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## Gaps in primary care documentation of cardiovascular risk factors

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### Abstract

**Background** New Zealand guidelines recommend that cardiovascular risk management should be informed by the absolute risk of a cardiovascular event. This requires knowledge of a person's age, sex, ethnicity, medical and family history, blood pressure, total and HDL cholesterol, diabetes, and smoking status.

**Aim** To establish the extent of primary care documentation of cardiovascular risk factors.

**Methods** An audit of electronic patient records was conducted in practices affiliated with an Auckland primary care organisation (ProCare Health Ltd). The audited population were patients eligible for risk assessment (all Māori and a random sample of non-Māori) who had a consultation with their general practitioner during a four week study period (1 year before the doctor first used cardiovascular electronic clinical decision support software). Audit nurses searched for risk factors documented prior to the study period.

**Results** The records of 1680 individuals from 84 doctors were audited. The study periods prior to which the records were inspected ranged from August 2001 to June 2003. The proportions of records with risk factors documented were: blood pressure 81.8%, cholesterol 62.4%, smoking status 41.5%, diabetes status 16.1%, all these risk factors 6.8%. Recording of blood pressure and of cholesterol was higher in those with cardiovascular disease or diabetes. Recording of blood pressure increased with increasing age, then levelled off at about age 60 years. Documentation of cholesterol was lowest in the oldest and youngest age groups, and in women (at all ages) compared to men.

**Conclusions** Primary care documentation of cardiovascular risk factors was incomplete. Whilst many doctors may know whether patients are smokers or have diabetes, systematic documentation of these factors in particular, is not occurring. In order to realise the large potential benefits associated with population-based cardiovascular risk assessment and management, a substantial investment by government, healthcare organisations, health professionals, and patients is required to collect and record this information.

In New Zealand, for over a decade, cardiovascular guidelines have recommended that risk management decisions be based primarily on a person's absolute risk of having a cardiovascular event.<sup>1-3</sup> Determination of a person's cardiovascular risk requires knowledge of their age, sex, ethnicity, medical and family history, blood pressure, total and high density lipoprotein (HDL) cholesterol, diabetes, and smoking status.

Intensive lifestyle and pharmaceutical-based treatment is recommended if a person is identified as being at high risk (defined as a 15% or greater probability of having a fatal or nonfatal cardiovascular event in the next 5 years according to the Framingham risk prediction equation).<sup>3,4</sup>

Cardiovascular events could be reduced by up to 50% in high risk individuals who are managed appropriately.<sup>3</sup> In light of these benefits, cardiovascular risk assessment and management criteria have been proposed for primary health organisation (PHO) performance indicators.<sup>5</sup>

The objective of this paper is to describe the baseline level of documentation of cardiovascular risk factors (blood pressure, cholesterol, diabetes, and smoking status) in electronic patient medical records in a sample of Auckland general practices prior to the implementation of cardiovascular electronic clinical decision support (ECDS) software.

## Methods

This research is part of a larger 'before-after' study investigating the impact of cardiovascular ECDS software on cardiovascular risk assessment and documentation.<sup>6</sup> General practitioners (GPs) invited to participate were members of ProCare Health Ltd, had used electronic patient records for at least a year, and had PREDICT<sup>TM</sup> ECDS integrated into their practice management system.

Electronic queries were run on the practice management system to find patients registered with the participating doctor who were eligible for cardiovascular risk assessment under the New Zealand cardiovascular risk guidelines' criteria (Māori/Pacific/Indian subcontinent men aged 35 years and over; Māori/Pacific/Indian subcontinent women aged 45 years and over; and 10 years later respectively for all other ethnic groups),<sup>3</sup> who had consulted their doctor during a four week study period 1 year prior to the doctor's first use of the ECDS software.

As the implementation of the ECDS was in several stages (starting in August 2002 and continuing to June 2004), the study periods ranged from August 2001 to June 2003.

The final audit list consisted of all the eligible Māori patients and a randomly selected 15% sample of the eligible non-Māori patients. All Māori patients were included to enhance statistical power as obtaining adequate explanatory power for Māori was an objective of the main study.<sup>6</sup> Patients whose ethnicity was documented as New Zealand Māori or equivalent (Māori, M, or New Zealand Health Information Service ethnicity level 2 code 21) in the electronic medical record were included as Māori. Where no ethnicity was recorded, patients were assumed to be non-Māori.

