CASE FOR ACTION-
PROPOSAL TO NHMRC

Appropriateness and performance in the management of cardiovascular disease in Australian hospitals

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Submitted by the Research Translation Faculty Cardiovascular Health and Stroke Steering Group (October 2014)
The National Health and Medical Research Council (NHMRC) Research Translation Faculty (the Faculty) was established as a key advisory forum in 2012. The primary work of the Faculty for the 2013-15 Triennium has been to help NHMRC accelerate the translation of research by identifying the most significant gaps between research evidence and health policy and practice in each of the major health areas in the NHMRC Strategic Plan, and to propose to NHMRC possible action it could consider taking to address that gap – these are called Cases for Action. In April and May 2013, fourteen Faculty steering groups were established as NHMRC working committees to each oversee the development of a Case for Action.

The Faculty’s Cardiovascular Health and Stroke Steering Group is comprised of a range of experts and includes primary (1°) representatives of NHMRC Health Care Committee (HCC), Prevention and Community Health Committee (PCHC) and Research Committee (RC). Further information is available at: www.nhmrc.gov.au/research/research-translation/research-translation-faculty/research-translation-faculty-steering-group.

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Declaration of interests

The declarations of interests of Steering Group members, authors and contributors are available at Appendix 1.

Suggested citation


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Disclaimer

The contents of this document reflect the views of third parties and do not necessarily reflect those of Australia’s National Health and Medical Research Council.
**Title:** Appropriateness and performance in the management of Cardiovascular Disease in Australian Hospitals

**Submitted to NHMRC for consideration:** October 2014

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HCC – Health Care Committee; PCHC – Prevention and Community Health Care Committee; RC – Research Committee

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A. Establish the NHMRC CVD Quality Care and Outcomes Network
B. Establish National Appropriateness and Performance Criteria
C. Development of National Cardiovascular Registries
D. Feedback Reporting of Performance & Appropriateness Criteria

POTENTIAL IMPACT

REFERENCES
Cardiovascular disease (CVD) constitutes both cardiac disorders (including cardiomyopathy, congenital and valvular heart disease) and vascular disorders (including coronary heart disease, cerebrovascular disease and peripheral vascular disease). Reports from the Australian Institute of Health and Welfare (AIHW) describe CVD as being one of the greatest contributors to mortality, total health burden of disease and expenditure in Australia (Figure-1). This is despite significant advances in CVD therapies, which have reduced mortality and impacted on health burden, but significantly contributed to health costs.

**Figure-1. Causes of Death amongst Australians in 2008**

![Graph showing the number of deaths from various causes.](image)

*Note: Based on underlying cause of death.*  
*Source: ABS: Causes of Death, Australia, 2008*

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1. **Contemporary Perspective of Cardiovascular Disease in Australia**

**Prevalence and Mortality.** It has been estimated that 1 in 6 Australians have CVD (i.e., about 3.5 million) and that 1 in 3 Australian deaths are attributable to CVD. Of particular concern, more than 1 in 10 Indigenous Australians are affected with CVD and have 1.8-fold higher CVD mortality compared with Non-indigenous Australians.

**Figure-2. Disease-specific Cardiovascular Mortality in Australia**

![Graph showing disease-specific mortality.](image)

*Note: Based on underlying cause of death.*  
*Source: AIHW National Mortality Database.*
Coronary heart disease is the most prevalent cardiovascular cause of death in Australia, responsible for 49% of CVD deaths, with stroke accounting for a further 18% of CVD deaths (Figure-2).

**Morbidity.** In addition to the significant mortality, CVD has a substantial impact on morbidity as assessed by hospitalisations and disability-adjusted life years (DALYs). There are approximately 500,000 hospital admissions in Australia each year attributable to CVD. Of these, 34% were attributable to coronary heart disease, 10% heart failure/cardiomyopathy, 7% stroke, 5% peripheral arterial disease, and 3% transient ischaemic attacks. Using DALYs assessment, CVD accounts for 18% of the total burden of disease in Australia. This burden is greater than for mental health disorders and slightly less than cancer.

