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GP detection of health risk factors among general practice patients at risk of primary and secondary stroke

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Abstract

Background. People with a history of stroke or heart disease are at increased risk of future stroke; therefore, identification of risk factors by GPs is critical.

Objectives. To compare the following among general practice patients with and without a history of stroke or heart disease: (i) self-reported prevalence rates of lifestyle risk factors; (ii) accuracy of GP detection of patient-reported risk factors and (iii) average proportion of patient-reported risk factors detected by GPs.

Methods. Consecutive patients attending a participating general practice clinic were invited to participate in a cross-sectional touchscreen survey assessing lifestyle risk factors in 2010–11. The GP of each consenting patient completed a corresponding survey assessing the patient’s risk factors. Demographic characteristics of patients and GPs were obtained.

Results. Data from 51 GPs and 564 patients were analysed. Patients without a history of stroke or heart disease reported significantly higher rates of smoking (12%) and risky alcohol consumption (56%) than patients with a history of stroke or heart disease (6% and 36%, respectively). Low sensitivity of GP detection of risk factors was found for all risk factors for all patients. Patients with a history of stroke or heart disease have a significantly higher mean proportion of risk factors detected by their GP compared to patients without a history of stroke or heart disease ($P = 0.00$).

Conclusion. Given low sensitivity and specificity of GP detection of risk factors among patients, alternate methods of identification are needed. Research is required to determine strategies to facilitate secondary care of patients with a history of stroke or heart disease by GPs.

Key words: At-risk groups, prevention, primary care, screening, stroke.
Introduction

*Stroke is prevalent and associated with a high burden of morbidity*

With 5.9 million deaths per year, stroke is the second leading cause of death worldwide and third leading cause of disability-adjusted life-years.\(^1\) Globally, in 2010, there were 16.9 million incidents of stroke and 33 million survivors.\(^1\) Stroke is projected to cost $95 billion in the USA by 2015.\(^2\)

*People with a history of stroke and heart disease are at higher risk of stroke*

A person who has had a stroke has an accumulated risk of secondary stroke of 43% over 10 years.\(^3\) Males and females aged 55 years with a history of cardiovascular disease (CVD) have a 22.4% and 27% risk of stroke over 10 years, respectively.\(^2\) Modifiable health risk factors are also associated with increased risk of stroke, including smoking, obesity or overweight, risky alcohol consumption and inadequate exercise.\(^2\) Identification and management of these lifestyle risk factors are therefore an important part of primary and secondary prevention. Despite this, less than half of all stroke survivors discharged from acute care receive education about modifiable risk factors.\(^3\)

*Role of GPs in stroke prevention*

Preventive care is seen as a key role of general practitioners (GPs), by GPs,\(^4\) and patients believe GPs have a role to play in improving lifestyle risk factors.\(^5\) As detection is a first necessary step in the provision of preventive care, clinical practice guidelines recommend GPs assess patients for modifiable risk factors.\(^5,6\) Assessment involves asking all patients aged 10 years and over about their smoking status and current level of physical activity, asking all patients aged 15 years and over about the quantity and frequency of their alcohol intake, and measuring body mass index (BMI) in all patients
aged 18 years and over.\textsuperscript{5, 6} Although detection and management of modifiable lifestyle risk factors is important for all patients, it is likely to be particularly important for those with a history of stroke or heart disease. Accordingly, clinical practice guidelines recommend secondary prevention through assessment and management of lifestyle risk factors for those with a history of stroke and heart disease.\textsuperscript{7, 8} Although secondary prevention should be initiated in the acute setting via assessments by allied health professions (AHPs) and continued by community rehabilitation services,\textsuperscript{9} the long-term management of risk factors is the primary role of GPs.\textsuperscript{7} Therefore, good communication between secondary and primary AHPs is essential for successful secondary prevention of stroke.\textsuperscript{7}

