

Cardiovascular disease risk management for Aboriginal and Torres Strait Islander peoples in primary health care settings: findings from the Kanyini Audit

David P Peiris, Anushka A Patel, Alan Cass, Michael P Howard, Maria L Tchan, John P Brady, Joanne De Vries, Bernadette A Rickards, Della J Yarnold, Noel E Hayman and Alex D Brown

The lack of progress in improving health outcomes for Aboriginal and Torres Strait Islander (Indigenous) Australians has resulted in intensified efforts to close the life-expectancy gap within a generation.¹ Despite having a 2.5-fold greater total disease burden than the non-Indigenous population,² Indigenous Australians substantially underutilise primary health care consultations,^{3,4} pharmaceutical subsidies,³ and specialist care.⁵ Important barriers to improved primary health care might include this inadequate access to care, an insufficient capacity in health service systems,⁶ and dysfunctional patient-provider interactions.⁷

At least a third of the total Indigenous disease burden is attributable to vascular-related disease: cardiovascular disease (CVD), chronic kidney disease (CKD) and diabetes.² Six risk factors (tobacco, high body mass index, high cholesterol level, physical inactivity, high blood pressure, and low fruit and vegetable intake) explain most of this vascular disease burden.² Despite the availability of evidence-based therapies to manage these risk factors, significant evidence-practice gaps exist in both Indigenous⁸ and mainstream primary health care.⁹

Vascular disease prevention strategies based on a person's overall or absolute cardiovascular risk maximise benefits and outperform the traditional approach which relies on management of single risk factors in isolation.¹⁰ Risk-based targeting of safe, effective drug therapies to those most likely to benefit could substantially reduce the total disease burden.¹¹ There has been little research on the utility of absolute CVD risk-based management in Indigenous health care settings. Improved identification and management of high-risk individuals, based on adequate risk delineation, could provide a major opportunity to reduce the burden of disease in Indigenous people.

The Kanyini Vascular Collaboration is a national health services research program established to improve vascular disease outcomes for Indigenous people. The program's first study, the Kanyini Audit, aimed to describe the identification and management

ABSTRACT

Objective: To describe cardiovascular disease (CVD) risk management in Indigenous primary health care.

Design, setting and participants: Review of 1165 randomly selected case records of Indigenous Australian adults, aged ≥ 18 years, regularly attending eight health services in diverse settings in New South Wales, Queensland and Central Australia, October 2007 – May 2008.

Main outcome measure: Adherence to CVD risk screening and management guidelines, especially with respect to overall or absolute CVD risk.

Results: More than half the people in the sample (53%) were not adequately screened for CVD risk according to national recommendations. Underscreening was significantly associated with younger age, less frequent attendance, and lower uptake of the Medicare Health Assessment. Of the sample, 9% had established CVD, and 29% of those aged ≥ 30 years were classified as high risk according to the 2004 National Heart Foundation of Australia (NHFA) adjusted Framingham equation. Of those with CVD, 40% (95% CI, 30%–50%) were not prescribed a combination of blood pressure (BP) medicines, statins and antiplatelet agents, and 56% (95% CI, 49%–62%) of high-risk individuals without CVD were not prescribed BP medicines and statins. For high-risk individuals not prescribed BP medicines or statins, 74% (95% CI, 64%–84%) and 30% (95% CI, 23%–39%) respectively, did not meet 2004 NHFA criteria for prescribing of these medications, and of those already prescribed BP medicines or statins, 41% (95% CI, 36%–47%) and 59% (95% CI, 52%–66%) did not meet respective guideline targets.

Conclusions: These management gaps are similar to those found in non-Indigenous health care settings, suggesting deficiencies across the health system. Prescribing guidelines which exclude many high-risk individuals contribute to suboptimal management. Guideline reform and improved health service capacity could substantially improve Indigenous vascular health.

MJA 2009; 191: 304–309

of CVD risk in primary health care services and to identify opportunities for improvement.

METHODS

An audit of a random sample of health care records of Indigenous Australian adults was conducted in collaboration with eight health services in New South Wales, Queensland, and Central Australia between October 2007 and May 2008. Sites with diverse service activity, based on size, location, funding and staffing, were selected.¹² According to the Rural Remote Metropolitan Area classification (RRMA),¹³ two services were in capital cities (RRMA 1), two in major regional centres (RRMA 2–3), two in rural locations (RRMA 4–5), and two in

remote communities (RRMA 7). Seven are Aboriginal Community Controlled Health Services and one is a state government Indigenous health service.