For each patient, audit nurses manually inspected 2 years of electronic records prior to their entry into the study. The following cardiovascular risk factors were audited:

- Blood pressure (defined as documented if there was a recorded systolic and diastolic measurement anywhere in the patient medical record; otherwise not documented).
- Cholesterol (defined as documented if there was a recorded total/HDL cholesterol ratio, or total cholesterol if there was no ratio, anywhere in the patient medical record; otherwise not documented).
- Smoking status (defined as documented if there was a statement anywhere in the patient medical record or diagnostic code indicating the patient is a current smoker, non-smoker, or past smoker [quit smoking for over 12 months]; otherwise not documented).
- Diabetes status (defined as documented if there was a statement anywhere in the patient medical record or diagnostic code indicating the patient has diabetes or does not have diabetes; otherwise not documented).

In addition, the electronic records were searched for evidence of a history of cardiovascular disease or diabetes at any time prior to the audit date. Cardiovascular disease was defined as present if any of the following conditions were recorded—*ischaemic heart disease, myocardial infarction, angina, coronary artery bypass graft (CABG) surgery, angioplasty or other coronary revascularisation procedure,*

ischaemic stroke (not haemorrhagic stroke), transient ischaemic attack (TIA), claudication, peripheral vascular disease—or if there was more than one prescription for oral or transdermal nitrates.

Diabetes was defined as present if there was a statement to that effect or evidence of prescriptions for oral hypoglycaemic agents, insulin or test strips, or a glycosylated haemoglobin (HbA1c) result above 6%.

To assess factors associated with the recording of blood pressure and cholesterol a mixed logistic regression model was used. In the model, practices and GPs were regarded as random effects and all other variables as fixed effects.

The following patient characteristics were included in the model: age group, sex, ethnicity (Māori or non-Māori), current smoker, the presence of existing cardiovascular disease or diabetes, and holding a High Use Health Card (government subsidy for those with medical conditions requiring frequent GP visits) or Community Services Card (government subsidy for lower income families).

Statistical analyses were conducted using SAS statistical software (version 9.1).<sup>7</sup>

The PREDICT-CVD Evaluation Study was approved by the Auckland Regional Ethics Committee (AKY/04/07/185).

## Results

Eighty-four out of 107 (78.5%) eligible doctors consented to be in the study. Consent was not obtained from 5 doctors who were unable to be contacted, and 18 declined to participate.

The electronic medical records of 1680 individuals were audited; their demographic characteristics are described in Table 1.

**Table 1. Patient demographics**

Variable	N = 1680	
	n	%
<b>Age group (years)</b>		
35–44	107	6.4
45–54	366	21.8
55–64	488	29.0
65–74	377	22.4
75–84	269	16.0
≥85	73	4.3
<b>Sex</b>		
Female	827	49.2
Male	853	50.8
<b>Ethnicity</b>		
Māori	474	28.2
Non-Māori	1206	71.8
<b>High Use Health Card status</b>		
No HUHC	1519	90.4
HUHC	161	9.6
<b>Community Services Card status</b>		
No CSC	919	54.7
CSC	761	45.3

