

Online Management of Cardiovascular Risk in New Zealand with PREDICT™ - Getting Evidence to the "Moment of Care"

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Abstract

Evidence-based clinical guidelines for managing cardiovascular risk recommend treatment decisions based on a patient's absolute risk. Despite the widespread dissemination in New Zealand of both paper-based and stand-alone software tools to rapidly assess cardiovascular risk, studies in general practice have demonstrated that these tools were used infrequently. To address this problem, a web-based clinical decision support programme, PREDICT™-CVD has been developed. The programme was designed so that any member of the clinical team can quickly and simply assess CVD risk and provides real-time, evidence-based "moment of care" advice individualised to the patient's own health profile. The programme integrates seamlessly and securely with existing GP electronic medical records generating important clinical information in a standardised form that can be used for risk profiling populations, developing new risk prediction tools and for clinical audit. Evaluations indicate that PREDICT™-CVD is usable in busy clinical settings and can have a significant impact on practice. Although this programme started in one focused area, it is potentially a forerunner of a major shift towards IT-based evidence-based medicine and the way chronic disease will be managed.

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Background Evidence

Over the past decade there has been a paradigm shift in the management of cardiovascular disease (CVD) risk. Previously, drug treatment was primarily recommended when blood pressure or cholesterol exceeded certain "cut-off" levels. However, clinical guidelines now focus more on absolute or global risk, rather than the levels of individual risk factors.^[1-4] Analysis from the Framingham Heart Study,^[5] a long-term, follow-up study of cardiovascular risk factors in the US, has demonstrated that the risk of having a cardiovascular event over a defined period of time (ie, the absolute risk) is determined more by the cumulative effect of combinations of risk factors (notably age, gender, smoking, blood pressure, cholesterol, diabetes and a previous history of cardiovascular disease) than by high levels of one or two risk factors. For example, at a given level of systolic blood pressure the risk of a cardiovascular event occurring in the next five years might vary more than ten-fold depending on the level and presence of the other risk factors (figure 1). Moreover, randomised trial evidence has shown that the magnitude of treatment benefits is directly proportional to the pre-treatment absolute CVD risk.^[6] Therefore, effective and efficient treatment decisions for managing CVD risk can only be made if the treating clinician is able to accurately determine the patient's absolute CVD risk.