Sampling

We used electronic patient information systems at each health service to produce a list of potential participants. A case record was eligible for inclusion if it identified the patient as an Aboriginal and/or Torres Strait Islander aged ≥ 18 years who had attended the service at least twice in the preceding 2 years. Using a random number generator, 200 records were selected in each of the five larger services, while a third of the eligible records were sampled in the three smaller services. All services predominantly used

1 Care practices and screening gaps at audited health centres, by health centre location (two centres at each location)

	Capital city	Major regional centre	Rural location	Remote community	Total				
Patient records and consultations									
No. of records sampled	200	200	200	200	75	39	201	50	1165
Median (range) consultations per patient in previous 2 years	8 (2–69)	8 (2–98)	11 (2–106)	8 (2–84)	9 (2–56)	6 (2–41)	14 (2–78)	12 (2–97)	10 (2–106)
Consultations per patient (average %) provided by:*									
General practitioner	66%	86%	47%	62%	79%	65%	37%	12%	60%
Registered nurse	29%	13%	26%	11%	21%	35%	60%	87%	31%
Aboriginal health worker	4%	1%	24%	22%	0	0	0.3%	0	10%
Other staff	1%	1%	2%	5%	0.2%	0	3%	1%	2%
Medicare Health Assessment item[†]									
Adult health check (18–54 years)	44%	20%	11%	47%	22%	3%	19%	33%	28%
Older persons check (≥ 55 years)	59%	35%	30%	44%	44%	0	14%	14%	33%
GP management plan	49%	4%	27%	17%	61%	0	0	44%	22%
Risk-factor screening gap[‡]									
Smoking status	44%	13%	20%	18%	24%	15%	46%	48%	29%
Blood pressure	17%	16%	1%	3%	21%	8%	6%	10%	10%
Body mass index	50%	39%	32%	28%	61%	33%	51%	48%	42%
Blood sugar level (without diabetes)	37%	40%	10%	18%	48%	39%	11%	23%	26%
Total : HDL cholesterol ratio	69%	52%	58%	32%	48%	92%	44%	44%	52%
eGFR [§]	46%	37%	27%	23%	34%	62%	34%	23%	34%
Albumin : creatinine ratio [§]	80%	78%	66%	44%	84%	100%	47%	45%	65%
Framingham screening gap [¶]	74%	44%	56%	32%	46%	93%	59%	46%	53%

Data are percentage of column totals unless otherwise stated. HDL = high-density lipoprotein. eGFR = estimated glomerular filtration rate.

* Percentages may not add to 100 because of rounding. † Proportion of patients with a Medicare Health Assessment item in previous 2 years. The denominator for adult health checks and older persons checks was the number in the specified age range. The denominator for GP management plan was patients identified as having cardiovascular disease, chronic kidney disease or diabetes. ‡ The proportion of patients recommended for screening, but a screening result had not been recorded at least once in the previous 2 years. § The denominator for eGFR testing and albumin : creatinine ratio included those with any one of the following: age, > 50 years; systolic blood pressure, > 140 mmHg; diabetes; current smoker; body mass index, ≥ 30 kg/m². ¶ The proportion of those aged ≥ 30 years lacking information on screening for one or more Framingham risk variables. Left ventricular hypertrophy was imputed as not present. ◆

electronic health records, although supplementary paper records for ancillary information were also reviewed.

The auditors were experienced health professionals familiar with the medical software. The web-based data collection form instantaneously queried apparently spurious data entries. Prescribed medicines were searched for on a pharmaceuticals database embedded within this form (using both generic and trade names). At completion, 10% of the records were reaudited to assess inter-rater reliability.

Estimation of CVD risk

Based on the 1991 Anderson Framingham equation, we calculated 5-year CVD risk estimates for people aged ≥ 30 years (people aged < 30 years were excluded because the Anderson Framingham equation is not validated for this group).¹⁴ This equation

uses age, sex, smoking status, blood pressure (BP), total and high-density lipoprotein (HDL) cholesterol levels, presence of diabetes, and presence of left ventricular hypertrophy to predict the risk of a first cardiovascular event (coronary heart disease, stroke, congestive heart failure and peripheral vascular disease). As the presence or absence of left ventricular hypertrophy is not reliably documented in primary care records, this was assumed to be absent.

