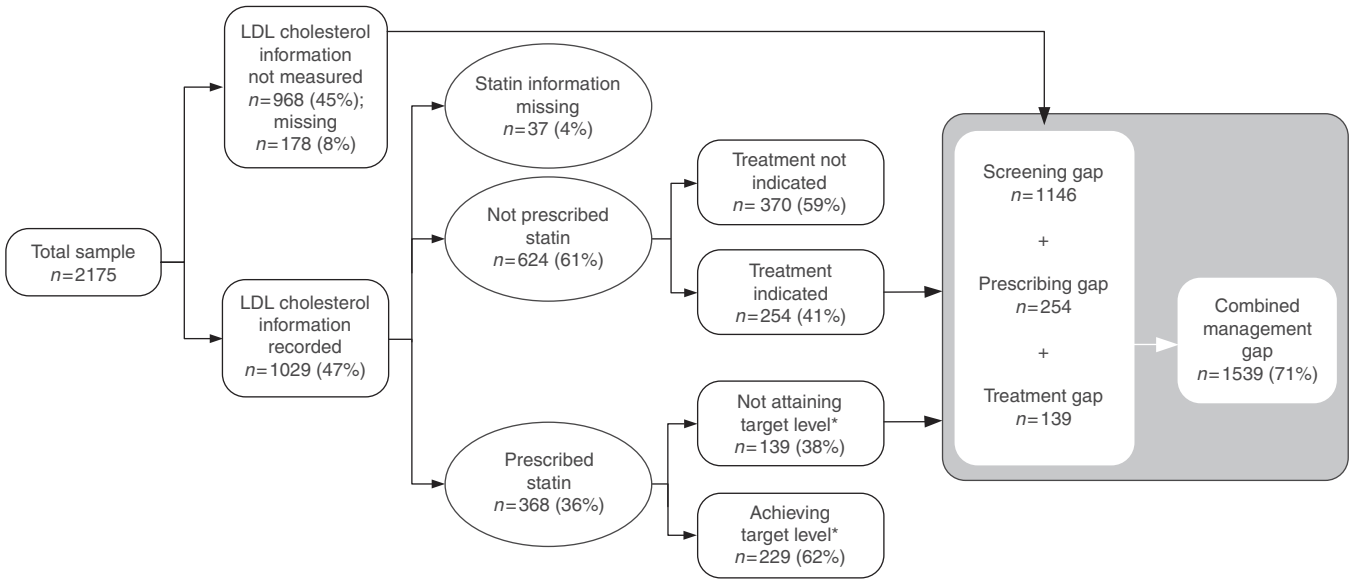
Of the 2618 patients, 2175 (83%) should, according to NHF guidelines, have had their lipid levels measured. Gaps in lipid management are summarised in Box 4. A total cholesterol value had been recorded for 1444 patients (66%). Sufficient information to determine all lipid fractions (high-density lipoprotein cholesterol, LDL cholesterol and triglycerides) was available for 1029 patients (47%). The number of participants with LDL information was used as the basis for

3 Distribution of patients with data on antihypertensive therapy (AHT), and management gap*



BP = blood pressure. * Treatment indication was determined according to National Heart Foundation of Australia guidelines for the management of hypertension. Target BP levels are defined as ⩽ 125/75 mmHg for patients with diabetes and proteinuria; ⩽ 130/80 mmHg for patients with diabetes without proteinuria; and ⩽ 140/90 mmHg for all other patients.[7] ◆

4 Distribution of patients with data on statin treatment, and management gap*



LDL = low-density lipoprotein. * Treatment indication was determined according to National Heart Foundation of Australia/Cardiac Society of Australia and New Zealand guidelines on lipid management. Target LDL cholesterol level is defined as < 2.5 mmol/L.[8] ◆

the flowchart in Box 4, as this is the key variable in determining NHF treatment recommendations. Of the 624 patients not prescribed a statin, 254 (41%) qualified for treatment under NHF criteria. Applying the then-current PBS criteria, 64 (25%) of these 254 would have been eligible for cost-subsidised statin treatment. Applying the current PBS criteria would increase those eligible to 139 (55%).