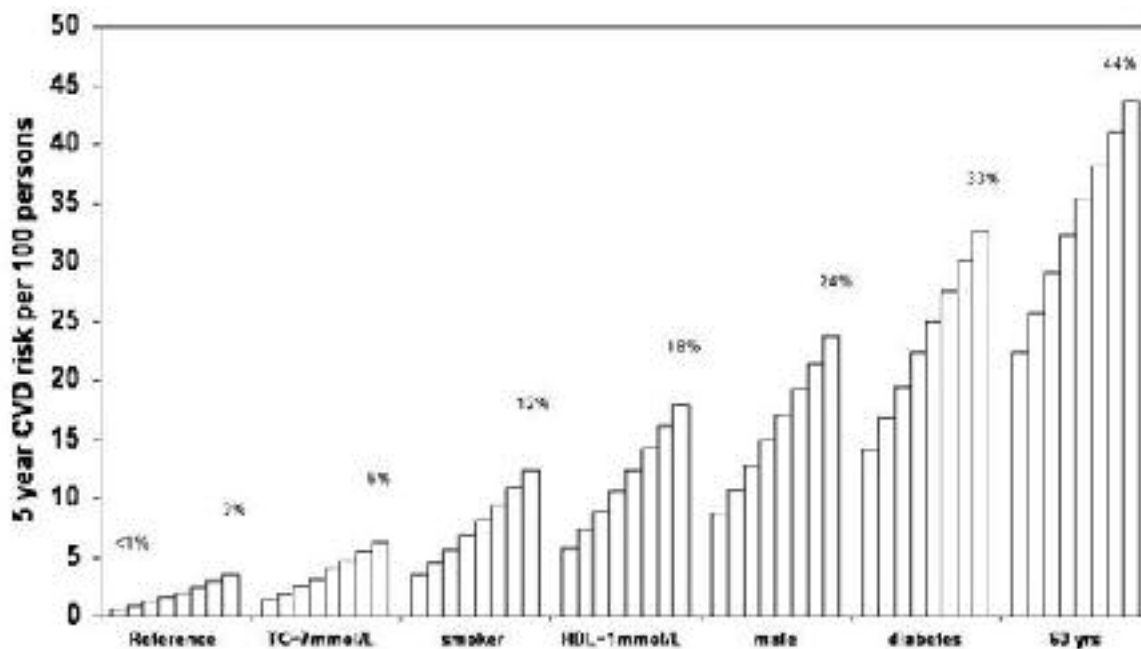


Figure 1: Absolute Risk of Cardiovascular Disease over 5 years in patients by systolic blood pressure (SBP) at specified levels of other risk factors²⁴

Reference category is a female aged 50 years with Total Cholesterol (TC) = 4.0 mmol/L, High Density Lipoprotein Cholesterol (HDL) = 1.6 mmol/L, non-smoker, no diabetes. Risks are given for SBP levels of 110, 120, 130, 140, 150, 160, 170 & 180 mmHg. In each of the other categories additional risk factors are added consecutively, for example the diabetes category is a 50 year old, TC = 7 mmol/L, a smoker, HDL = 1 mmol/L, a male and with diabetes. (Cepled from the Lancet)

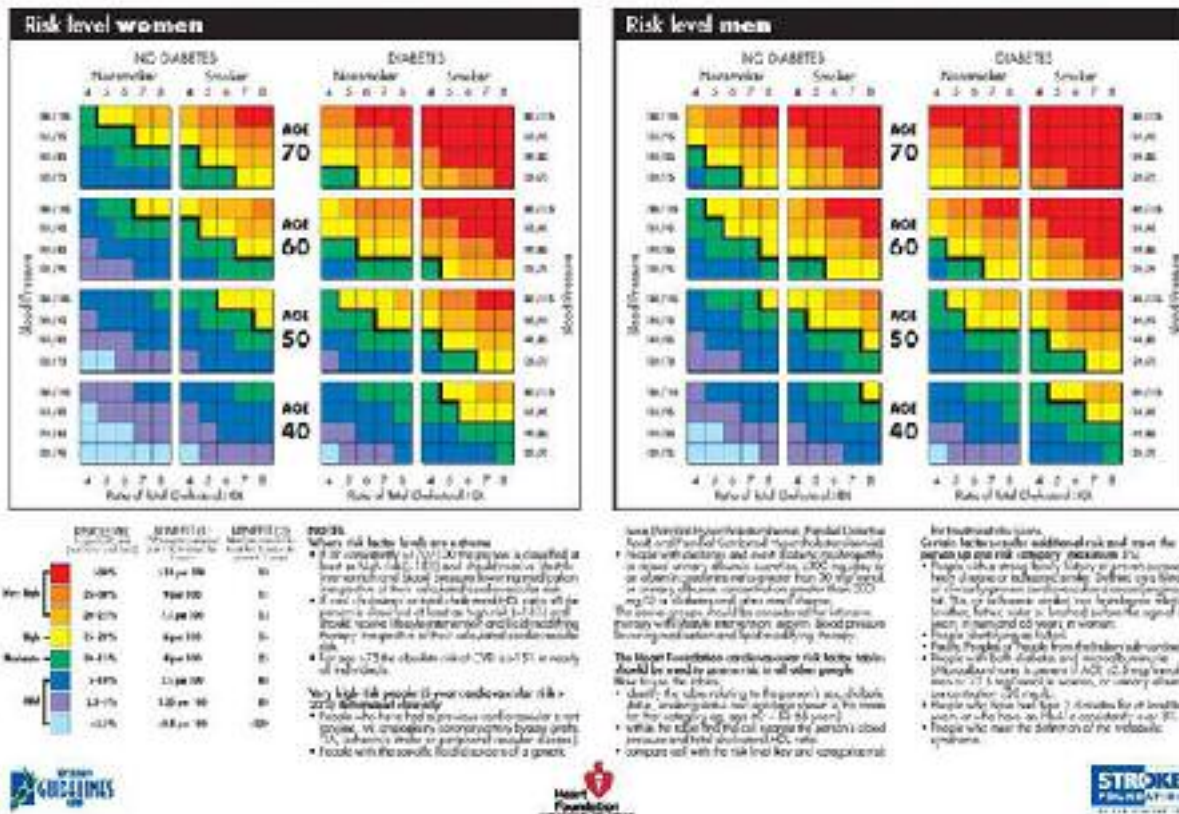
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From The Evidence to Clinical Risk Assessment Tools