We calculated risk using the most recent results available (including an average of the two most recent BP readings), whether or not the subjects were being treated for that risk factor. Recognising that the Framingham equation might underestimate risk for Indigenous populations,¹⁵ and acknowledging the absence of population-specific risk equations, the risk estimate was adjusted based on the 2004 National Heart Foundation of Australia (NHFA) recommenda-

tions.¹⁶ People with a recorded diagnosis of coronary heart disease, CVD, or peripheral vascular disease were assigned to the established CVD group. People with diabetes, an albumin : creatinine ratio > 3.0 mg/mmol, or an estimated glomerular filtration rate (eGFR) < 60 mL/min/1.73m², as well as those aged ≥ 75 years, were automatically assigned a 5-year CVD risk ≥ 15%. For all others, a 5% upward adjustment to the Framingham risk estimate was applied.

Risk-factor screening and management

The “screening gap” was defined as the proportion of people, recommended for screening for a particular risk factor, for whom no result of screening had been recorded at least once in the previous 2 years. Screening recommendations for our study were based on the *National guide to a preventive health assessment in Aboriginal and*

2 Vascular risk-factor characteristics of patients obtained from health records

Risk factor	Women (n = 693)		Men (n = 472)		P (age-adjusted sex differences)*
	No. with information available	No. (%) or mean (SE)	No. with information available	No. (%) or mean (SE)	
Diabetes [†]	693	149 (22%)	472	100 (21%)	0.99
Family history of coronary heart disease in a first-degree relative [†]	693	92 (13%)	472	46 (10%)	0.07
Current smoker	483	226 (47%)	349	212 (61%)	<0.001
Body mass index, $\geq 30 \text{ kg/m}^2$	384	182 (47%)	294	90 (31%)	<0.001
Mean (SE) systolic blood pressure (mmHg)	642	122.4 (0.71)	409	125.4 (0.79)	0.006
Mean (SE) cholesterol level (mmol/L)					
Total cholesterol	410	4.8 (0.05)	275	4.9 (0.07)	0.71
LDL cholesterol	323	2.9 (0.05)	203	2.8 (0.06)	0.51
Triglycerides	410	2.1 (0.11)	276	2.6 (0.14)	0.18 [‡]
HDL cholesterol	334	1.2 (0.02)	222	1.1 (0.02)	0.04
Total : HDL cholesterol ratio	334	4.5 (0.08)	222	4.7 (0.10)	0.09
Albuminuria [§]	194	88 (45%)	144	73 (51%)	0.26
eGFR, $< 60 \text{ mL/min/1.73 m}^2$	407	45 (11%)	273	22 (8%)	0.20

LDL = low-density lipoprotein. HDL = high-density lipoprotein. eGFR = estimated glomerular filtration rate.

* Significant differences are in bold type. † If there was no mention in the record of diabetes or family history of heart disease, it was imputed as not present. ‡ Triglyceride values were log transformed for significance testing of sex differences. § Defined as an albumin : creatinine ratio, $> 3.0 \text{ mg/mmol}$.

Torres Strait Islander peoples¹⁷ and the Guidelines for preventive activities in general practice.¹⁸ Generally, these recommend screening Indigenous people for all the Framingham equation risk factors (except left ventricular hypertrophy) from the age of 18 years.¹⁷ Screening recommendations for proteinuria and CKD were based on Kidney Health Australia guidelines¹⁹ (with screening recommended for people with any one of the following: age > 50 years, systolic BP $> 140 \text{ mmHg}$, diabetes, current smoker, body mass index $\geq 30 \text{ kg/m}^2$).

Two “prescribing gaps” were defined: (i) the proportion of people currently not prescribed BP medicines or statins, where the NHFA guidelines, current at the time of the audit,^{16,20} recommended treatment; and (ii) the proportion of people classified as being at high cardiovascular risk who were not prescribed BP medicines, statins or antiplatelet medicines. We also used Pharmaceutical Benefits Scheme (PBS) criteria for statin subsidies to assess prescribing gaps.²¹ The “treatment gap” was defined as the proportion of people, already prescribed BP medicines or statins, in whom target levels were not being reached. The study design did not allow for

an assessment of adherence to medication regimens.

