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AN INITIATIVE OF THE NATIONAL, STATE AND
TERRITORY GOVERNMENTS OF AUSTRALIA
AND THE GOVERNMENT OF NEW ZEALAND

Horizon Scanning Technology Prioritising Summary

**Targeted screening for cardiovascular
risk for all adults between 40-74 years**

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PRIORITISING SUMMARY

REGISTER ID: 000522

NAME OF TECHNOLOGY: TARGETED SCREENING FOR CARDIOVASCULAR RISK

PURPOSE AND TARGET GROUP: ALL ADULTS BETWEEN 40 AND 74 YEARS

STAGE OF DEVELOPMENT (IN AUSTRALIA):

- | | |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> Yet to emerge | <input type="checkbox"/> Established |
| <input type="checkbox"/> Experimental | <input type="checkbox"/> Established <i>but</i> changed indication or modification of technique |
| <input type="checkbox"/> Investigational | <input type="checkbox"/> Should be taken out of use |
| <input type="checkbox"/> Nearly established | |

AUSTRALIAN THERAPEUTIC GOODS ADMINISTRATION APPROVAL

- | | |
|----------------------------------------------------|-------------|
| <input type="checkbox"/> Yes | ARTG number |
| <input type="checkbox"/> No | |
| <input checked="" type="checkbox"/> Not applicable | |

INTERNATIONAL UTILISATION:

COUNTRY	LEVEL OF USE		
	Trials Underway or Completed	Limited Use	Widely Diffused
United Kingdom	✓		
The Netherlands	✓		
Norway	✓		

IMPACT SUMMARY:

The National Health Service in the United Kingdom provides a health check of adults aged 40 to 74 years with the purpose of identifying those at risk of chronic disease. The technology is available through primary care services.

BACKGROUND

The term cardiovascular disease (CVD) includes all diseases and conditions of the heart and blood vessels. Combining both the burden of premature death from CVD and the extent of its disability, CVD is expected to account for 16 per cent of the overall disease burden in Australia in 2010, with coronary heart disease and stroke contributing to over four-fifths of this burden. Most of the CVD burden comes from

premature death and it has been estimated that CVD will contribute 26 per cent of total years of life lost, second only to cancer (34%) (AIHW 2010a).

In Australia, the main underlying cause of CVD is atherosclerosis caused by formation of arterial plaques, which may result in a reduced or blocked blood supply to the heart (causing angina or heart attack) or to the brain (which can lead to a stroke). Chronic heart disease, stroke and heart failure/cardiomyopathy are major contributors to the CVD burden in Australia. The most common form of heart disease is coronary or ischaemic heart disease (CHD). There are two major types of CHD: acute myocardial infarction (AMI) also known as a heart attack, and angina. Preventable risk factors for CVD include tobacco smoking, high blood pressure, high blood cholesterol, insufficient physical activity, overweight and obesity, poor nutrition and diabetes (AIHW 2010b).

In 2005, the Australian Health Minister's Conference (2005) agreed an agenda "to encourage coordinated action in response to the growing impact of chronic disease on the health of Australians and our health care system" with cardiovascular health being one of the eight identified National Health Priority Areas (AIHW 2010c). In addition, the New Zealand health strategy identified the reduction of the incidence and impact of cardiovascular disease as one of the top 13 health priorities (Sinclair & Kerr 2006).

In 2009, the National Health Service in the United Kingdom introduced health checks for adults aged between 40 and 74 years, with the aim of reducing the population risk of heart disease, stroke, type II diabetes and kidney disease. Full implementation of this program is expected by 2013, with eligible patients invited by the local Primary Care Trusts to take part. The health checks are being offered in general practitioner surgeries and pharmacies. The health check takes approximately 20-30 minutes and involves questions about family history, and current medications; height, weight, body mass index (BMI), sex, ethnicity and age are recorded; blood pressure is measured and a blood test is taken to obtain cholesterol levels. Most results are given to the patient immediately and discussed either with the GP, practice nurse or pharmacist. If a patient is assessed as being at risk of developing heart disease, advice may be given on maintaining good health, and on any lifestyle changes (e.g. reduce alcohol, increase physical activity) that may improve the health of the patient, and medication may be prescribed (NHS 2010). In the United Kingdom it has been estimated that the NHS Health Check has the potential to prevent 9,500 myocardial infarctions and strokes per year, saving approximately 650 lives (Chamnan et al 2010; NHS 2010).