\textit{Detection of stroke risk factors in primary care is poor}

Previous studies demonstrated GP detection and screening of lifestyle risk factors is poor, with sensitivity of GP detection of at-risk alcohol consumption and overweight and obesity at 27% \textsuperscript{10} and 63%\textsuperscript{, 11} respectively. In addition, only two-thirds of patients are asked about their smoking status in primary care,\textsuperscript{12} with only one-third of patients screened for adequate levels of physical activity.\textsuperscript{13} Little information exists about relative rates of detection of lifestyle risk factors for stroke by GPs for patients with a history of stroke or heart disease. Given risk factors are causally related to stroke and heart disease, higher prevalence of risk factors among this group would be expected. Therefore, this study aimed to compare the following among general practice patients with and without a history of stroke or heart disease: (i) self-reported prevalence rates of lifestyle risk factors; (ii) accuracy of GP detection of patient-reported lifestyle risk factors and (iii) average proportion of patient-reported lifestyle risk factors detected by GPs. Comparison of these two populations allows identification of where suboptimal
care is provided regarding detection of risk factors and recognition of which health risk factors need to be targeted for each population to gain the most benefit and reduce the risk of primary and secondary stroke.

Methods
The study was conducted in 12 general practice clinics in New South Wales and Victoria, Australia, from 2010 to 2011. Ethical approval was obtained from Human Research Ethics Committees of University of Newcastle, Monash University and University of New South Wales.

Participants
Consecutive patients attending a participating general practice clinic were invited to participate in a touchscreen survey while waiting for their appointment. Patients under 18 years of age, with insufficient English, or unable to complete the survey for health reasons were excluded. This study was conducted as part of a larger study exploring CVD and cancer risk factors among Australian general practice patients. All patients who self-reported a history of stroke and/or heart disease, as well as a random sample of patients without a history of stroke or heart disease that had a corresponding GP assessment, were included in the current study. A random sample of 376 patients without a history of stroke (twice the number of patients with a history of stroke or heart disease) was taken (without replacement using the ‘sample’ command in STATA/IC 11.1) from the larger study’s database once patients with a history of stroke or heart disease were removed.


**Procedure**

Upon patient arrival at the clinic, a research assistant sought free and informed consent from those potentially eligible. Consenting patients completed a 12-minute survey on a touchscreen computer prior to their consultation. Gender of non-consenters was recorded to enable assessment of consent bias. Participants provided the research assistant with their name and date of birth to allow linking of their survey results with those of their GP. GPs completed a 3-minute paper and pencil survey for each participant before, during or after their appointment with the patient. GPs were not restricted from consulting their medical notes to complete surveys.

**Measures**

*Patient characteristics*

Patients reported whether they had a history of stroke or heart problems (e.g. blocked arteries and heart attack) via the question ‘Have you ever been told by a doctor or nurse that you have any of these?’ Age, gender, highest level of education completed, country of birth, number of times they had seen the GP in the last 12 months, whether they had private health insurance, had visited the clinic before and had a health care card were obtained.

*Lifestyle risk factors*

Patients reported their smoking status, alcohol consumption per week, amount of exercise per week and BMI. To assess ‘smoking status’, participants were asked ‘Which of the following best describes your smoking status?’ Response options included ‘I smoke daily’, ‘I smoke occasionally’, ‘I don’t smoke now but I used to’, ‘I’ve tried it a few times but never smoked regularly’ and ‘I’ve never smoked’. Participants reporting
that they smoke daily or occasionally were classified as having this risk factor. One review examining smoking status reported a mean difference of only $-4.8\%$ when comparing self-reported status to measured cotinine in saliva.\textsuperscript{17} ‘Alcohol consumption’ was measured via a modified version of AUDIT-C.\textsuperscript{18} Compared to other measures of self-report, this measure has been shown to be effective in identifying individuals with risky alcohol consumption (sensitivity 51–97\% and specificity 78–96\%).\textsuperscript{19} Participants were identified as having this risk factor if they reported consuming more than two standard drinks on a typical day or more than four standard drinks on any drinking occasion.\textsuperscript{20} Participants were asked ‘As a rule, do you do at least half an hour of moderate or vigorous exercise on five or more days a week?’ to assess ‘amount of exercise per week’. Individuals responding ‘no’ were considered as having this risk factor. Correlations between self-report and direct measures of physical activity have been found to reach 0.96.\textsuperscript{21} BMI was assessed by asking patients to report their height (centimeters or feet/inches) and weight (kilograms or stones). Individuals with a calculated BMI of $\geq 25\text{kg/m}^2$ were classified as obese or overweight. Data collected from a subset of patients within the larger study indicated no significant differences between BMI classifications based on measured compared to self-reported height and weight.\textsuperscript{11}