Absolute risk

According to the guidelines, absolute risk should have been calculated for 1736 patients (66% of the sample), all of whom were aged 30 years or over. Sufficient information was available to calculate this risk in 1282 patients (74%); the necessary data were not measured/unknown for 348 patients (20%); and data were missing for the remaining 99 patients (6%). The distribution of risk for the 1736 patients for whom absolute risk should have been calculated is shown in Box 5. More than a fifth of these patients (22%) were at high risk for CVD.

Treatment stratified by risk category

The proportions of patients in each risk category who were prescribed various cardiovascular medications are summarised in Box 6. Sixty-five per cent of high-risk participants were prescribed at least one medication (a statin, antihypertensive agent or antiplatelet drug). Fifty-three per cent of patients with established CVD and 23% of those at high risk of CVD (without established CVD) were prescribed a combination of an antihypertensive medication and a statin.

Gap between guideline recommendations and actual treatment for high-risk patients

Of the 264 patients at high risk who did not have established CVD and who were not prescribed statins, 10% would have been eligible for treatment according to the 2005 NHF lipid guidelines (52% had insufficient information to make the assessment). Similarly, of the 166 patients at high risk who did not have established CVD and who were not prescribed antihypertensive medication, 51% would have been eligible for treatment according to the 2004 NHF hypertension guidelines (28% had insufficient information to make the assessment).

DISCUSSION

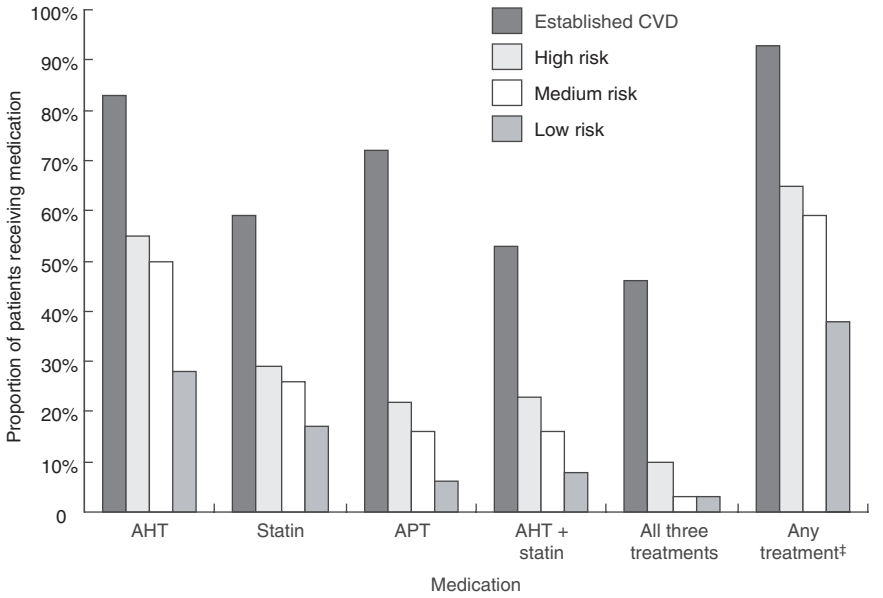
Our survey reveals significant gaps in CVD risk screening and management in Australian general practice. This has been documented previously for people with established disease.[20] We assessed management gaps in the context of the relatively new clinical paradigm of prevention of CVD according to absolute risk. It was not our

5 Distribution of risk and missing data in patients who should have had absolute risk of CVD measured* (*n* = 1736)

Risk category	Number (%)
Established CVD	426 (25%)
High risk (excluding patients with established CVD)	373 (22%)
Medium risk	74 (4%)
Low risk	416 (24%)
Unable to estimate risk (at least one variable not measured by/unknown to GP):	348 (20%)
HDL cholesterol	325 (93%)†
Total cholesterol	194 (56%)†
Diabetes status	31 (9%)†
Sex	0
Smoking status	5 (1%)†
Blood pressure	4 (1%)†
Unable to estimate risk (at least one variable missing):	99 (6%)
HDL cholesterol	64 (65%)‡
Total cholesterol	25 (25%)‡
Diabetes status	27 (27%)‡
Sex	7 (7%)‡
Smoking status	11 (11%)‡
Blood pressure	20 (20%)‡