CLINICAL NEED AND BURDEN OF DISEASE

The National Health Survey conducted in 2007-08 estimated that 3.4 million Australians, or 16.5 per cent of the population, self-reported that they had one or more long-term diseases of the circulatory system that year, with the prevalence of CVD increasing steadily with age (AIHW 2010a).

During this same period, it has been estimated that 684,800 Australians had long-term CHD, with an overall burden of disease of nine per cent of the population. In 2007-08, there were approximately 6.8 per cent of Australians aged 55–64 years with long-term CHD, however this rate increases markedly with age with CHD occurring in approximately 19.9 per cent of those aged 75 years and over. After adjusting for age, rates for CHD were twice as high for males (4.4%) than females (2.3%). In addition, an estimated 60,000 stroke events occur in Australia every year and the majority of these (70%) are first-ever strokes (AIHW 2010a).

In 2007, CVD was recorded as the primary cause of death for 46,623 Australians in 2007, accounting for just over a third of all deaths in that year. Although the prevalence of CHD remains high, the rate of death from CHD has decreased over time. During the period 1998–2007, the age-standardised rate of death from CHD fell by 40 per cent for both males and females, mainly due to primary prevention measures and improved survival after a cardiac event. Despite this, CHD is still the largest single cause of death in Australia, accounting for 16.5 per cent of all deaths (22,727) in 2007, with the majority of deaths occurring in individuals aged 75 years and over. In 2007, the age-standardised rate of CHD death for males and females was 126.3 and 72.5 per 100,000, respectively (AIHW 2010a). During the same period, cerebrovascular disease accounted for 11,491 deaths (8.3% of all deaths), with stroke (8,623 deaths) and its resulting disorders (2,398) accounting for 96 per cent (11,021) of these deaths. Death from cerebrovascular disease occurred mainly in individuals aged 75 years or over (83.9%). In 2007 the overall age standardised rate of death from stroke was approximately 48 per 100,000 persons (AIHW 2010a).

In Australia during 2007-08 there were a total of 475,122 public hospital separations for all diseases of the circulatory system (I00 – I99). Of these, the greatest proportion was for ischaemic heart diseases (I20-I25) with 161,417 separations (ALOS 3.8 days) followed by other forms of heart disease (I30-I52) with 137,750 separations (ALOS 5.1 days). During the same period there were 391,310 public hospital separations for cerebrovascular diseases (I60 – I69). Of these, the greatest proportion was for cerebral infarction (I63) with 183,595 separations (ALOS 11.1 days) followed by stroke (I64, not specified as haemorrhage or infarction) with 68,884 separations (ALOS 7.9 days) (AIHW 2010d).

In the year 2000, it was reported that cardiovascular disease, including cerebrovascular disease, was the leading cause of mortality in New Zealand, accounting for 40 per cent of all deaths. A total of 5,973 individuals died from coronary heart disease in the year 2000, at an age standardised rate of 82 per 100,000 persons. The age standardised mortality rate for males was double that for females at 114 and 56 per 100,000, respectively. The age standardised mortality rate for cerebrovascular disease was similar for males and females, with an overall rate of 33 per 100,000 persons. Mortality rates for coronary heart disease were considerably higher in the Māori and Pacific Islander populations compared to the general

population. Māori males and females had an age standardised mortality rate of 201 and 114 per 100,000, respectively. Pacific Islander males also had a high age standardised rate of mortality at 201 per 100,000, however the rate for Pacific Islander females approached that of the general population at 67 per 100,000 (Hay 2004).