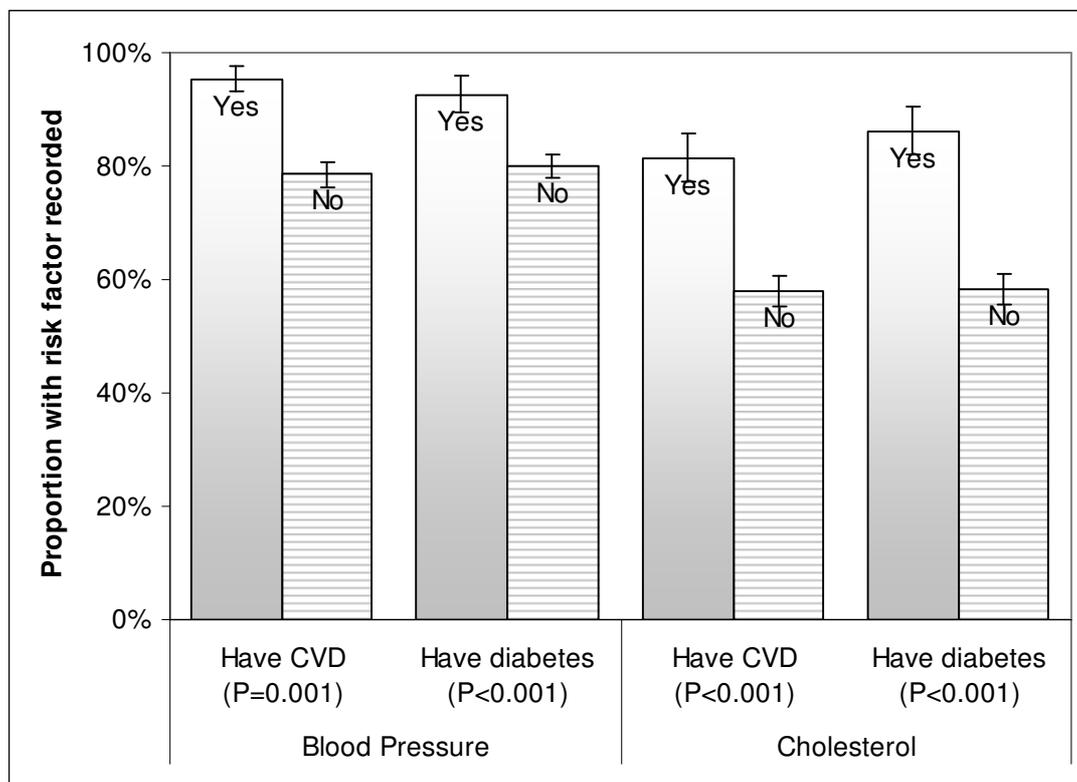
Of those audited, one in five patients (19.5%) had evidence of cardiovascular disease and 14.7% had evidence of diabetes. Blood pressure was documented in 81.8% of

electronic notes, cholesterol in 62.4%, and diabetes status in 16.1% (this included where diabetes was documented as not present).

Smoking status was documented in 41.5%; the coding of smoking and factors that were associated with its documentation are described in more detail elsewhere.<sup>8</sup> Of those without a cardiovascular history, only 6.8% (92/1353) had documentation of all the required cardiovascular risk factors necessary to calculate a 5-year cardiovascular risk score.

The proportion of patients with blood pressure and cholesterol recorded according to the presence or absence of cardiovascular disease and diabetes is shown in Figure 1. The 95% confidence intervals of these proportions are indicated.

**Figure 1. Influence of presence of cardiovascular disease (CVD) and diabetes on recording of blood pressure and cholesterol (proportions and 95% confidence levels; associated p values from the multivariate model are included)**