The provision of Medicare Health Assessments for Aboriginal and Torres Strait Islander people aged 15–54 years (Item 710) and ≥ 55 years (Items 704, 706) were recorded. These assessments mandate recording of CVD risk-factor information, along with other preventive health measures. Medicare-rebated general practice management plans (Item 721) for people with CVD, CKD or diabetes were also recorded.

Statistical analyses

Frequency distributions were reported as proportions, means or medians. Inter-rater agreement was assessed using the κ statistic for categorical variables, and intra-class correlation coefficients for continuous variables. A pooled, overall κ statistic was calculated using inverted variance-weighted averages. Logistic regression models (for percentage outcome variables) and linear regression models (for continuous outcome variables) were used to assess (i) age-adjusted sex differences in risk-factor characteristics and (ii) age- and sex-adjusted

associations with completeness of recording of Framingham risk-factor variables. Because frequency of health care consultations was not normally distributed, the association with screening practices was analysed non-parametrically using Wilcoxon's rank-sum test.

Ethics approval

Our study protocol was developed in collaboration with the participating Indigenous health services and approved by four regional ethics committees. A written participation agreement was signed between each health service's governing body and the coordinating research institutes.

RESULTS

Sample characteristics

We reviewed 1165 case records from the participating health centres. The mean age of the patients was 41.1 years (95% CI, 40.3–42.0 years); 59% were female, and 72% were ≥ 30 years. The recorded ethnicity was Aboriginal in 90%, Torres Strait Islander in 9%, and both in 1%. We re-audited 111 case records (10%) at five sites. Inter-rater agreement was high. For the categorical variables, the pooled κ statistic was 0.91 (95% CI, 0.88–0.93). For continuous variables, the range of the intraclass correlation coefficient was 0.87–1.00.

Screening gaps and classification of CVD risk

An overview of management practices and risk-factor screening gaps for each health centre is given in Box 1. Screening gaps occurred across all sites and were not related to the remoteness of services. Major contributors to incomplete absolute risk assessments were underscreening for cholesterol and albumin : creatinine ratio levels. Box 2 gives the risk-factor characteristics in people with relevant information available.

Fifty-three per cent of those aged ≥ 30 years lacked information on screening for one or more Framingham risk variables. When compared with the over 30 year olds for whom all Framingham risk variables had been recorded, those with insufficient recorded risk information were significantly younger (mean age, 45.4 years v 50.2 years; sex-adjusted $P < 0.001$), had been seen less frequently at the health service (median number of consultations, 8 v 17; $P < 0.001$), and were less likely to have received a

RESEARCH

Medicare Health Assessment (26% v 68%; age- and sex-adjusted $P < 0.001$). However, there were no significant sex differences and no association between care-provider category and screening for all Framingham risk variables.

Nine per cent of the total sample had established CVD, and 16%, 4% and 29% of those aged ≥ 30 years had a 5-year CVD risk of low ($< 10\%$), medium (10%–14%) and high ($\geq 15\%$), respectively, according to the 2004 NHFA-adjusted Framingham equation.

Prescribing and treatment gaps

Prescribing of BP-lowering medicines and statin therapy, respectively, as measured against NHFA guidelines, are given in Box 3 and Box 4. For individuals currently *not* prescribed statins (Box 4) in whom NHFA guidelines recommend their being prescribed ($n = 208$), only 30% would qualify for subsidised treatment under PBS criteria.