In New Zealand during the period 2006-07 there was a total of 71,884 public hospital separations for all diseases of the circulatory system (I00 – I99). Of these, the greatest proportion was for ischaemic heart diseases (I20-I25) with 25,968 separations (ALOS 7.5 days) followed by other forms of heart disease (I30-I52) with 22,716 separations (ALOS 10.9 days). During 2006-07 there were 8,742 public hospital separations for cerebrovascular diseases (I60 – I69) with an average length of stay of 46.4 days. Of these, the greatest proportion was for cerebral infarction (I63) with 3,410 separations (ALOS 11.8 days) followed by stroke (I64, not specified as haemorrhage or infarction) with 2,406 separations (ALOS 116.4 days) (MoH 2010).

DIFFUSION

A targeted screening program for the identification of individuals deemed to be at risk of cardiovascular disease is not currently in place in Australia or New Zealand. Screening is opportunistic as individuals in Australia aged 45-49 years may opt, or be advised by their clinician, to undergo a more extensive health assessment to assess their risk of chronic disease, including cardiovascular disease.

COMPARATORS

The Medicare Benefits Schedule (MBS) currently has four item numbers for health assessments for people aged 45-49 years who are at risk of developing chronic disease, which may be claimed only once by an eligible patient. These health checks are voluntary and may be initiated at the behest of the patient or the clinician, rather than part of a population “screening” process where patients are invited to undergo a health check on a regular basis (every 5 years). Chronic diseases or conditions covered by these items include asthma, cancer, cardiovascular illness, diabetes mellitus, mental health conditions, arthritis and musculoskeletal conditions. A patient is considered to be at risk of developing a chronic disease if, in the clinical judgement of the attending medical practitioner, a specific risk factor for chronic disease is identified including: lifestyle risk factors, such as smoking, physical inactivity, poor nutrition or alcohol use; biomedical risk factors, such as high cholesterol, high blood pressure, impaired glucose metabolism or excess weight; or a family history of a chronic disease. MBS item number 701 is for a brief health assessment, lasting not more than 30 minutes, where relevant information, including a patient history, is collected, a basic physical examination is conducted, interventions and referrals may be initiated and the patient is provided with preventive health care advice and information (Fee \$56.00). MBS item number 703 covers a standard health assessment, lasting more than 30 minutes but less than 45 minutes but with a more detailed

physical examination (Fee \$130.10). MBS item number 705 covers a long health assessment, lasting at least 45 minutes but less than 60 minutes and involves a comprehensive patient history, an extensive examination of the patient's medical condition and physical function, the initiation of interventions and referrals, the provision of a basic preventive health care management plan (Fee \$179.45). MBS item number 707 covers a prolonged health assessment lasting at least 60 minutes but with the provision of a more comprehensive preventive health care management plan for the patient (Fee \$253.60) (DoHA 2010).

SAFETY AND EFFECTIVENESS ISSUES

The NHS Health Check program advocates universal screening for individuals aged over 40 years. Universal screening every five years was found to be cost-effective when compared with no screening, however a cost-analysis was not conducted on whether universal screening would remain cost-effective when compared to targeted screening. It is thought that the development of tools, such as electronic health records, to identify the small per cent of undiagnosed patients who would benefit from cardiovascular interventions may be a better use of scarce health funds (Marshall 2010).

Chamnan et al (2010) explored an alternative approach to universal vascular screening by pre-stratifying patients using routine data, and then inviting only those individuals found to be at high-risk of cardiovascular disease to attend a clinic for a vascular health check. Modelling was performed on data collected from the large European Prospective Investigation of Cancer-Norfolk (EPIC-Norfolk) cohort. A total of 77,630 adults were invited to participate in the original study. Of these 25,639 (33%) enrolled in the study between 1993 and 1997. Basic information including family history of disease, lifestyle and smoking status was collected. In 2007, participants who were free from cardiovascular disease and diabetes at time of recruitment were followed up for any incidence of cardiovascular disease.

Of the original cohort, 1,015 had a history of CVD, 779 were not in the appropriate screening age of 40-74 years, 704 had diabetes and 3,719 were on lipid lowering or antihypertensive medication. After excluding 2,442 individuals who had missing data, a total of 16,970 were available for analysis (median age at baseline 56 years). From values obtained at baseline the Framingham risk score, the Cambridge diabetes risk score¹ and the Finnish diabetes² risk score were all calculated. Seven different population based strategies for cardiovascular screening were modelled:

¹ The Cambridge risk score uses data (age, sex, smoking, family history, BMI and use of prescribed steroids and antihypertensives) to identify individuals with diabetes who have a raised but modifiable risk of cardiovascular disease.