CVD = cardiovascular disease. HDL = high-density lipoprotein. * According to the guidelines.[7,8,14,15] † Denominator = 348. ‡ Denominator = 99. ◆

6 Among patients for whom absolute risk of CVD should have been estimated,* proportions of patients receiving antihypertensive therapy (AHT), a statin or antiplatelet therapy (APT), by CVD risk category†



CVD = cardiovascular disease. * According to the guidelines.[7,8,14,15] † Number of patients in each risk category: established CVD (426), high risk (373), medium risk (74), low risk (416). ‡ Any treatment refers to at least one of a statin or antihypertensive or antiplatelet medication. ◆

aim to assess the appropriateness of guideline recommendations for the calculation or adjustment of absolute risk. These issues require debate in other forums. Instead, we sought to quantify guideline adherence and the extent of absolute-risk-based prescribing.

In terms of individual risk factor guidelines, BP was managed reasonably well according to the guidelines current at the time. However, 71% of patients eligible for lipid screening were either not recognised as needing to be screened, were not prescribed appropriate medicines or, once prescribed, were not attaining recommended targets.

When patients were stratified by absolute risk, the management gaps were more striking. Fewer than half of those with established CVD — arguably those at highest risk — were being prescribed the universally recommended combination of antihypertensive, statin and antiplatelet medications.[5,21,22] For those at high risk who had not yet experienced a cardiovascular event, about a third were taking no medications to modify their risk, and fewer than a quarter were prescribed the combination of antihypertensive and statin medications.

We uncovered several factors that may explain these low prescribing rates. First, relevant data were available for fewer than half (47%) of the patients for whom lipid screening was indicated. Having appropriate data is an essential first step in assessing and managing risk. For 20% of patients for whom absolute risk should have been calculated, GPs lacked the data to do so, primarily because lipid levels had not been measured.

Second, treatment generally appears to be based on levels of individual risk factors rather than on absolute risk. This is supported by the guidelines' focus on risk factor levels as targets rather than on treatment to lower absolute risk. Although in our study we were unable to directly assess how frequently GPs performed absolute risk assessment, other studies have shown that most GPs do not routinely calculate absolute risk.[23,24]

Third, under the guidelines current at the time of our study, statins and antihypertensive medications would not have been recommended for some high-risk individuals. It has been shown that guideline recommendations do not always accurately target those at highest risk of CVD.[25,26] Our data support this contention. The move in the 2008 NHF hypertension management guidelines[19] towards risk-based prescribing recommendations (with antihypertensive treatment recommended for all high-risk patients) is a promising initiative. However, the differing approaches between the NHF hypertension and lipid guidelines (including slightly different definitions of patients at high risk, and recommendations for prescribing lipid-modifying therapy in certain high-risk groups being based primarily on LDL cholesterol levels rather than level of CVD risk) could lead to confusion or failure to follow the recommendations.

Fourth, GPs are restricted by PBS prescribing criteria. We found marked differences in recommendations between the NHF lipid guidelines and the 2006 PBS criteria for prescribing statins, although the latest PBS criteria are an improvement.

Our study did not assess non-pharmacological measures of control. Furthermore, we only collected single measurements of BP and lipid levels. In general practice, before prescribing medications, a trial of lifestyle modification and monitoring of risk factors over time is commonly undertaken. In this context, these aspects of study design might have led to an overestimation of management gaps. However, in relation to patients at highest risk, who require pharmacological therapy, this is unlikely to significantly affect our findings.