The findings described above stimulated the development of simple cardiovascular risk charts to provide clinicians in New Zealand with an easy way to estimate absolute cardiovascular risk at the moment of care. Research had demonstrated that clinicians are unable to accurately estimate a patient's cardiovascular risk without help^[7] - it has been likened to trying to do your tax return in your head. One of the authors (RJ) had experimented using the style of risk tables developed by the Framingham Study investigators,^[8] that required clinicians to add up a series of numeric scores then convert this into an absolute risk score, but found this approach too cumbersome.

First attempts to develop absolute CVD risk charts were incorporated into the 1992 New Zealand guidelines for managing raised blood pressure^[9] and the 1993 National Heart Foundation guidelines for managing dyslipidaemia.^[10] These charts used colour coding to denote absolute risk given the presence or level of risk factors. They were improved in response to feedback from clinicians and as a result of international developments^[11] and in 1996 new colour charts (figure 2) were included in updated guidelines for managing raised blood pressure^[12] and dyslipidaemia.^[13]

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These guidelines with their associated risk charts were widely disseminated by repeated mail outs and were printed in the standard drug compendium used by most New Zealand general practitioners (GPs). There was also considerable promotion via medical opinion leaders with initial implementation involving extended road shows throughout the main centres of New Zealand.

In the late 1990s, CVD risk assessment calculators were also developed as an alternative to the paper-based risk charts. These calculators were stand-alone software programs, some of them having the ability to display the colour chart. Some were included in general practice electronic patient management systems although they did not have the functionality to self-populate patient data.

Uptake of Risk Assessment Tools

Despite the ability that risk charts gave practitioners to rapidly assess a patient's absolute CVD risk and much positive anecdotal feedback about their usefulness from GPs, the use of the risk charts to support the management of raised blood pressure and dyslipidaemia in routine clinical practice was found to be disappointingly low. A nationwide survey of 499 randomly selected New Zealand GPs conducted in 1999 found that the majority used CVD risk charts only once per month or less (table 1).^[14] Based on typical practice populations we estimated that the risk assessment tools should be used daily.

Table 1: Use of CVD risk charts by GPs in New Zealand in 1999

Never	6%
Less than once per month	39%
About once per month	24%
More than twice per month	31%

(Adapted from Arroll et al 2002)^[14]

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The Development of PREDICTTM-CVD - An Integrated Online CVD Risk Assessment and Management Tool

The findings from the Arroll study demonstrated that, in a busy general practice, systematic and comprehensive CVD risk assessment and management would be a challenge. Stimulated by this research, we developed a web-based clinical decision support program, PREDICTTM-CVD Version 1, between 1999 and 2002. We involved a large collaborative group representing clinicians, primary and secondary care organisations, non-governmental organisations (National Heart Foundation and New Zealand Guidelines Group), led in collaboration by clinical epidemiologists at the University of Auckland and Enigma Publishing Ltd (a private provider of online health knowledge systems).