² Has been shown to predict incident CHD and total mortality using questions about age, use of antihypertensives, history of high blood glucose levels, food intake, exercise levels, BMI and waist circumference.

1. All adults aged 40-74 years screened;
2. All adults aged 50-74 years screened;
3. Only overweight adults screened ($\text{BMI} \geq 27.5 \text{ kg/m}^2$ or waist circumference $>94 \text{ cm}$ for men or $>80 \text{ cm}$ for women); and the following high-risk strategies
4. Adults with a score ≥ 9 on the Finnish diabetes score;
5. Adults with a score ≥ 0.2518 on the Cambridge diabetes score (top 20%);
6. Adults with a score ≥ 0.1194 on the Cambridge diabetes score (top 40%); and
7. Adults with a score ≥ 0.0615 on the Cambridge diabetes score (top 60%).

The model assumed that 70 per cent of individuals invited for the NHS cardiovascular health check would attend. Measurements taken during this check would be used to calculate a Framingham risk score and individuals would be stratified according to this score with a score ≥ 20 being associated with a high-risk of CVD (level III-2 screening evidence) (Chamnan et al 2010).

Of the 16,970 participants, there were 7,505 males (44%) of whom 871 (11.6%) went on to develop CVD. Of the 9,465 females who were free from CVD at baseline, 491 (5.2%) went on to develop CVD. The individuals who developed CVD at follow-up were significantly older, more obese, had high overall cholesterol but lower high density lipoprotein levels, had high HbA_{1c} levels and higher blood pressure compared to those participants who did not develop CVD. The total of 1,362 cardiac events occurred over 183,586 person years of follow-up, with an incident rate of 7.4 per 1,000 person years. The incidence rate of CVD in individuals with a Framingham score ≥ 20 was 19.4 per 1,000 person years and 4.3 per 1,000 for those with a score <20 (Chamnan et al 2010).

The current NHS policy of inviting all adults aged 40-74 years would prevent 26,789 new cardiovascular events in the UK. Using strategy seven and inviting only 60 per cent of the population based on the Cambridge risk score would identify 84 per cent of individuals who developed a first cardiovascular event and would prevent 25,134 new cardiovascular events. Results were similar when strategy two was employed, inviting only those aged ≥ 50 years, which would identify 92 per cent of individuals who developed a first cardiovascular event, preventing 25,016 new cardiovascular events. When strategy one was employed in EPIC-Norfolk cohort, 16,970 individuals would be invited to attend screening, compared to only 12,506 and 10,168 when strategies two and seven were employed. By targeting the appropriate population to be screened and potentially decreasing the number of patients screened with the same overall benefit would impact on the total cost of a screening program such as the NHS health check (Chamnan et al 2010). This analysis is limited due to the fact that a cost-effectiveness analysis was not conducted. It is likely that costs will be reduced when either strategy two or seven or employed, especially as these strategies use information that is already stored electronically by most general practitioners. Of note is that individuals in the EPIC-Norfolk cohort may be at lower risk of CVD in

comparison to other individuals in the UK as Norfolk has a standardised mortality ratio³ of 93 (Waugh 2010).

A smaller study conducted in Scotland compared a number of strategies to identify the most effective and cost-effective strategy to identify those individuals at high-risk of developing cardiovascular disease with the aim of delivering appropriate treatment. Data from participants in two rounds of the Scottish Health survey (1998 and 2003) aged between 40 and 74 years were included in the following modelling strategies:

1. Mass screening of the whole population;
2. Screening only those individuals in “deprived” communities⁴;
3. Screening only those with a family history of CVD;
4. Screening those who either lived in deprived communities *or* had a family history of CVD; and
5. Screening those who either lived in deprived communities *and* had a family history of CVD (Lawson et al 2010).