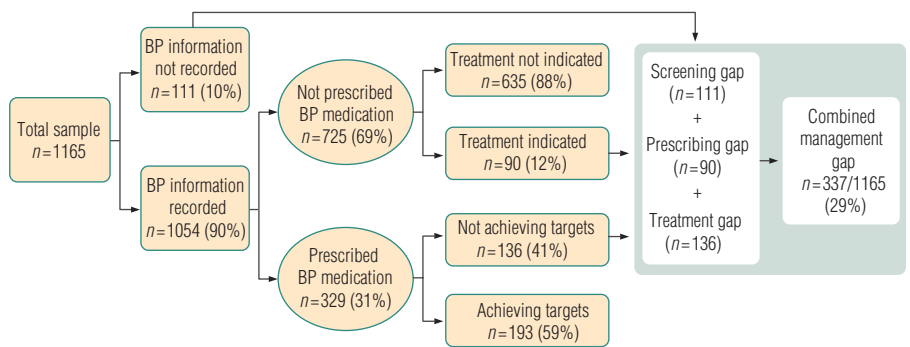
Box 5 examines prescribing gaps by CVD risk category. Forty per cent of people with established CVD were not prescribed combination therapy (BP medicines, statins, antiplatelets), and over half of the high-risk individuals without CVD were not prescribed both a BP medicine and a statin. When applying the 2004 NHFA guidelines for prescribing of BP- and lipid-lowering medications for individuals classified as high risk who have not yet experienced a cardiovascular event, treatment would *not* be recommended for 74% (95% CI, 64%–84%) and 30% (95% CI, 23%–39%), respectively, despite their high-risk status. Similarly, when applying PBS subsidy criteria for statin prescribing to this high-risk group who have not yet experienced a cardiovascular event, 30% would *not* qualify for the subsidy. Receipt of a Medicare preventive health check was not significantly associated with improved prescribing of BP medicines or statins for high-risk individuals.

DISCUSSION

This study provides a comprehensive analysis of CVD risk identification and management in Indigenous primary health care settings. While case record audits have limitations in the accuracy of data captured, we identified several issues with important implications for the effective management of cardiovascular risk.

The first of these was the large screening gaps. Although the absolute risk-based approach has theoretical benefits, its utility

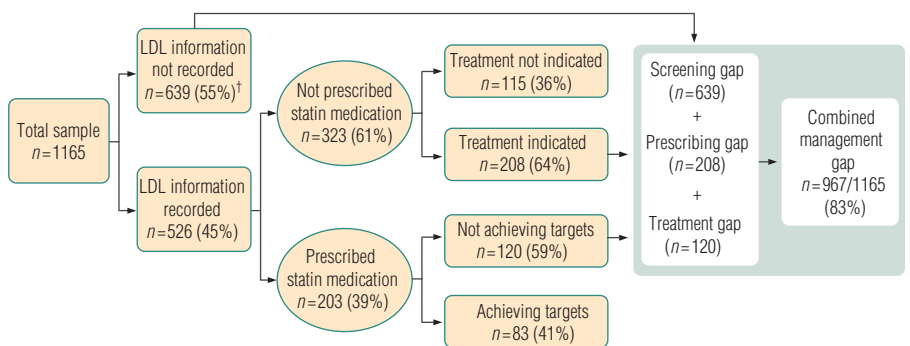
3 Blood pressure (BP) management measured against 2004 National Heart Foundation of Australia guidelines*¹⁶



Except where indicated, the denominator for each percentage is the number in the preceding step.

*Treatment indication was based on a consistent reading of $> 130/80$ mmHg for those with diabetes or chronic kidney disease, and $> 140/90$ mmHg for all other patients. Target BP levels were defined as: (i) $\leq 130/80$ mmHg for patients with established cardiovascular disease, diabetes, chronic kidney disease, or albumin:creatinine ratio > 30 mg/mmol; and (ii) $\leq 140/90$ mmHg for all other patients. ◆

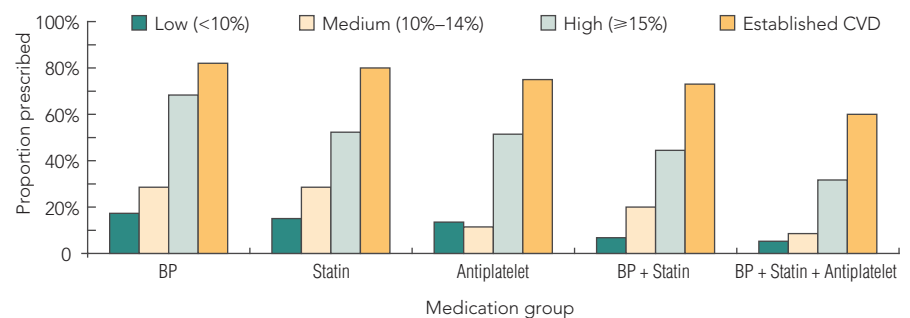
4 Statin prescribing measured against 2005 National Heart Foundation of Australia / Cardiac Society of Australia and New Zealand guidelines*²⁰



Except where indicated, the denominator for each percentage is the number in the preceding step.