The PREDICTTM-CVD Version 1 program was designed to get the right information to the right people (practitioners and patients) at the right time. There are two main components to PREDICTTM-CVD, a risk assessment component and a risk management component. PREDICTTM-CVD is web-based but integrates into a practitioner's electronic medical record (EMR) system. The front end is a risk assessment screen, much of which will self-populate from the EMR if risk data are available in a standardised format to allow mapping. Using a broadband internet connection PREDICTTM-CVD takes only five seconds to calculate and return a quantified absolute CVD risk assessment based on the data entered at the risk assessment screen. PREDICTTM-CVD also has a risk management screen where additional data on the patient's current management can be entered. PREDICTTM-CVD

then compares the particular patient's current risk assessment and current management with nationally agreed guidelines on managing CVD risk and generates a series of patient-specific management recommendations for the practitioner, again in only five seconds. PREDICT™-CVD also generates a personalised version of these recommendations that can be printed out to help facilitate the patient's care planning and goal setting. Other patient health education materials are also available to be printed out.

PREDICT™-CVD contains a standard core content based on nationally agreed guidelines but the program also allows for local adaptation. This adaptation allows the content of the nationally agreed PREDICT™-CVD module to be modified at district health board or primary care organisation level to reflect care management options locally (for example, contact details of smoking cessation clinics).

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PREDICT™-CVD Implementation

PREDICT™-CVD Version 1, as described above, was implemented in ProCare, a large Auckland primary care organisation (PCO) serving approximately 590,000 patients, during 2003/4 and was also implemented on a smaller scale in a structured chronic care management programme supported by a District Health Board [a] in the Auckland region (Counties Manukau) over the same period. Since then PREDICT™-CVD has been successfully implemented within a Coronary Care Unit of a major Auckland hospital (Middlemore), ensuring that systematic risk management has been completed prior to patient discharge. Currently over 130 GPs are using PREDICT™-CVD and anonymised risk profile data for 12,000 patients has been stored with an encrypted unique identifier.

Version 2 of PREDICT™-CVD is currently in the final stages of testing and now incorporates diabetes risk management guidelines. This version of PREDICT™-CVD/Diabetes is designed for a widespread roll-out throughout New Zealand and it is envisaged that it will be used systematically as the risk assessment and risk management tool by the majority of primary care clinicians in New Zealand within several years.

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PREDICT™-CVD Research and Quality Improvement Opportunities

The academic group involved in developing PREDICT™-CVD plans to work in partnership with the clinical organisations using the program on a range of research and development projects. One of the major research-related benefits of the PREDICT™-CVD approach to CVD risk management is that it encourages the standardisation of clinical data collection and documentation. Practitioners using PREDICT™-CVD are required to enter data in a standardised way to allow the program to generate a risk assessment or patient-specific management recommendations. As the "rewards" for standardised data entry are immediate and clinically relevant, correct data entry is much more likely to be accurate and sustainable.

In the first instance, it will be possible for the first time in New Zealand to electronically extract standardised, uniformly documented, cardiovascular and diabetes risk profile data from primary care clinical records across the country. When PREDICT™-CVD is used systematically in a primary care population - this approach is already being piloted in a second PCO (Health West) - the CVD and diabetes risk factor burden for that population can be determined without the need for expensive one-off surveys.

The second major research and development opportunity will arise when the individual risk factor profiles are linked to national hospitalisation and mortality data using the National Health Index number - a unique health services identifier allocated to each New Zealander - that has been encrypted to ensure confidentiality. With these data linked, it will be possible to develop New Zealand-specific risk prediction tools to replace the risk prediction tool currently used, which is based on data from the American Framingham Heart Study. Moreover, given the large numbers of patients likely to be assessed from implementation of the programme more widely in New Zealand (over 500,000), it should be possible to develop in a timely fashion separate risk prediction tools for different at-risk subpopulations.

The data generated from PREDICT™-CVD can also be used by individual practitioners and their organisations to undertake audits of practice against current guidelines. One of the major problems with current audits is that practitioners do not record data in a standardised way, making electronic audits of practice extremely difficult and time consuming. As all PREDICT™-CVD data will be generated in a consistent, electronic format, audits will be able to be carried out more regularly, accurately and efficiently.

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The Effectiveness of PREDICT™-CVD

An initial evaluation of PREDICT™-CVD was undertaken in 2003, based on self-reported CVD risk assessment practice from 25 GPs who had been early adopters of the program. The results were very promising, with substantial increases in risk assessment being reported (table 2).