Of the 9,327 survey participants, 2,985 and 2,421 were excluded due to pre-existing CVD and missing data, respectively. Of the remaining 3,921 individuals included in the study, 804 (21%) had an ASSIGN risk score⁵ of ≥ 20 (level III-2 screening evidence).

The effectiveness and cost-effectiveness of each of the strategies are summarised in Table 1. When only deprived communities (strategy 2) were targeted 15 per cent of the total population would be screened, identifying 25 per cent of the high-risk population. To identify one high-risk individual would require 3.0 people to be screened at a cost of £69. Targeting individuals with a family history of CVD (strategy 3) would result in 28 per cent of the total population being screened but would identify 43 per cent of the high-risk population. Using this strategy, identifying one high-risk individual would require 3.2 people to be screened at a cost of £75. Combining both strategies (strategy 5) would enable 57 per cent of the high-risk population to be identified by screening 39 per cent of the general population. Mass screening would identify all high-risk individuals and would require 4.9 people to be screened to identify one high-risk individual at a cost of £113.

³ SMRs equal to 100 imply that the mortality rate is the same as the standard mortality rate. A number higher than 100 implies an excess mortality rate whereas a number below 100 implies below average mortality.

⁴ A deprived community was defined as those in the bottom quintile of the Scottish Index of Multiple Deprivation using 37 indicators in 7 domains (income, employment, health, education, access to services, housing and crime).

⁵ ASSIGN risk score ≥ 20 corresponds to a >20% of a CVD event in the next 10 years based on age, sex, blood pressure, family history, smoking and socio-economic status.

Table 1 The effectiveness and cost-effectiveness of each of the strategies for those aged 40-74 years

	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5
Coverage of general population	100%	15%	28%	5%	39%
Coverage of high-risk population (ASSIGN ≥ 20)	100%	25%	43%	10%	57%
% of screened population at high risk	21%	34%	31%	44%	30%
Number needed to screen	4.9	3.0	3.2	2.3	3.3
Mean cost per high-risk case detected (£)	113	69	75	53	75
Incremental cost-effectiveness ratio	199 (115 to 283)	89 (51 to 126)	81 (47 to 116)	53 (31 to 75)	81 (47 to 116)

Modelling was then conducted changing the population from all individuals aged 40-74 years to only include those considered to be at risk of premature CVD, that is, men aged 40-54 years and women aged 40-64 years. These results are summarised in Table 2. When only deprived communities (strategy 2) were targeted 17 per cent of the total population being screened would identify 45 per cent of the high-risk population. To identify one high-risk individual would require 6.1 people to be screened at a cost of £141. Targeting individuals with a family history of CVD (strategy 3) would result in 28 per cent of the total population being screened but would identify 61 per cent of the high-risk population. To identify one high-risk individual would require 7.4 people to be screened at a cost of £170. Combining both strategies (strategy 5) would enable 84 per cent of the high-risk population to be identified by screening only 41 per cent of the general population. Mass screening would identify all high-risk individuals but would require 16 people to be screened to identify one high-risk individual at a cost of £370 (Lawson et al 2010).

Table 2 The effectiveness and cost-effectiveness of each of the strategies for those individuals at risk of premature CVD

	Strategy 1	Strategy 2	Strategy 3	Strategy 4	Strategy 5
Coverage of general population	100%	17%	28%	5%	41%
Coverage of high-risk population (ASSIGN ≥ 20)	100%	45%	61%	23%	84%
% of screened population at high risk	6%	16%	14%	31%	13%
Number needed to screen	16.0	6.1	7.4	3.3	7.8
Mean cost per high-risk case detected (£)	370	141	170	75	180
Incremental cost-effectiveness ratio	1358 (784 to 1931)	203 (117 to 289)	225 (130 to 321)	75 (43 to 107)	196 (113 to 278)

Both of these models indicate that strategies other than mass screening may identify high numbers of individuals considered to be at risk of CVD and may be less costly.

