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 the 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 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)

<table>
<thead>
<tr>
<th>Patient records and consultations</th>
<th>Capital city</th>
<th>Major regional centre</th>
<th>Rural location</th>
<th>Remote community</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of records sampled</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>75</td>
<td>50</td>
</tr>
<tr>
<td>Median (range) consultations per patient in previous 2 years</td>
<td>8 (2–69)</td>
<td>8 (2–98)</td>
<td>11 (2–106)</td>
<td>8 (2–84)</td>
<td>9 (2–56)</td>
</tr>
<tr>
<td>Consultations per patient (average %) provided by:*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General practitioner</td>
<td>66%</td>
<td>86%</td>
<td>47%</td>
<td>62%</td>
<td>79%</td>
</tr>
<tr>
<td>Registered nurse</td>
<td>29%</td>
<td>13%</td>
<td>26%</td>
<td>11%</td>
<td>21%</td>
</tr>
<tr>
<td>Aboriginal health worker</td>
<td>4%</td>
<td>1%</td>
<td>24%</td>
<td>22%</td>
<td>0%</td>
</tr>
<tr>
<td>Other staff</td>
<td>1%</td>
<td>1%</td>
<td>2%</td>
<td>5%</td>
<td>0%</td>
</tr>
<tr>
<td>Medicare Health Assessment item†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adult health check (18–54 years)</td>
<td>44%</td>
<td>20%</td>
<td>11%</td>
<td>47%</td>
<td>22%</td>
</tr>
<tr>
<td>Older persons check (&gt; 55 years)</td>
<td>59%</td>
<td>35%</td>
<td>30%</td>
<td>44%</td>
<td>0%</td>
</tr>
<tr>
<td>GP management plan</td>
<td>49%</td>
<td>4%</td>
<td>27%</td>
<td>17%</td>
<td>61%</td>
</tr>
<tr>
<td>Risk-factor screening gap‡</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking status</td>
<td>44%</td>
<td>13%</td>
<td>20%</td>
<td>18%</td>
<td>24%</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>17%</td>
<td>16%</td>
<td>1%</td>
<td>3%</td>
<td>21%</td>
</tr>
<tr>
<td>Body mass index</td>
<td>50%</td>
<td>39%</td>
<td>32%</td>
<td>28%</td>
<td>61%</td>
</tr>
<tr>
<td>Blood sugar level (without diabetes)</td>
<td>37%</td>
<td>40%</td>
<td>10%</td>
<td>18%</td>
<td>48%</td>
</tr>
<tr>
<td>Total: HDL cholesterol ratio</td>
<td>69%</td>
<td>52%</td>
<td>58%</td>
<td>32%</td>
<td>48%</td>
</tr>
<tr>
<td>eGFR§</td>
<td>46%</td>
<td>37%</td>
<td>27%</td>
<td>23%</td>
<td>34%</td>
</tr>
<tr>
<td>Albumin : creatinine ratio§</td>
<td>80%</td>
<td>78%</td>
<td>66%</td>
<td>44%</td>
<td>84%</td>
</tr>
<tr>
<td>Framingham screening gap¶</td>
<td>74%</td>
<td>44%</td>
<td>56%</td>
<td>32%</td>
<td>46%</td>
</tr>
</tbody>
</table>

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). 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, and acknowledging the absence of population-specific risk equations, the risk estimate was adjusted based on the 2004 National Heart Foundation of Australia (NHFA) recommendations. 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
Torres Strait Islander peoples\(^{17}\) 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 guidelines\(^ {19} \) (with screening recommended for people with any one of the following: age > 50 years, systolic BP > 140 mmHg, diabetes, current smoker, body mass index > 30 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 \( \kappa \) statistic for categorical variables, and intra-class correlation coefficients for continuous variables. A pooled, overall \( \kappa \) 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 \( \kappa \) 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 vs 50.2 years; sex-adjusted \( P < 0.001 \)), had been seen less frequently at the health service (median number of consultations, 8 vs 17, \( P < 0.001 \)), and were less likely to have received a

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

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Women (n = 693)</th>
<th>Men (n = 472)</th>
<th>( P ) (age-adjusted sex differences)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes(^1)</td>
<td>693</td>
<td>472</td>
<td>0.99</td>
</tr>
<tr>
<td>Family history of coronary heart disease in a first-degree relative(^2)</td>
<td>693</td>
<td>472</td>
<td>0.07</td>
</tr>
<tr>
<td>Current smoker</td>
<td>483</td>
<td>349</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Body mass index, ≥ 30 kg/m(^2)</td>
<td>384</td>
<td>294</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Mean (SE) systolic blood pressure (mmHg)</td>
<td>642</td>
<td>409</td>
<td>0.006</td>
</tr>
<tr>
<td>Mean (SE) cholesterol level (mmol/L)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>410</td>
<td>275</td>
<td>0.71</td>
</tr>
<tr>
<td>LDL cholesterol</td>
<td>323</td>
<td>203</td>
<td>0.51</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>410</td>
<td>276</td>
<td>0.18(^{18})</td>
</tr>
<tr>
<td>HDL cholesterol</td>
<td>334</td>
<td>222</td>
<td>0.04</td>
</tr>
<tr>
<td>Total: HDL cholesterol ratio</td>
<td>334</td>
<td>222</td>
<td>0.09</td>
</tr>
<tr>
<td>Albuminuria(^3)</td>
<td>194</td>
<td>144</td>
<td>0.26</td>
</tr>
<tr>
<td>eGFR, &lt; 60 mL/min/1.73 m(^2)</td>
<td>407</td>
<td>273</td>
<td>0.20</td>
</tr>
</tbody>
</table>

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 mg/mmol.

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

The study design did not allow for an assessment of adherence to medication regimens.
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 (≥ 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

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

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-ascertained risk. The screening gaps were broadly similar to those found in mainstream general practice, 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, 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. 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.

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 practice 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. 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 with diabetes, and glycated haemoglobin (HbA1c) 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, 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 Isabel, 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, Tan Vu Anh, 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 marketing and manufacturing 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.

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