*Treatment indication was based on a low-density lipoprotein (LDL) cholesterol level > 2.5 mmol/L or any level in the presence of established cardiovascular disease. Treatment target LDL level was defined as < 2.5 mmol/L. †Includes 27 patients in whom the serum triglyceride level was > 4.5 mmol/L and LDL level could not be calculated. ◆

5 Prescribing of major cardiovascular medication groups by absolute cardiovascular disease (CVD) risk category*



BP = blood pressure. * Five-year cardiovascular disease risk was estimated using the 2004 National Heart Foundation of Australia adjustments to the 1991 Anderson Framingham equation. ◆

was limited by under-ascertainment of risk. The screening gaps were broadly similar to those found in mainstream general practice settings,²² and were especially large for younger, less frequent attendees. They were not related to remote location. It was encouraging that Medicare Health Assessments were associated with significantly smaller screening gaps. Point-of-care testing could be an effective strategy to ameliorate the under-performing of cholesterol and albumin:creatinine ratio tests. Although a national point-of-care program exists,²³ cholesterol testing does not attract a Medicare rebate for health services participating in this program.

Substantial prescribing gaps were encountered for those at highest risk of a CVD event, although risk management compares favourably with previous Australian and New Zealand studies.^{9,22,24,25} Importantly, around a third of high-risk people without CVD were classified by both NHFA guidelines and PBS subsidy criteria as not qualifying for statin therapy, and almost three-quarters did not qualify for prescribing of BP medications under the 2004 NHFA guidelines; this could be considered a “guideline gap”. Although the changes in the 2008 NHFA guidelines will assist BP management, substantial gaps remain in recommendations for lipid-lowering drugs. This supports the findings of Chen et al that there is not only a need for improvement in guideline adherence, but for guidelines themselves to adequately identify appropriate individuals for treatment.²⁶

The barriers highlighted above are not restricted to Indigenous health care. Although the large variability in Aboriginal and Torres Strait Islander health services may mean these findings are not representative of all service settings, the similarity in findings with mainstream general practice²² suggests these barriers are prevalent across the primary health care system.

Based on our study's findings, we endorse current recommendations that an absolute risk-based approach to screening be recommended for Indigenous adults, and that this be incorporated into a preventive health assessment.¹⁷ This check should include the Framingham risk factors (with optional assessment of left ventricular hypertrophy) — albumin:creatinine ratio, eGFR, body mass index and waist circumference, and blood glucose level for people without diabetes, and glycated haemoglobin (HbA_{1c}) level for those with diabetes. Although it might be reasonable to assume that younger

people are less likely to have a CVD event (which might partially explain the large screening gaps in younger people), the sharp rise in Indigenous CVD mortality after the age of 30 provides a strong argument for comprehensive screening from at least this age. Although a national absolute risk-based screening guideline has recently been released,²⁷ a single risk-management guideline now needs to be developed to address prescribing gaps. It must avoid the assumption that all Indigenous people are at high risk, and be linked to appropriate resourcing to support its implementation. Given the evolving and uncertain evidence base, regular revision of the guideline would be essential.

Addressing guideline-related barriers alone is not sufficient. Future work in the Kanyini Vascular Collaboration will enable a better understanding of health system barriers and enablers, which can be used to develop well evaluated, novel intervention strategies in partnership with providers of Indigenous health services. If we are to close the gaps in screening, prescribing and treatment in Indigenous primary care, substantial investment in primary health care systems is needed to implement sustainable, risk-based chronic vascular disease programs that are responsive to community needs.

ACKNOWLEDGEMENTS

On behalf of the Kanyini Vascular Collaboration, the writing committee thanks all health service collaborators and their governing bodies for participating in this work. The Kanyini Vascular Collaboration is funded by a National Health and Medical Research Council (NHMRC) health services research grant (Grant ID #402797). The Collaboration chief investigators, associate investigators and health service representatives include (in alphabetical order): John Boffa, Alex Brown, Alan Cass, Jeannie Devitt, Sandra Eades, Noel Hayman, Nicole Isbel, Stephen Jan, Nancy Long, Peter O'Mara, Anushka Patel, Cilla Preece, Ian Ring, Karmananda Saraswati, Janelle Speed, Greg Stewart, Susan Thomas, Andrew Tonkin, Vicki Wade, Tarun Weeramanthri, Darryl Wright. Full details of the program are available at <<http://www.kvc.org.au>>.