**Health Expenditure.** Cardiovascular disease is the most costly disease in Australia, representing 11% of total health expenditure. Within CVD, coronary heart disease and stroke account for 40% of the total expenditure with hospital costs contributing to over $1,270 million for coronary heart disease and $380 million for stroke.

### 2. Trends in Cardiovascular Disease in Australia

As in many other developed countries, CVD mortality has significantly improved within Australia over the past 30 years. As shown in Figure-3, CVD mortality progressively increased in the early decades of the 20th century, peaking in the 1950s – 1960s but has since substantially improved. This improvement in mortality is evident for both coronary heart disease and stroke. In Australia, there were 32,093 coronary heart disease deaths in 1987 as compared with 22,983 in 2006, representing a 28% reduction over the 3 decades. In comparison, stroke mortality fell from 10,593 in 1987 to 8,484 in 2006, a 20% reduction over 3 decades. This improved stroke mortality was greater for ischaemic stroke than haemorrhagic stroke. Considering population growth from 16 million in 1987 to over 19 million by 2006, this improved cardiovascular mortality is even more impressive.

**Figure-3. Age-standardised Cardiovascular Mortality Trends in Australia**

![Cardiovascular Mortality Trends in Australia](https://example.com/cardiovascular-trends.png)

Note: Age-standardised to the 2001 Australian population.

In addition to the improved mortality rate, age-standardised hospitalisations for cardiovascular disease have improved over the past couple of decades (Figure 4). In 1993-94 there were 2,312 admissions per 100,000 population, which fell to 2,027 per 100,000 by 2009-10, representing a 12% reduction over this period. Again, this was evident for both coronary heart disease and stroke.
The above data is age-standardised, reflecting a reduction in cardiovascular mortality amongst young/middle-aged individuals and thus an increase in life expectancy. Consequently, cardiovascular disease and mortality is more prevalent amongst the elderly population. This presents future challenges that require investigation since many preventative strategies and cardiovascular therapies have primarily been assessed in a middle-aged population and their effectiveness in the elderly is unclear. Moreover, the elderly (who frequently have multiple medical problems) are often more concerned with disabilities and impairment in quality of life rather than mortality risk. Thus focussed studies in the elderly population are required.

3. Previous Improvements in Cardiovascular Care in Australia

The improved trends in cardiovascular mortality and morbidity (as evident by reduced hospitalisations) reflect an improvement in Australian healthcare over the past 50-60 years. This has been an evolutionary process with important philosophical changes in the approach to healthcare. This includes the evolution of Rehabilitation Medicine, Preventative Medicine, Evidence-based Medicine, Guideline Medicine and Translational Medicine, as outlined below.

Rehabilitation Medicine. In the early portion of the 20th century, both myocardial infarct and stroke patients were managed with prolonged bed rest. By the early 1950s it was appreciated that early mobilisation reduced immobilisation-associated complications and improved outcomes in patients with acute cardiovascular events. This led to an understanding of the importance of exercise and the birth of cardiac and stroke rehabilitation services. These have since evolved to multi-disciplinary services that not only include exercise therapy but also patient education, nutritional advice and the management of depression.

Preventative Medicine. In the late 1940s, the Framingham Heart study was established, which was to revolutionise cardiovascular care of the future. At the time, atherosclerosis was perceived as an inevitable pathology of aging. The Framingham study demonstrated a constellation of risk factors that predisposed to atherosclerosis, including hypertension, diabetes, dyslipidaemia, smoking, physical inactivity and a family history of CVD. Subsequent clinical studies demonstrated that early treatment of these risk factors prevented acute cardiovascular events. Moreover, treatment of these risk factors not only prevented future cardiovascular events in those with established CVD (Secondary Prevention) but also in those with no prior history of CVD (Primary Prevention). This underscored the important role of general practitioners as well as the hospital physician in treating CVD, and emphasized the importance of co-ordinated cardiovascular care.
Evidence-based Medicine. At the beginning of the last century, many clinical practices were based upon 'expert opinion', often extrapolated from established physiological principles. With the advent of randomised, controlled clinical trials, many of these traditional clinical practices were subsequently revoked. Moreover, it was appreciated that utilising clinically-relevant endpoints (such as cardiac events) were more useful rather than the use of surrogate endpoints (such as the suppression of ventricular ectopic beats; a valuable lesson learned from the CAST Trial4).