\textit{GP characteristics and patient assessment}

GPs reported if the patient had any of the following health risks: current cigarette smoker, overweight or obese, risky alcohol consumption and inadequate exercise. Response options were ‘yes’, ‘no’ and ‘unsure’. GP’s age, gender, years worked in general practice and number of sessions worked per week were obtained.
**Statistical analysis**

Pearson chi-square analyses were conducted to compare differences in patient characteristics between participants with and without a history of stroke or heart disease. Differences in the prevalence of patient self-reported risk factors between those with and without a history of stroke or heart disease were estimated using logistic regression, where the outcome was the patient’s self-reported risk factor status (present or absent). History of stroke or heart disease was included in the model as an independent variable, as well as *a priori* defined confounding variables (age, gender and health care card holder). As a sensitivity analyses, we also adjusted for patient characteristic variables that had statistically significant differences between the two groups; however, the results of the analyses adjusting for these variables were similar and so have not been reported. GPs responses of ‘unsure’ on the presence of patient risk factors were coded as ‘no’. Patient self-report was considered the gold standard for accuracy of GP detection of risk factors. For each self-reported risk factor, the sensitivity (the proportion of patients with a particular risk factor, where the GP correctly detected risk factor presence), specificity (the proportion of patients without a particular risk factor, where the GP correctly detected risk factor absence), positive predictive values (PPV, the proportion of all patients where the GP declared risk factor presence, where the patient had reported the presence of the risk factor) and negative predictive values (NPV, the proportion of all patients where the GP declared risk factor absence, where the patient had not reported the risk factor) are estimated, with 95% confidence intervals (CIs) presented. Rates of GP risk factor detection (defined as the number of correctly detected risk factors out of the total number of risk factors reported by the patient) were compared between those with a history of stroke or heart disease and those without a history of stroke or heart disease using logistic regression, with
crude and confounder adjusted odds ratios and 95% CIs reported. Jacknife standard errors were used for all estimates to adjust for clustering of patients within GPs. An alpha level of 0.05 was used. Missing data were excluded. All analyses conducted in 2014 using Intercooled Stata 13.1.\textsuperscript{22} The STROBE guidelines were followed in the reporting of this study.\textsuperscript{23}

A sample of 188 patients with a history of stroke or heart disease and 376 without such a history will have 80% power to estimate differences in the rate of correctly detected risk factors by their GP as small as 12% at the 5% significance level. This calculation conservatively assumes a 50% risk factor detection rate for those with a history of stroke/heart disease, each GP sees 10 patients on average, patients from the same GP have an intra-cluster correlation of 0.11, and a design effect of 1.99. We used the ‘clustersampsi’ module in Stata for this calculation.\textsuperscript{24}