In addition to non-pharmacological approaches, the use of statins and antihypertensive and antiplatelet medications is the established evidence-based strategy for reducing CVD risk. Clinical practice guidelines help clinicians discern "best-practice medicine". Having multiple, sometimes conflicting, single-risk-factor guidelines confuses time-poor GPs, who are expected to apply different guidelines concurrently. The separate updating of each guideline makes additional demands on GPs' time. Furthermore, CVD risk management, although important, is only one aspect of a GP's workload and can often be provided only opportunistically during consultations, usually about other problems.

The substantial undertreatment of high-risk patients demonstrated in our study suggests that synthesis of current multiple *risk factor* management guidelines into a single *CVD risk* management guideline is urgently required. Essential components of such a guideline would be the endorsement of absolute-risk-based screening and the integration of risk assessment with multifactorial recommendations on management. Such a guideline should comply with National Health and Medical Research Council (NHMRC) recommendations[27] and be endorsed nationally by all relevant peak

professional bodies. Availability of a single consolidated guideline could be an important and necessary initial step towards achieving substantial improvement in CVD risk management in general practice.

A comprehensive strategy for guideline dissemination, to both GPs and specialists, is also essential. Simply providing guidelines will not be sufficient to change clinical practice and alleviate treatment gaps. Development of novel, effective strategies to enhance adherence by both care providers and patients must also be a priority.

ACKNOWLEDGEMENTS

We wish to thank the participating GPs for their generosity. We also thank Peter Arnold for his extensive editorial comment on the manuscript and Helena Britt for her editorial input. Anushka Patel was supported by an NHF Career Development Award, David Peiris by a New South Wales Clinical Excellence Commission scholarship, and Alan Cass by an NHMRC Senior Research Fellowship.

COMPETING INTERESTS

During the data collection period of our substudy, the BEACH program was funded by the National Prescribing Service, AstraZeneca, Janssen-Cilag, Merck Sharp & Dohme, Pfizer, Abbott and Sanofi-Aventis.

AUTHOR DETAILS

Ruth J Webster, BMedSc(Hons), MB BS(Hons), MIPH(Hons), Research Fellow[1]
Emma L Heeley, BSc(Hons), MSc, PhD, Senior Research Fellow[1]
David P Peiris, MB BS, FRACGP, MIPH, Senior Research Fellow[1]
Clare Bayram, BAppSc(HIM)(Hons), Senior Research Officer[2]
Alan Cass, MB BS, FRACP, PhD, Director, Renal Division,[1] Co-Director,[3] and Professor[4]
Anushka A Patel, MB BS, FRACP, PhD, Director, Cardiovascular Division[1]

1 The George Institute for International Health, University of Sydney, Sydney, NSW.
2 Family Medicine Research Centre, School of Public Health, University of Sydney, Sydney, NSW.
3 Poche Centre for Indigenous Health, University of Sydney, Sydney, NSW.
4 Faculty of Medicine, University of Sydney, Sydney, NSW.