Evidence-based medicine has been defined by Rosenberg and Donald5, as 'the process of systematically finding, appraising, and using contemporaneous research findings as the basis for clinical decisions'. Its origins date back to 1972 with Professor Archie Cochrane's publication6 entitled 'Effectiveness and Efficiency: Random Reflections on Health Services'. This eventually led to the establishment of the Cochrane Centre at Oxford and the development of the Cochrane Collaboration.

Guideline Medicine. In the 1980s and 90s there was an explosion of cardiovascular clinical trials endeavouring to establish a strong evidence-base for cardiovascular therapeutics. These studies required expert interpretation to provide an informed context for the practicing clinician, consequently clinical practice guidelines evolved. The American College of Cardiology and American Heart Association recently celebrated 30 years of developing these guidelines7, reporting that for every 10% adherence to their Class I acute coronary syndrome recommendations there was a 10% reduction of in-hospital mortality8.

In Australia, professional medical societies also formulate clinical practice guidelines thereby providing local authoritative recommendations and clinical standards. Professional cardiovascular societies involved in guideline development include the Heart Foundation, Stroke Foundation, National Vascular Disease Prevention Alliance and Cardiac Society of Australia & New Zealand. Contemporary Australian clinical guidelines for cardiovascular disease span both primary and secondary preventative treatments and include the management of cardiovascular risk factors9,10, acute coronary syndromes11, cardiac failure12, rheumatic heart disease13, and stroke14. In addition, the Australian Commission on Safety and Quality in Health Care (ACSQHC) has developed clinical standards for acute coronary syndromes based upon the corresponding guidelines and are undertaking similar standards for stroke management.

Translational Medicine. With the evolution of clinical guidelines, the opportunity arose to compare these standards with contemporary clinical practice. For example, the ASPIRE15 and EUROASPIRE16 studies were large clinical surveys undertaken in Britain and Europe respectively, and revealed that guideline recommendations were frequently not implemented so that there was a ‘clinical practice gap’. Considering the evidence-base supporting the guidelines, then their translation into clinical practice would improve cardiovascular care. Consequently translational science has evolved and involves T1 to T4, where T1 is the traditional bed to bedside research; T2 involves clinical trials to established the evidence base for therapeutic interventions therefore providing the basis for clinical guidelines; T3 involves dissemination and implementation of evidence-based medicine (clinical guidelines); and T4 is the policy development for health care delivery. Accordingly, this proposal primarily focuses upon T3 approaches.

4. Future Directions in Cardiovascular Care in Australia
By exploiting the ‘clinical practice gap’ with ‘T3 research’ there is an opportunity to further improve cardiovascular care within Australia. This has been initiated by the National Health and Medical Research Council (NHMRC) with the establishment of a Translational Faculty. However considerably more effort is required to achieve this goal. This includes understanding and embracing Outcomes Research and the facilitation of routine measurement of clinical outcomes.

NHMRC Research Translation Faculty. The NHMRC incorporated the ‘T3 research’ concept into its 2013-15 Strategic Plan and thus established the NHMRC Research Translation Faculty, which now has a membership of over 2,860 NHMRC supported researchers. This Faculty provides clinical expertise from NHMRC researchers to assist in the formulation of T3 research strategies, which can then be facilitated by the NHMRC by its links with policy makers, consumer advisory groups and other professional societies. The tools available to the Faculty to achieve its goals of
Outcomes Research. This concept has been best described by Clancy and Eisenberg\textsuperscript{17}, who defined outcomes research as ‘the study of the end results of health services that takes patients’ experiences, preferences, and values into account – is intended to provide scientific evidence relating to decisions made by all who participate in healthcare’. Accordingly this encompasses not only the health workers but also the policy-makers, health funders, and particularly the patients. The importance of this multidisciplinary approach is exemplified by considering a patient who fails to utilise an evidence-based medication following hospital discharge. This may occur because the clinician did not prescribe the medication, the nurse or pharmacist did not ensure the patient received the medication, the regulatory authorities restricted access to the medication, the medication cost was prohibitive for the patient, the patient had limited insight into their CVD and elected not to comply with the prescribed therapy, or all of the above. Hence evaluation must be of the relevant final clinical outcome if the success of the treatment is to be evaluated.