\textbf{Results}

For the larger study, at least one GP from each participating general practice took part. A consent rate of 86% was obtained for patients. For the current study, the included sample consisted of 51 GPs, 188 patients with a history of stroke or heart disease and 376 patients without a history of stroke or heart disease. Thirty-two (63\%) of the participating GPs were male, 12 (24\%) GPs were aged 25–44 years and 39\% were aged 45–54 years, with 37\% aged ≥55 years. When asked how many years they have worked in general practice, 4 (8\%) reported having worked ≤5 years, 27\% reported 6–19 years and 65\% reported ≥20 years. Thirteen (25\%) GPs reported they worked ≤20 hours per week, with 73\% working 21–40 hours and 2\% working 41–60 hours.
Patient characteristics are outlined in Table 1.1. Of participants with a history of stroke or heart disease, 50 (27%) reported having a health care card and 173 (98%) had been to the clinic previously. Of participants without a history of stroke or heart disease, 82 (22%) reported having a health care card and 335 (95%) had been to the clinic previously. A significant difference in the proportion of responders reporting to have private health insurance was found between those with (44%) and without (92%) a history of stroke or heart disease ($P = 0.00$).
Table 1.1: Demographic and disease characteristics of participating general practice patients (2010-2011).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Patients with history of stroke/heart disease n=188 (%)</th>
<th>Patients without history of stroke/heart disease n=376 (%)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male 101 (54)</td>
<td>148 (39)</td>
<td>0.0041</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-24 years</td>
<td>2 (1)</td>
<td>23 (6)</td>
<td>0.000</td>
</tr>
<tr>
<td>25-44 years</td>
<td>8 (4)</td>
<td>103 (27)</td>
<td></td>
</tr>
<tr>
<td>45-64 years</td>
<td>42 (22)</td>
<td>139 (37)</td>
<td></td>
</tr>
<tr>
<td>≥65 years</td>
<td>136 (72)</td>
<td>111 (30)</td>
<td></td>
</tr>
<tr>
<td>Health history</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stroke</td>
<td>34 (18)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Heart disease</td>
<td>166 (88)</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Highest level of education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High school education and below</td>
<td>87 (51)</td>
<td>138 (41)</td>
<td>0.0975</td>
</tr>
<tr>
<td>Technical certificate/Diploma</td>
<td>26 (15)</td>
<td>54 (16)</td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>37 (22)</td>
<td>110 (33)</td>
<td></td>
</tr>
<tr>
<td>Postgraduate</td>
<td>10 (6)</td>
<td>23 (7)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>10 (6)</td>
<td>10 (3)</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aboriginal and Torres Strait Islander</td>
<td>0 (0)</td>
<td>2 (1)</td>
<td>0.3258</td>
</tr>
<tr>
<td>Number of times seen GP in last 12 months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>23 (13)</td>
<td>135 (38)</td>
<td>0.000</td>
</tr>
<tr>
<td>4-6</td>
<td>56 (31)</td>
<td>125 (35)</td>
<td></td>
</tr>
<tr>
<td>7-10</td>
<td>37 (21)</td>
<td>47 (13)</td>
<td></td>
</tr>
<tr>
<td>&gt;10</td>
<td>63 (35)</td>
<td>53 (15)</td>
<td></td>
</tr>
</tbody>
</table>

NA=Not Applicable

**Prevalence rates of lifestyle risk factors**

A significant difference in self-reported prevalence rates for smoking \[\chi^2 (50, n = 562) = 4.06, P = 0.05\] and risky alcohol consumption \[\chi^2 (49, n = 540) = 17.43, P = 0.00\] was found among patients with and without a history of stroke or heart disease (Table 1.2).

When adjusted for differences in age, gender and health care card status, these differences were no longer significant.
Table 1.2: Prevalence of general practice patient self-reported lifestyle risk factors.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Patients with history of stroke/heart disease n=188 (%)</th>
<th>Patients without history of stroke/heart disease n=376 (%)</th>
<th>Crude p-value</th>
<th>Adjusted p-value&lt;sup&gt;a&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking</td>
<td>12 (6)</td>
<td>46 (12)</td>
<td>0.05</td>
<td>0.88</td>
</tr>
<tr>
<td>Overweight/obese</td>
<td>101 (58)</td>
<td>200 (57)</td>
<td>0.85</td>
<td>0.81</td>
</tr>
<tr>
<td>Risky alcohol consumption</td>
<td>64 (36)</td>
<td>200 (56)</td>
<td>0.00</td>
<td>0.10</td>
</tr>
<tr>
<td>Inadequate exercise</td>
<td>85 (47)</td>
<td>159 (44)</td>
<td>0.45</td>
<td>0.22</td>
</tr>
</tbody>
</table>

<sup>a</sup>Adjusted for age, gender and healthcare card.

Accuracy of GP detection of lifestyle risk factors

Accuracy of GP identification of risk factors was similar for patients with and without a history of stroke or heart disease (Table 1.3). Sensitivity for GP assessment of smoking status was 67% (95% CI: 48.24–86.54) for patients without a history of stroke or heart disease compared to 50% (95% CI: 5.24–94.76) for those with a history of stroke or heart disease. Specificity for GP assessment of overweight or obesity was almost identical for patients with and without a history of stroke or heart disease, 90% (95% CI: 82.61–97.94) and 89% (95% CI: 84.00–94.66), respectively. Low sensitivity for GP assessment of risky alcohol consumptions was found for patients with a history of stroke or heart disease [17% (95% CI: 8.33–26.04)] and those without a history of stroke or heart disease [12% (95% CI: 6.13–16.98)]. GP specificity for patients reporting inadequate physical activity ranged 73–78% among patients with and without a history of stroke or heart disease.
Table 1.3: Accuracy of GP identification of lifestyle risk factors among general practice patients.