A study conducted in the Netherlands has suggested the use of urinary albumin excretion (UAE) levels as a mass screening tool for individuals aged 28-75 years. UAE values between 0 and 15 mg/dl are considered normal, with elevated levels >15 mg/dl being associated with a significant increase in developing CVD. Due to the time constraints of writing this summary, an in-depth analysis of this study cannot be reported, however a brief summary of the results indicate a potentially favourable cost-effectiveness of population-based screening for albuminuria in the general Dutch population. It was estimated that 76 CVD events would occur in the screening/treatment scenario compared to 124 in the no screening scenario. In the screening scenario 16 CVD deaths would occur, compared to 27 deaths in the no screening scenario. Prevention of CVD deaths in the screening scenario was estimated to gain 0.0421 discounted life-year per person with an estimated cost-effectiveness of €2,000 per life-year gained. Limiting screening to those subjects aged ≥ 50 and ≥ 60 years resulted in a more favourable cost-effectiveness compared with population-based screening without age restriction (Boersma et al 2010).

COST IMPACT

In 2004-05 CVD was the most expensive disease group in Australia in terms of direct health-care expenditure, with costs totalling \$5.94 billion, representing 11 per cent of overall recurrent health system expenditure (Figure 1) (AIHW 2008).

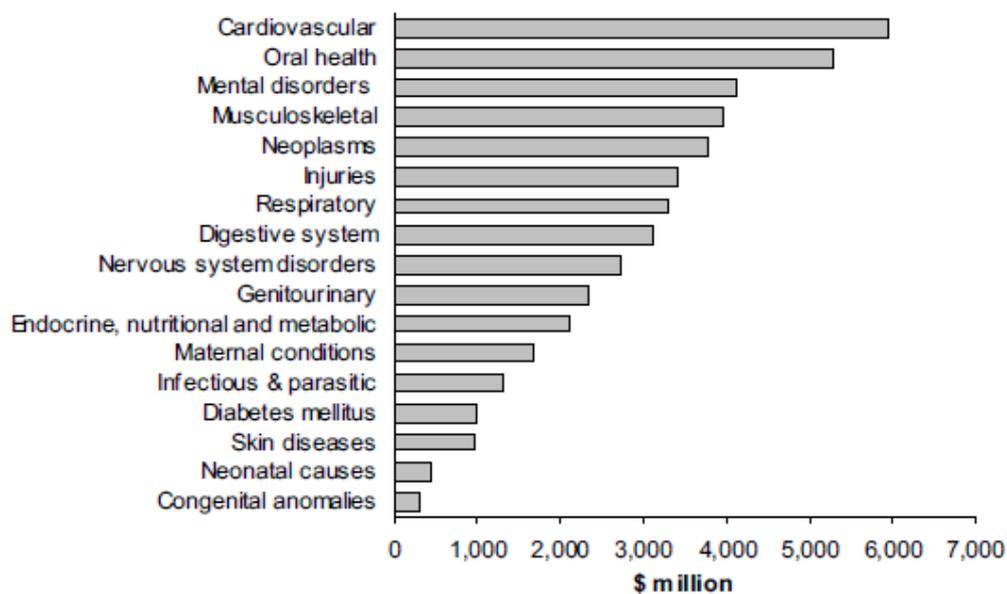


Figure 1 Health expenditure on chronic diseases, 2004-05 (AIHW 2008)

During this period, total estimated expenditure on coronary heart disease and stroke was \$1,813 and \$546 million, respectively, accounting for 40 per cent of the total expenditure for CVD. These estimates are likely to underestimate the true cost of CHD and stroke as a substantial portion of pharmaceutical spending for these conditions are allocated elsewhere. Of patients with CVD, by far the greatest cost to the health system was for patients admitted to hospital, which accounted for 51 per

cent of total CVD costs, or \$3,009 million. Prescription pharmaceuticals were the next most expensive sector, accounting for \$1,636 million (28%), followed by out-of-hospital medical services (\$1,133 million, 19%) (Figure 2) (AIHW 2008).