In an insightful editorial, Krumholz\textsuperscript{18} summarises the key attributes to Outcomes Research emphasizing its (i) \textit{multi-disciplinary approach} involving the biological sciences, clinical sciences, epidemiological sciences, social sciences, health economics and statistical sciences, as well as policy-makers and health funders, (ii) \textit{multi-analytical approach} including clinical randomised controlled trials, prospectively-designed observational clinical registry studies, interrogation of administrative datasets, economic analyses, meta-analysis, propensity analysis, and (iii) \textit{multi-dimensional approach} that extends beyond T3 research to also incorporate safety monitoring, quality assurance, comparative effectiveness, and the integration of emerging technologies. Accordingly, Outcomes Research is a comprehensive, collaborative and essential to the improvement of future health care.

Outcome Measurements. Fundamental to Outcomes Research is the measurement of meaningful outcomes. If clinical outcomes are not quantitatively measured, then Outcomes Research is essentially impotent. Outcomes measurements may be derived from several sources including:

- \textit{Administrative datasets} (e.g. hospital morbidity data, birth/death registries, Medicare)
- \textit{Adverse event reporting systems} (e.g. hospital adverse event reporting systems)
- \textit{Clinical registries} (e.g. Table 1).
- \textit{Data linkage}, which combines the above datasets to create person-based longitudinal, records capturing multiple dimensions of patient care and outcomes

Of these, clinical registries potentially have the most utility for Outcomes Research but also are the most difficult and expensive to establish.

In Australia, there are a number of established, well-constructed clinical registries (Table-1) but there is a desperate need to further develop these. Although the Australian Stroke Clinical Registry is a comprehensive national registry that collects patient follow-up data three months following stroke, no such national registry exists for cardiac or peripheral vascular disease except for two industry-sponsored registries that each have less than 1,000 Australian patients. In contrast, in the United States, there are national registries monitoring both in and outpatient management of acute and chronic heart disease, heart failure, hypertension, and peripheral artery disease. Moreover these societies have developed both ‘performance measures’ and ‘appropriate use criteria’ in relation to many of these conditions. Although these criteria have been developed by the professional societies, there remains limited data concerning adherence to these performance measures and appropriate use of cardiovascular tests or procedures.
<table>
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<th>TABLE-1. CURRENT AUSTRALIAN CARDIOVASCULAR DISEASE CLINICAL REGISTRIES</th>
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<tr>
<td><strong>Coronary Heart Disease/Other Cardiac Disorders.</strong></td>
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<tr>
<td>• Australian Cardiac Outcomes Registry (ACOR) – in development</td>
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<td>• Australian Cardiac Procedures Registry (ACPR)</td>
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<tr>
<td>• Australian Society of Cardiothoracic Surgeons Database (ASCTS)</td>
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<td>• Coronary Angiogram Database of South Australia (CADOSA)</td>
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<tr>
<td>• Global Registry of Acute Coronary Events (GRACE)</td>
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<td>• Melbourne Interventional Group Interventional Cardiology Registry (MIG)</td>
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<tr>
<td>• Victoria Cardiac Arrest Registry</td>
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<tr>
<td>• Victorian Cardiac Outcomes Registry (VCOR)</td>
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<tr>
<td><strong>Stroke.</strong></td>
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<td>• Australian Stroke Clinical Registry (AuSCR)</td>
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<tr>
<td><strong>Peripheral Artery Disease.</strong></td>
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<tr>
<td>• Australasian Vascular Audit</td>
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<td>• Melbourne Vascular Surgeons Association Audit</td>
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<tr>
<td>• Patient-centred Outcomes Related to Treatment Practices in PAD: an International Trajectory (PORTRAIT).</td>
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There are several different types of outcome measures, reflecting the purpose for which they were established. The types of outcome measurements include the following, although any particular measures does not necessarily belong exclusively to one type:

- **Cardiovascular Event Measures** – these are traditionally captured in clinical trials and include endpoints such as death and myocardial infarction.