Correspondence: rwebster@george.org.au

REFERENCES

1 Australian Institute of Health and Welfare. Australia's health 2008. Canberra: AIHW, 2008. (AIHW Cat. No. AUS 99.)
2 Knox SA, Harrison CM, Britt HC, Henderson JV. Estimating prevalence of common chronic morbidities in Australia. *Med J Aust* 2008; 189: 66-70.
3 Jackson R, Lawes CM, Bennett DA, et al. Treatment with drugs to lower blood pressure and blood cholesterol based on an individual's absolute cardiovascular risk. *Lancet* 2005; 365: 434-441.
4 Anderson KM, Odell PM, Wilson PW, Kannel WB. Cardiovascular disease risk profiles. *Am Heart J* 1991; 121: 293-298.
5 Joint British recommendations on prevention of coronary heart disease in clinical practice: summary. British Cardiac Society, British Hyperlipidaemia Association, British Hypertension Society, British Diabetic Association. *BMJ* 2000; 320: 705-708.
6 Jackson R. Updated New Zealand cardiovascular disease risk–benefit prediction guide. *BMJ* 2000; 320: 709-710.
7 National Heart Foundation of Australia. Hypertension management guide for doctors, 2004. Canberra: NHF, 2003.
8 Tonkin A, Barter P, Best J, et al. National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand: position statement on lipid management — 2005. *Heart Lung Circ* 2005; 14: 275-291.
9 Harris P, Mann L, Phillips P, et al. Diabetes management in general practice. 11th ed, 2005/6. Norah Head: Diabetes Australia and Royal Australian College of General Practitioners, 2005.
10 Jackson R, Lynch J, Harper S. Preventing coronary heart disease. *BMJ* 2006; 332: 617-618.
11 Britt H, Miller GC, Charles J, et al. General practice activity in Australia 2006–07. Canberra: Australian Institute of Health and Welfare, 2008. (AIHW Cat. No. GEP 21.)
12 Britt H, Miller G, Bayram C. The quality of data on general practice — a discussion of BEACH reliability and validity. *Aust Fam Physician* 2007; 36: 36-40.
13 Britt H, Miller GC, Henderson J, Bayram C. Patient-based substudies from BEACH: abstracts and research tools 1999–2006. Canberra: Australian Institute of Health and Welfare, 2007. (AIHW Cat. No. GEP 20.)
14 Royal Australian College of General Practitioners. Guidelines for preventive activities in general practice. 6th ed. Melbourne: RACGP, 2005.
15 National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand. Reducing risk in heart disease 2004: guidelines for preventing cardiovascular events in people with coronary heart disease. Canberra: NHF, 2004.
16 National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand. Lipid management guidelines — 2001. *Med J Aust* 2001; 175 (9 Suppl): S57-S88.
17 National Stroke Foundation. Clinical guidelines for stroke rehabilitation and recovery. Melbourne: NSF, 2005.
18 Britt H, Miller G, Charles J, et al. General practice activity in Australia 2005–06. Canberra: Australian Institute of Health and Welfare, 2007. (AIHW Cat. No. GEP 19.)
19 National Blood Pressure and Vascular Disease Advisory Committee, National Heart Foundation of Australia. Guide to management of hypertension 2008. Canberra: NHF, 2008.
20 Vale MJ, Jelinek MV, Best JD; on behalf of the COACH study group. How many patients with coronary heart disease are not achieving their risk-factor targets? Experience in Victoria 1996–1998 versus 1999–2000. *Med J Aust* 2002; 176: 211-215.
21 National Heart Foundation of Australia and Cardiac Society of Australia and New Zealand. Reducing risk in heart disease 2007: guidelines for preventing cardiovascular events in people with coronary heart disease. Canberra: NHF, 2008.
22 Smith SC Jr, Allen J, Blair SN, et al; AHA/ACC; National Heart, Lung, and Blood Institute. AHA/ACC guidelines for secondary prevention for patients with coronary and other atherosclerotic vascular disease: 2006 update: endorsed by the National Heart, Lung, and Blood Institute. *Circulation* 2006; 113: 2363-2372.
23 Peeters A, Ting J, Nelson MR, McNeil JJ. Coronary heart disease risk prediction by general practitioners in Victoria [letter]. *Med J Aust* 2004; 180: 252.
24 Montgomery AA, Fahey T, MacKintosh C, et al. Estimation of cardiovascular risk in hypertensive patients in primary care. *Br J Gen Pract* 2000; 50: 127-128.
25 Forge BH, Briganti EM. Lipid lowering and coronary heart disease risk: how appropriate are the national guidelines? *Med J Aust* 2001; 175: 471-475.
26 Chen L, Rogers SL, Colagiuri S, et al. How do the Australian guidelines for lipid-lowering drugs perform in practice? Cardiovascular disease risk in the AusDiab Study, 1999–2000. *Med J Aust* 2008; 189: 319-322.
27 National Health and Medical Research Council. A guide to the development, evaluation and implementation of clinical practice guidelines. Canberra: NHMRC, 1999.

(Received 1 Aug 2008, accepted 10 Mar 2009) ❑