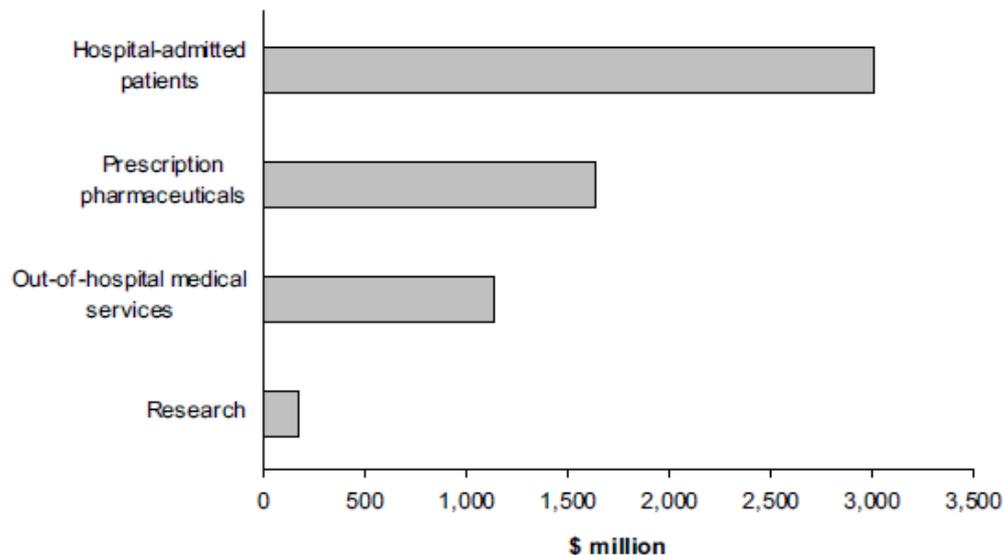


Figure 2 Health care expenditure on cardiovascular disease, by area of expenditure, 2004-05 (AIHW 2008)

In the United Kingdom it has been estimated that the NHS Health Check has the potential to prevent 9,500 myocardial infarctions and strokes per year at an estimated annual cost of £250 million⁶ (Chamnan et al 2010).

The key objectives of the economic modelling for the NHS Vascular Health Checks program were to establish whether a policy of vascular checks was likely to be cost effective, to identify the optimal starting age and the frequency for re-testing, and to provide indicative cost estimates of the policy. The universal screening policy was found to be cost-effective, with a conservative estimate of its cost per quality adjusted life year of approximately £3,000, when compared to *no screening*. There was some uncertainty in many of the parameters used, however a sensitivity analysis demonstrated the cost effectiveness of the policy was robust against these uncertainties. The optimal starting age was 40 years, with vascular checks occurring every five years. Modelled costs are estimated to increase over time before levelling out at between £180m to £243m per annum after the initial five year roll-out period. Roll-out was assumed to be 40 per cent in the first year with an estimated cost impact of £40m, increasing gradually to 100 per cent by the fifth year and an estimated cost impact of £210m (NHS 2008).

ETHICAL, CULTURAL OR RELIGIOUS CONSIDERATIONS

No issues were identified/raised in the sources examined.

⁶ £250 million = \$401 million as of 3rd November

OTHER ISSUES

No issues were identified/raised in the sources examined.

SUMMARY OF FINDINGS

Universal screening for cardiovascular disease will identify most of the population at risk of developing CVD, with the potential for saving lives and for down-stream financial gains for the health system with the associated decrease in morbidity related to CVD. However, modelling of different strategies with a more targeted approach may identify almost as many at-risk individuals but at a reduced overall cost to the health system. Exactly which strategy is the most appropriate to employ requires further assessment. Before embarking on any cardiovascular disease screening program a full economic analysis should be conducted to ensure the appropriate population is targeted to maximise cost-effectiveness.

HEALTHPACT ASSESSMENT:

It is unclear how the results of the United Kingdom screening program for cardiovascular risk would translate to the Australian setting. Before such a program could be feasible in Australia a model of care would need to be established, and the current Australasian primary care environment would also need to be considered. This summary should be referred to the National Screening Committee and HealthPACT does not intend to further review this technology.

NUMBER OF INCLUDED STUDIES

Total number of studies	
Level III-2 screening evidence	2

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SEARCH CRITERIA TO BE USED:

Mass Screening

Cardiovascular Diseases
Risk Assessment/ Risk Factors