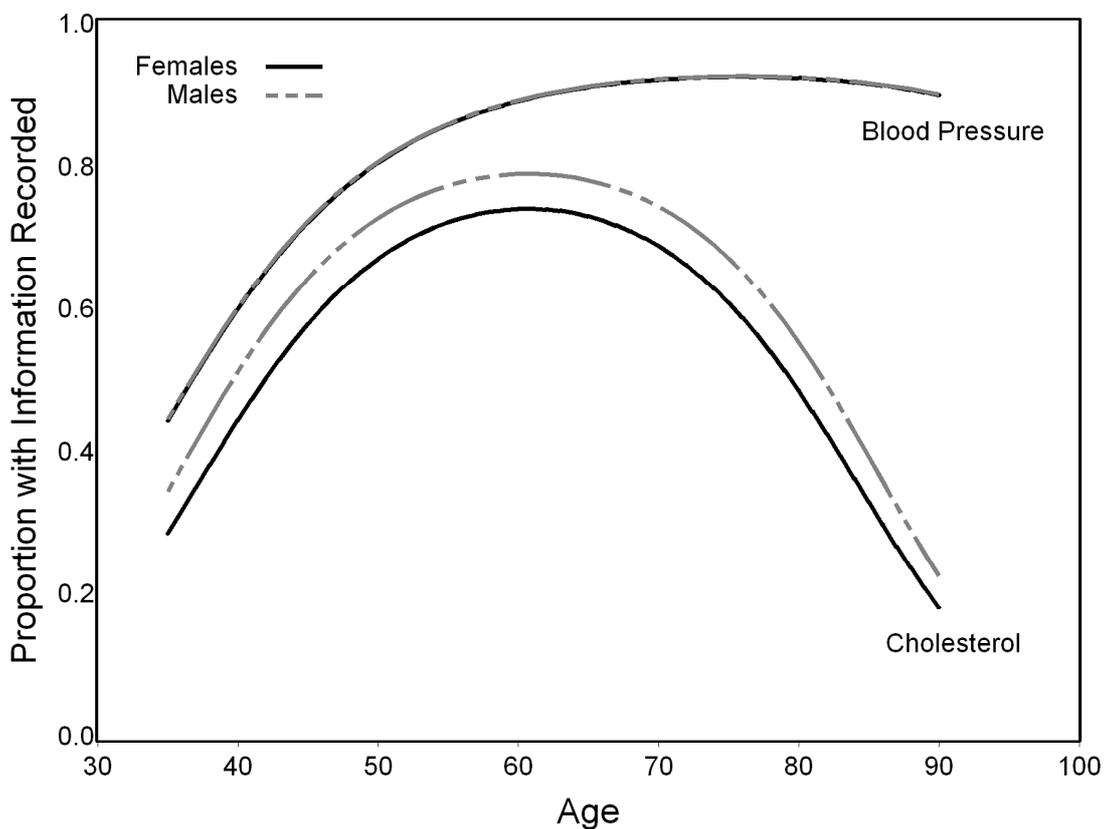


In the multivariate model, age, cardiovascular disease, and diabetes were significantly related to the documentation of blood pressure. Documentation increased steeply with increasing age up to about 60 years, but this increase diminished among the older age groups (Figure 2).

The recording of cholesterol varied significantly with age, cardiovascular disease, diabetes, and sex. A greater proportion of males than females had their cholesterol

levels recorded (69% of males compared to 60% of females overall). Documentation was highest in those aged between about 50 and 70 years, but fell off steeply in both older and younger people (Figure 2).

**Figure 2. Relationship of cholesterol and blood pressure recording with age and sex using the predicted values from the multivariate model**



There were no differences in the recording of blood pressure or cholesterol by recorded smoking status.

## Discussion

In this sample of people eligible for cardiovascular risk assessment, who had visited their GP over a specified 1-month period between August 2001 and June 2003, the documentation of cardiovascular risk factors necessary for risk assessment ranged from 16% (diabetes status) to over 80% (blood pressure).

Whilst many GPs may know the smoking and diabetes status of their patients, this research demonstrates major gaps in the completeness of documentation of risk factors; although GPs are achieving high levels of documentation of blood pressure and cholesterol in patients with cardiovascular disease and diabetes.

Direct comparison with other studies examining documentation is difficult because recording of risk factors is likely to be affected by the population under study and the healthcare system environment, and the method of data extraction may also influence the accuracy of the assessment. However, audits in the United Kingdom have reported similar patterns of low levels of cholesterol documentation particularly in women and older patients.<sup>9-11</sup>

Several studies of cardiovascular risk factor documentation in New Zealand primary care medical records have been published. Lower rates than the current study were reported in 2000, when 64% of men aged at least 45 years and women at least 55 years had systolic blood pressure recorded and 28% had cholesterol recorded—based on electronic data extraction from 25,384 individuals whose medical records were included in the Dunedin Royal New Zealand College of General Practitioners Research Unit database.<sup>12</sup>

Similarly, slightly lower rates than ours were found by the Bold Promise Project audit in 2004 of 180 clinical records from three primary care practices in South Auckland and Hawke's Bay. The Project authors estimated that among the enrolled primary care population who were eligible for cardiovascular screening, 52% had a lipid profile recorded, 72% had a blood pressure, and only 36% had smoking status documented.<sup>13</sup>

In 2003, diabetes audit nurses found 83% of 5917 primary care patients with diabetes in South and West Auckland had their cholesterol ratio documented, with systolic blood pressure recorded in 94% and smoking status in 81%; results which are very similar to our findings.<sup>14</sup>

As with any medical records-based research, there are limitations. General practices in this study are members of one large urban primary care organisation and were the ones who agreed to have the ECDS tool integrated in the practice, so may not be representative of all general practice. However the strengths of the study are the relatively large number of doctors included, good response rate, and the large number of patient medical records manually searched by experienced audit nurses.