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Patients with history of stroke/heart disease</th>
<th>Patients without history of stroke/heart disease</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sensitivity % [95% CI] Specificity % [95% CI] PPV % [95% CI] NPV % [95% CI]</td>
<td>Sensitivity % [95% CI] Specificity % [95% CI] PPV % [95% CI] NPV % [95% CI]</td>
</tr>
</tbody>
</table>

PPV (Positive Predictive Value); NPV (Negative Predictive Value).
**Proportion of patient-reported risk factors detected by GPs**

On average, GPs correctly detected 38% of risk factors for patients without a history of stroke or heart disease and 51% for those with a history of stroke or heart disease. Results from logistic regression analysis determined that patients with a history of stroke or heart disease have 1.69 higher odds of a GP correctly detecting their risk factors compared to those without a history of stroke or heart disease (OR: 1.69, 95% CI: 1.19–2.39, \( P = 0.00 \)). When adjusted for differences in patient’s age, gender and health care card status, this finding was no longer significant (OR: 1.36, 95% CI: 0.96–1.93, \( P = 0.08 \)).

**Discussion**

**Patient characteristics**

Our sample of patients with a history of stroke or heart disease had higher proportions of males, older aged individuals, those who have visited their GP more frequently within the last 12 months and those without private health insurance compared to patients without a history of stroke or heart disease. These findings are consistent with the previous research that has found prevalence of stroke to be higher among males and older age groups.\(^25\)

**Prevalence rates of lifestyle risk factors**

Given the modifiable risk factors examined are causally related to stroke and heart disease, we expected a higher prevalence of risk factors among those with a history of stroke or heart disease. When adjusted for age, gender and health care card, there were no significant differences between those with and without a history of stroke or heart disease. This may reflect some degree of successful secondary prevention in this population resulting in reduction of lifestyle risk factors. In line with this interpretation, one study in the UK reported a reduction in prevalence of self-reported lifestyle risk factors when assessing patients pre- and post-stroke.\(^26\) Nevertheless, high rates of overweight/obesity (58%) and
inadequate exercise (47%) reported by patients with a history of stroke or heart disease is particularly concerning given the adverse health effects associated with these risks. Greenlund identified higher rates of smoking (26%) and obesity (26%) among patients with a history of stroke compared to those without of stroke or heart disease (24% and 20%, respectively). Differences in prevalence rates between the current study and previous studies can be accounted for by inclusion of past smokers and exclusion of overweight individuals in Greenlund’s study.25

**Accuracy of GP detection of lifestyle risk factors**

The large overlap in CIs for sensitivity, specificity, NPV and PPV for GP detection of risk factors for patients with and without a history of stroke or heart disease suggests that risk factor identification was similar for both groups. The NPV CIs for GP detection of risky alcohol consumption did not overlap for both groups. It is suspected that this is due to variance in prevalence rates for risky alcohol consumption rather than a true difference in GP detection. Sensitivity of GP detection of lifestyle risk factors ranged 17–64% and 12–67% across all risk factors, for those with and without a history of stroke or heart disease, respectively. It is concerning that sensitivity for detection of risk factors was poor, meaning many opportunities for provision preventive care are being missed. In contrast, high rates of specificity were found across all risk factors, ranging 73–99% for patients with a history of stroke or heart disease and 78–99% for patients without a history of stroke or heart disease. This indicates that GPs are able to accurately identify those patients that do not have these risk factors. Our findings are comparable to Heywood et al., who reported sensitivity of 59% and specificity of 92% for GP identification of overweight and obesity. In contrast, sensitivity for detection of risky alcohol consumption (12% and 17%) was lower than that reported for other studies. For example, an international meta-analysis reported that patients’
alcohol problems were correctly recorded in 27% of primary care records. These differences may be due to varying measures and definitions of risk used between studies. Alternatively, they may reflect that GPs place a lower priority on identification of risky alcohol consumption compared to other risk factors.