- **Safety Measures** – these include both clinical errors (e.g. drug administration errors) and procedure complications (e.g. interventional bleeding rates).

- **Process Measures** – these are often guideline-driven measures reflecting patient management such as door-balloon time, discharge medications and referral to rehabilitation.

- **Efficiency Measures** – these primarily reflect the cost of patient care, such as average length of stay and the completion of hospital discharge letters.

- **Patient-Reported Outcome Measures (PROM’s)** – these relate to patient symptoms and are often related to the impact of the disease on quality of life.

There is an increasing awareness of the importance of PROM’s within health care service delivery and thus why Outcomes Research strategies particularly focus on the importance of patient input. However capturing PROM’s is logistically and financially challenging.

**Outcome Assessment Criteria.** The above outcome measures are often bundled together into specific assessment criteria to benchmark health care delivery between comparable health services or with accepted standards. These assessment criteria are typically categorised into the following:

- **Safety Criteria** – these usually exclusively focus on adverse events, where ideally there should zero events (especially for those that are avoidable).

- **Performance Criteria** – these are targeted at a particular disease management and are typically guideline-driven (e.g. acute myocardial infarction performance criteria).

- ** Appropriateness Criteria** – these are also guideline-driven and focus on the indication for a particular investigation or procedure (e.g. percutaneous coronary intervention appropriateness criteria).
Within the United States, many performance and appropriateness criteria have been developed and published (Table-2); however within Australia, none have been developed. Considering that the evidence-base is international, it could be argued that Australia should adopt the US criteria. However the health care systems are different and potentially the expectations of the patients also differ. Thus whether specific Australian criteria need to be developed based upon the local clinical guidelines needs to be considered.

Irrespective of developing specific Australian outcome assessment criteria, it is imperative that these are assessed since few Australian hospitals routinely evaluate performance or appropriateness; although safety is being monitored via hospital standardised mortality ratios¹⁹).  

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<th>USA CARDIOVASCULAR DISEASE OUTCOME ASSESSMENT CRITERIA</th>
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| **Performance Criteria.** | • Acute Myocardial Infarction²⁰  
• Cardiac Rehabilitation²¹  
• Chronic Heart Failure²² |

| **Appropriateness Criteria.** | • Cardiac Computed Tomography²³  
• Cardiac Magnetic Resonance Imaging²⁴  
• Cardiac Radionuclide Imaging²⁵  
• Diagnostic Coronary Angiography²⁶  
• Coronary Revascularisation²⁷ |

The Importance of Outcomes Research in Australia. Establishing clinical registries and adopting the key principles in outcomes research outlined above may improve cardiovascular healthcare in three aspects (1) improved outcomes, (2) reduced costs, and (3) clinician engagement. The evidence supporting these improvements is outlined below.

1. Improved Outcomes. As would be expected, Peterson et al⁸ confirmed that adherence to acute coronary syndrome clinical guidelines in the United States improved in-hospital mortality with a 6.3% mortality in hospitals with low adherence and 4.1% in those with high adherence. They concluded that for each 10% adherence to the Class I guidelines, there was a 10% reduction in in-hospital mortality.

The benefit of achieving improved guideline adherence with the implementation of clinical registries is well illustrated by the Swedish experience with Swedeheart. This acute coronary care national registry in Sweden was first established in 1991 and resulted in dramatic improvements in adherence to acute myocardial infarct guidelines between over a 12-year period. During this period, 30-day mortality fell by 65% and 12-month mortality by 49%²⁸. Moreover in a controlled study involving the Swedish registry, implementation of a systematic quality improvement intervention further improved guideline adherence and outcomes²⁹.