Table 2: Self-reported frequency of absolute CVD risk assessment before and after the introduction of PREDICT™-CVD among 25 early adopter GPs

Frequency of CVD risk assessment	Before PREDICT™-CVD	After PREDICT™-CVD
1-2 times per month	25%	0%
1-2 times per week	75%	50%
5-10 times per week	0%	38%
10-20 times per week	0%	12%

(pers comm Kate Moodabe, ProCare and Susan Wells, University of Auckland, 2003)

However, as this evaluation was based on self-reports and because there may be differences between early and later adopters, a large before and after study of all eligible GPs in ProCare, the PCO that had implemented PREDICT™ Version 1, was undertaken. The evaluation was based on a detailed review of multiple clinical records and has only recently been completed. Preliminary analyses indicate that GPs using PREDICT™ increased risk assessment and risk factor documentation more than four-fold (unpublished data).

Barriers to Implementation

A number of potential barriers to successful implementation were identified in the process of undertaking these PREDICT™-CVD evaluations. First, although 99% of GPs have computerised practice systems in New Zealand, [15] there are up to 15 different patient management systems (PMS) being used, the most commonly used being MedTech 32 (60%), Intrahealth Profile (12%) and Houston GP (8.9%). [15] PREDICT™-CVD Version 1 was only integrated into the MedTech PMS system MedTech because it was the most commonly used system at ProCare. Integration into the other systems will be required for a successful national roll-out.

We found huge variability in individual practitioners' computer hardware, software, skills and degree of comfort in using a computerised decision support programme. On-going systems support from the umbrella PCO, long after initial training and installation, was crucial to continuing use. Although PREDICT™-CVD contained widely trusted and credible content, the format, functionality (including speed of output) and ordering of content was also very important. The ability to respond and adjust the program, especially in the early phases, greatly assisted in tailoring the "fit" to clinical care.

The availability of the new national guidelines in *New Zealand Management of Type 2 Diabetes* [16] and *the Assessment and Management of Cardiovascular Risk* [1] published at the end of 2003, necessitated the development of the updated version of the program: PREDICT™-CVD/Diabetes Version 2, which will supersede the older version during 2005. Updating the program has been a major undertaking and, to remain credible with practitioners, decision support systems like PREDICT™-CVD/Diabetes must continue to be kept up-to-date with new clinical evidence.

As the update has led to a broadening of the original programme scope to include the management of two major chronic diseases, it is potentially a forerunner of a shift towards IT-based evidence-based medicine and the way chronic disease will be managed in the future. The feasibility of further increments to the programme such as cardiac rehabilitation, management post-stroke, and the management of atrial fibrillation and congestive heart failure are currently being investigated.

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Conclusions

PREDICT™-CVD is a flexible, evidence-based, "moment of care", electronic decision support system that also generates important clinical information in a standardised form that can be used for risk profiling populations, developing new risk prediction tools and for clinical audit. As it is web-based, all users always have the same up-to-date version based on current best clinical evidence. While PREDICT™-CVD contains a standard core content based on nationally agreed guidelines, the program also allows for local adaptation.

As the content has been developed and designed by clinicians for clinicians, it closely mirrors usual clinical care processes. Evaluations indicate that PREDICT™-CVD is usable in busy clinical settings and can have a significant impact on practice. The PREDICT™ platform has the potential to be used to support prevention and management of multiple conditions across multiple settings. It can be used by a range of practitioners, from community outreach nurses to primary, secondary and tertiary care doctors. Future versions will also be developed for direct patient use.

The next revolution in health care will be electronic, not genomic. Electronic decision support systems like PREDICT™-CVD will make a major contribution to this revolution.

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Footnote

Under the New Zealand Health & Disability Act 2000, 21 District Health Boards (DHBs) were created throughout the country. Each DHB is responsible for both the funding and provision of services within a defined geographical area. Typically, public hospitals form a substantial portion of the provider operations of a DHB.