**Proportion of patient-reported risk factors detected by GPs**

On average, only half (51%) of the risk factors reported by patients with a history of stroke or heart disease were accurately detected by their GP, and even less (38%) were detected for those without a history of stroke or heart disease. There were no significant differences between rates of risk factor detection by GPs for those with and without a history of stroke and heart disease once adjusted for patient’s age, gender and health care card status. Given that our sample of patients with a history of stroke or heart disease visit their GP more frequently than those without a history of stroke or heart disease, a statistically significant difference in the rate of risk factors detected by GPs may have been expected. These results further emphasise the suboptimal detection of lifestyle risk factors for the secondary prevention of stroke in the general practice setting. Previous research also supports our findings regarding patients without a history of stroke or heart disease. A study by Coups et al. that examined general population prevalence of self-reported lifestyle risk factors compared to prevalence of screening for lifestyle risk factors in the USA reported that 28% of patients were not screened for any risk factors, and of patients that reported having at least one risk factor, only 58% of their risk factors were screened for.

**Implications**

The low detection rate of lifestyle risk factors is concerning given the modifiable nature of these risks. Given the higher risk of stroke for those with a history of stroke or heart disease, timely detection and management of risk factors is particularly important for this group.
Given the accumulative nature of risk, that is, the more risk factors an individual has, the greater their future risk of disease,\cite{5} the identification of one health risk factor by GPs should trigger subsequent assessment for additional risk factors, given prevalence rates of multiple risk factors are greater than singular risk factors.\cite{5}

Effective communication between secondary and primary health care providers is crucial to the secondary prevention of stroke.\cite{7} One potential way of improving communication and continuity of care for patients in need of secondary prevention would be the incorporation of patients’ medical history into automatic electronic reminder systems for risk factor assessment in general practice settings. Future research should assess the effectiveness of such reminder systems via Clinical Decision Support Systems on the rates of GP lifestyle risk factor assessment and management among primary care patients. Evidence suggests that the use of reminders is effective in improving health care provider performance,\cite{29} including the delivery of secondary preventive care to stroke survivors.\cite{30} GPs may use this information to assist in the detection of high risk patients and initiate discussions surrounding lifestyle interventions, based on their detected risk factors.\cite{5}

**Limitations**

A small number of general practices ($n = 12$) and GPs ($n = 51$) took park in the study, potentially limiting the sample generalizability. While GPs in the current study reported working slightly fewer direct patient hours per week than GPs in the Bettering the Evaluation and Care of Health (BEACH) study (an ongoing program that continuously collects
information about clinical activities in general practice clinics within Australia),\textsuperscript{31} other GP characteristics were similar.

Our sample of patients with a history of stroke or heart disease consisted of slightly more men, and older participants, compared to patients within BEACH.\textsuperscript{31} Demographic characteristics of patients without a history of stroke or heart disease were similar to patients within BEACH,\textsuperscript{31} suggesting results are generalizable to the wider community of general practice patients. The high consent rate (87\%) is indicative of survey acceptability and representativeness among patients attending general practice clinics.

Self-report data were used to assess prevalence of risk factors among patients. It is possible that this resulted in some under-reporting. Finally, alterations were made to national guidelines related to alcohol consumption prior to data collection. Alterations included removal of the terms ‘risky’ and ‘high-risk’ drinking levels, and reduction in the number of recommended drinks per day for men, and may have caused uncertainty among GPs when defining ‘risky alcohol consumption’.

**Conclusion**

To our knowledge, this is the first study to compare GP detection of patient-reported lifestyle risk factors among general practice patients with and without a history of stroke or heart disease. Results indicated no significant differences in self-reported prevalence rates of lifestyle risk factors among patients with and without a history of stroke or heart disease. Low sensitivity of GP detection of risk factors was found for all risk factors regardless of a patient’s medical history. On average, GPs only detected half of the risk factors reported by patients with a history of stroke or heart disease and even less for patients without a history of stroke or heart disease.
There is considerable room for improvement in detection of lifestyle risk factors for all general practice patients. Alternate methods to identify risk factors are needed, particularly for those patients with a history of stroke or heart disease.
**Declaration**

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Ethical approval: the study was approved by the University of Newcastle Human Research Ethics Committee (HREC) (H-2009-0341), Monash University HREC (2009001860) and the University of New South Wales HREC (HREC 09393/UN H-2009-0341).

Conflicts of interest: none.

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