This paper presents an estimate of the level of cardiovascular risk factor documentation in the electronic records of New Zealand primary care patients prior to the publication of *The Assessment and Management of Cardiovascular Risk* guideline by the New Zealand Guidelines Group in late 2003.<sup>3</sup> The findings indicate there were major gaps and variability (by medical history, age and sex) in recording of cardiovascular risk factors.

New strategies are required to improve documentation and increase the ability of primary care to implement the cardiovascular risk guideline.<sup>3</sup> Whilst the recording of risk factors or risk may not in itself always lead to improved clinical management of an individual, a controlled trial in patients with diabetes has demonstrated that documentation of cardiovascular risk increases appropriate prescription of preventive therapy and a Canadian study showed greater cholesterol reduction when patients were regularly informed of their cardiovascular risk profile.<sup>15,16</sup>

Lomas provides a framework which can be used to translate research into interventions to enhance systematic risk factor documentation.<sup>17</sup> It focuses on four strategic areas of influence on clinical practice and these are presented below with examples of New Zealand cardiovascular risk initiatives:

- **Patient-centred approaches**—Social marketing to consumers to increase awareness about cardiovascular risk.<sup>18</sup> The *One Heart, Many Lives* social marketing campaign undertaken by PHARMAC between 2003 and 2004 targeted Māori and Pacific men aged 35 and over and raised awareness of heart disease using a theme of positive roles within whānau (family).<sup>19</sup>
- **Practitioner-centred approaches**—Education of primary care teams in the value of systematic risk factor documentation and provision of training in the use of computer software for risk factor documentation.<sup>18,20–22</sup> Nurses in Northland and Auckland trained in the use of ECDS software now run cardiovascular risk clinics in a variety of urban and rural settings.<sup>23</sup> The implementation of PREDICT™ ECDS in Auckland which included training of GPs through regular continuing medical education meetings, showed a four to five fold increase in cardiovascular risk documentation in Māori and non-Māori.<sup>6</sup>
- **Administrative approaches**—The development of an information culture in primary care which acknowledges the time and effort necessary to change behaviour, and of systems which support systematic documentation, preferably within chronic care management programmes. For example, standardised and user friendly coding tools, automatic prompts, performance indicators, regular feedback, and audits to evaluate programme success.<sup>5,18,21–27</sup>

Systems changes and audit were integral to the Bold Promise Project and included pop-up alerts, recalls, use of a standardised screening template, simplified Read coding, and reporting on clinical performance indicators.<sup>13</sup> A Masterton primary care initiative incorporated similar system changes and information technology tools which tracked progress at the practice population level; within 3 years ninety percent of the population eligible for risk assessment had a calculated cardiovascular risk.<sup>28,29</sup>

Such systematic processes are consistent with the Royal College of General Practitioners' Cornerstone practice accreditation programme. Indeed their *Aiming for Excellence* framework recommends practices have systems to update smoking status and participate in population screening programmes.<sup>26</sup>

- **Economic approaches**—Incentives that recognise the resources required to collect and record risk factor information.<sup>11,18</sup> Cardiovascular risk assessment is one of the priority indicators in the New Zealand Ministry of Health's *Diabetes and Cardiovascular Disease Quality Improvement Plan*,<sup>30</sup> DHBNZ's PHO performance indicator programme is likely to provide incentive payments for the completion of risk assessments in 2008.

In conclusion, we have demonstrated that significant gaps existed in the documentation of cardiovascular risk factors in primary care patients eligible for

cardiovascular risk assessment prior to the publication of the most recent national cardiovascular risk assessment and management guidelines at the end of 2003.<sup>3</sup>

While several initiatives have been implemented since then to address the problem, these have not been introduced systematically or countrywide. It is likely that a range of strategies will be required to achieve systematic population-based risk factor recording and cardiovascular risk assessment in the eligible population.

It will be imperative that practices, PHOs, and district health boards (DHBs) develop the capability to accurately audit practice to ensure that any strategies introduced are effective.

**Competing interests:** None known.

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