The above US and Swedish studies exemplify the benefits of adhering to performances measures as derived from clinical guidelines, however compliance with criteria for appropriate use of tests and procedures will also improve outcomes. Ko et al³⁰ evaluated the adherence to coronary revascularisation appropriateness criteria in Canada and demonstrated both overutilization and underutilisation by clinicians. Moreover, they demonstrated that underutilisation is associated with an increased risk of adverse outcomes.

Clinical registries are the principal tool for outcomes research as they have an unrivalled ability to monitor guideline compliance in relation to performance and appropriateness of care. Furthermore, they have the ability to assess variability in care and thus identify high performers whose practices should be modelled and poor performers who may need assistance. These actions will improve outcomes for cardiovascular healthcare.
2. **Reduced Costs.** Improved quality does not imply increased costs. Reduced expenses have been shown to result from quality of care registries. This is best illustrated by the Swedish joint registry where identification of the optimal joint prosthesis resulted in a reduced requirement for prosthetic hip joint revisions, resulting in a substantial cost saving\textsuperscript{31}. In cardiovascular health, guideline adherence would reduce events and thus readmissions resulting in significant cost savings. Furthermore, more appropriate use of cardiovascular investigations would result in significant cost savings both in relation to avoidance of inappropriate investigations and undertaking appropriate life-saving procedures that may have been overlooked. These costs savings might well pay for the cost of a registry many times over. Appreciation of the potential cost savings in this outcomes research strategy has prompted the Swedish Government to increase its financial support of clinical registries from $10 to $45 million per year\textsuperscript{31}.

3. **Clinician Engagement.** Involvement of clinicians is essential in outcomes research. Not only is the feedback to the clinicians imperative if clinical practice is to change but also there is the potential for these ‘frontline providers’ to innovate. Thus by engaging the clinicians with feedback on their clinical practice, there is the potential for them to identify system improvements to further improve quality.

Furthermore, routine collection of data through a registry, particularly using opt-out data collection processes, provides the ability to develop quality improvement initiatives locally, state-wide and nationally. This means that individual project evaluation is possible using registry data and that beyond the scope of these studies, sustainability can also be measured. The Australian Clinical Stroke Registry data are being used in this way in a current NHMRC funded project (Stroke123 Project).
ACTION PLAN

As detailed above, Australia has the potential to achieve significant improvements in cardiovascular care by embracing Outcomes Research principles, thereby translating our clinical knowledge base into clinical practice and achieving improved patient outcomes. The NHMRC Research Translation Faculty has the capability to achieve this goal and this ‘Case For Action’ will outline the fundamental steps required to establish this for cardiovascular disease. Importantly, it should also be considered in the context of primary preventative measures, which are being deliberated by the Primary Care Steering Group.

The Cardiovascular Health and Stroke Steering Group propose that the NHMRC Research Translation Faculty ‘Case for Action’ involve the ‘Utilisation of Appropriateness and Performance Criteria in the Management of Cardiovascular Disease in Australian Hospitals’. Routinely undertaking outcome measures and applying performance/appropriateness criteria will benchmark clinicians and health systems, thereby fostering improvement in health care delivery. For this to be successful, the outcome measures must be collected, analysed and reported back to the clinicians/health system, so that clinical care improvement can be facilitated.

To achieve this objective, three steps are required:

A. Establish the NHMRC CVD Quality Care and Outcomes Research Network.
B. Establish National Appropriateness and Performance Criteria.
C. Develop National Cardiovascular Registries.
D. Feedback Reporting of Performance & Appropriateness Criteria.

The details involved in these steps are outlined below.

A. Establish the NHMRC CVD Quality Care & Outcomes Network

The NHMRC Research Translation Faculty is well positioned to establish a Cardiovascular Disease Quality Care and Outcomes Research Workgroup (CVD-QCOR Network) to foster the development of Outcomes Research within Australia and oversee the objective of this ‘Call for Action’. The terms of reference for this workgroup are outlined below.

Scope. This national network will be a committee within the NHMRC Research Translational Faculty and will be responsible for the establishment and implementation of cardiovascular disease appropriateness and performance assessment.