We thank Peter Arnold for his help in editing this article, Avinesh Pillai and Toshiharu Ninomiya for statistical advice, and Annie Preston-Thomas, Janelle Speed, Darryl Wright and Tim Senior for reviewing and providing helpful comments on the manuscript. David Peiris is supported by a scholarship from the New South Wales Clinical Excellence Commission. Anushka Patel has an NHFA Career Development Fellowship and Alan Cass has an NHMRC Senior Research Fellowship. Alex Brown was supported by an NHFA postgraduate scholarship and now has an NHFA Indigenous Postdoctoral Fellowship.

COMPETING INTERESTS

Anushka Patel has received lecture fees and travel assistance from companies manufacturing and marketing blood pressure lowering drugs and/or statins, including Servier, Pfizer, Abbott, Astra-Zeneca and Merck Sharp & Dohme. Alex Brown received travel support from Alphapharm to present preliminary findings of this project at the Cardiac Society of Australia and New Zealand 2008 conference.

AUTHOR DETAILS

David P Peiris, MB BS, FRACGP, MIPH, Senior Research Fellow, Renal Division,¹ and General Practitioner, Tharawal Aboriginal Corporation
Anushka A Patel, MB BS, PhD, FRACP, Director, Cardiovascular Division¹

Alan Cass, MB BS, FRACP, PhD, Director, Renal Division,¹ and Professor and Co-Director, Poche Centre for Indigenous Health, University of Sydney

Michael P Howard, RN, MHN, MPH, Project Manager²

Maria L Tchan, BN, MPH, Program Manager, Renal Division¹

John P Brady, BScApp, Indigenous Research Fellow³

Joanne De Vries, DipPHC, Program Coordinator and Indigenous Research Fellow⁴

Bernadette A Rickards, RN, MPH, Research Assistant²

Della J Yarnold, MB, Research Fellow, Renal Division,¹ and PhD Candidate, Children's Health Research Centre, Westmead Children's Hospital, University of Sydney

Noel E Hayman, MB BS, MPH, FAFPHM, Clinical Director,³ and Associate Professor, School of Medicine, University of Queensland

Alex D Brown, BMed, MPH, FCSANZ, Head²

¹ The George Institute for International Health, University of Sydney, Sydney, NSW.

² Centre for Indigenous Vascular and Diabetes Research, Baker IDI Heart and Diabetes Institute, Alice Springs, NT.

³ Inala Indigenous Health Service, Queensland Health, Brisbane, QLD.

⁴ Wuchopperen Health Service, Manoora, QLD.

Correspondence: alex.brown@bakeridi.edu.au

REFERENCES

- 1 Aboriginal and Torres Strait Islander Social Justice Commissioner and the Steering Committee for Indigenous Health Equality. Close the Gap. National Indigenous health equality targets. Outcomes from the National Indigenous Health Equality Summit. http://www.hreoc.gov.au/social_justice/health_targets/health_targets.pdf (accessed Aug 2009).
- 2 Vos T, Barker B, Stanley L, Lopez AD. The burden of disease and injury in Aboriginal and Torres Strait Islander peoples, 2003. Brisbane: University of Queensland, 2007.
- 3 Australian Institute of Health and Welfare. Expenditures on health for Aboriginal and Torres Strait Islander peoples, 2004–05. Health and welfare expenditure series no. 33. Canberra: AIHW, 2008. (AIHW Cat. No. HWE 40.)

RESEARCH

- 4 Kelaher M, Dunt D, Thomas D, Anderson I. Comparison of the uptake of health assessment items for Aboriginal and Torres Strait Islander people and other Australians: implications for policy. *Aust New Zealand Health Policy* 2005; 2: 21. doi: 10.1186/1743-8462-2-21.
- 5 Cunningham J. Diagnostic and therapeutic procedures among Australian hospital patients identified as Indigenous. *Med J Aust* 2002; 176: 58-62.
- 6 Si D, Bailie R, Cunningham J, et al. Describing and analysing primary health care system support for chronic illness care in Indigenous communities in Australia's Northern Territory — use of the Chronic Care Model. *BMC Health Serv Res* 2008; 8: 112.
- 7 Cass A, Lowell A, Christie M, et al. Sharing the true stories: improving communication between Aboriginal patients and healthcare workers. *Med J Aust* 2002; 176: 466-470.
- 8 Si D, Bailie R, Connors C, et al. Assessing health care systems for guiding improvement in diabetes care. *BMC Health Serv Res* 2005; 5: 56. doi: 10.1186/1472-6963-5-56.
- 9 Vale MJ, Jelinek MV, Best JD. 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.
- 10 Jackson R, Lawes C, Bennet D, 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.
- 11 Jackson R, Wells S, Rodgers A. Will screening individuals at high risk of cardiovascular events deliver large benefits? Yes. *BMJ* 2008; 337: a1371. doi: 10.1136/bmj.a1371.
- 12 Australian Government Department of Health and Ageing, National Aboriginal Community Controlled Health Organisation. A national profile of Australian Government funded Aboriginal and Torres Strait Islander primary health care services. Service activity reporting. 2005–06 key results. Canberra: DoHA, 2008.
- 13 Australian Institute of Health and Welfare. Rural, regional and remote health: a guide to remoteness classifications. Rural health series no. 4. Canberra: AIHW, 2004. (AIHW Cat. No. PHE 53.) <http://www.aihw.gov.au/publications/index.cfm/title/9993> (accessed Jun 2009).
- 14 Anderson KM, Odell PM, Wilson PW, Kannel WB. Cardiovascular disease profiles. *Am Heart J* 1991; 121: 293-298.
- 15 Wang Z, Hoy WE. Is the Framingham coronary heart disease absolute risk function applicable to Aboriginal people? *Med J Aust* 2005; 182: 66-69.
- 16 National Heart Foundation of Australia. Hypertension management for doctors 2004. Canberra: NHFA, 2003. <http://www.heartfoundation.org.au/SiteCollectionDocuments/hypertension%20management%20guide.pdf> (accessed Aug 2009).
- 17 National Aboriginal Community Controlled Health Organisation. National guide to a preventive health assessment in Aboriginal and Torres Strait Islander peoples. Melbourne: Royal Australian College of General Practitioners, 2005.
- 18 Royal Australian College of General Practitioners. Guidelines for preventive activities in general practice. 6th ed. Melbourne: RACGP, 2005.
- 19 Kidney Health Australia. Chronic kidney disease (CKD) management in general practice. Melbourne: KHA, 2007.
- 20 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.
- 21 Australian Government Department of Health and Ageing. PBS-eligibility criteria for lipid lowering drugs fact sheet. Canberra: DoHA, 2006. http://www.health.gov.au/internet/main/publishing.nsf/Content/lipid_eligibilitycriteria.htm (accessed Apr 2009).
- 22 Webster RJ, Heeley EL, Peiris DP, et al. Gaps in cardiovascular disease risk management in Australian general practice. *Med J Aust* 2009; 191: 324-329.
- 23 Martin DD, Shephard MDS, Freeman H, et al. Point-of-care testing of HbA_{1c} and blood glucose in a remote Aboriginal Australian community. *Med J Aust* 2005; 182: 524-527.
- 24 Peiris D, Murray J, Scully D, et al. Cardiovascular risk management at a Maori-led primary health organisation — findings from a cross-sectional audit. *N Z Med J* 2008; 121: 35-46.
- 25 Reid C, Nelson MR, Shiel L, et al. Australians at risk: management of cardiovascular risk factors in the REACH Registry. *Heart Lung Circ* 2008; 17: 114-118.
- 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 Heart Foundation of Australia. National Vascular Disease Prevention Alliance. Guidelines for the assessment of absolute cardiovascular disease risk. Canberra: NHFA, 2009. http://www.heartfoundation.org.au/SiteCollectionDocuments/A_AR_Guidelines_FINAL%20FOR%20WEB.pdf (accessed Jun 2009).

(Received 8 Feb 2009, accepted 2 Jun 2009)

□