Objectives. The specific objectives of the CVD-QCOR Network will include the following:

1. Oversee the development of a business case for national clinical cardiovascular registries
2. Develop Australian Appropriateness and Performance Criteria for Cardiovascular Disease.
3. Facilitate the establishment/development and sustainability of clinical cardiovascular registries for appropriateness and performance assessment, ensuring that participating hospitals are provided timely feedback
4. Educate healthcare workers, policymakers, and the broader community on the importance of appropriateness and performance assessment.
5. Promote translational research within the research community.

Reporting Relationship. The CVD-QCOR Network would operate within the NHMRC Research Translation Faculty and therefore would have a reporting line to the NHMRC Principal Committees.

Network Structure. The CVD-QCOR Network structure will include an overseeing executive committee that will co-ordinate the three disease-focussed working groups. The membership of these groups is outlined below.
1. **CVD-QCOR Network Executive.** The details of the ‘Executive’ are summarised below.

   **Functions:**
   - To co-ordinate the activities of the CVD-QCOR Workgroups
   - Co-ordinate a CVD educational program on appropriateness and performance
   - Promote translational research within the Australian research community
   - Facilitate participation of interested ancillary organisations

   **Membership (Table 3).** Workgroup leads will be the core members of the Executive, with the executive committee chair rotating between these three, each for a period of 2 years.

   - **Education and Research Outcome Facilitator** will be appointed by the Workgroup Leads. This person will be responsible for co-ordinating an educational program on appropriateness and performance assessment as well as promoting translational research within the research community. They will deliver a combined educational/promotional program involving all of the cardiovascular disorders included in the CVD-QCOR Network.

   - **NHMRC Principal Committees Representative** will be appointed to facilitate communication between the Executive and the NHMRC Principal Committees.

   **Affiliate Representatives (Table 3).** These will be supernumerary members of the Executive will have a bidirectional communication purpose; that is to disseminate the activities of the CVD-QCOR Network to these interested parties and feedback to the Executive the potential support these organisations may provide in the Network achieving its goals.

   **Scheduled Meetings:** at least 6-monthly, with more meetings as required.

### TABLE-3. Cardiovascular Quality Care & Outcomes Research Network Executive Members

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<th>Executive Members:</th>
<th>Cardiology Outcome Workgroup Lead</th>
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<td>Stroke Outcome Workgroup Lead</td>
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<td>Peripheral Artery Disease Outcome Workgroup Lead</td>
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<td>NHMRC Community and Consumer Advisory Group</td>
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<td>National Stroke Foundation</td>
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<td>Cardiac Society of Australia &amp; New Zealand</td>
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<td>Australia &amp; New Zealand Society of Vascular Surgery</td>
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<td>Australian Stroke Clinical Registry</td>
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<td>Stroke Society of Australasia</td>
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<td>Royal Australasian College of Emergency Medicine</td>
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<td>Australian College of Ambulance Professionals</td>
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</table>
2. **CVD-QCOR Network Workgroups.** Three groups will be established focussing on CVD.

**Workgroups.** CVD-QCOR Network - Cardiology Outcome Workgroup
- CVD-QCOR Network - Stroke Outcome Workgroup
- CVD-QCOR Network - Peripheral Artery Disease Outcome Workgroup

**Functions.**
- To develop Australian Appropriateness and Performance Criteria for CVD.
- To establish/support a national disease-specific clinical registry with the capacity to undertake appropriateness and performance assessment.
- To provide feedback to participating sites against a national benchmark.

**Scope.** The CVD-QCOR Network workgroups should address the above cardiovascular appropriateness and performance measures in relation to coronary, cerebrovascular and peripheral disorders and procedures. This is an extensive workload, so the Network should aim to establish the criteria and a corresponding clinical registry for one procedure or disease-process within each workgroup, in the first 2 years. It would be proposed that the first targets should include percutaneous coronary interventions, stroke and abdominal aortic aneurysms, drawing on the experience of established registries. Following consolidation of these initial registries, others should be evolved (eg atrial fibrillation, cardiac devices, rheumatic heart disease, carotid revascularisation, peripheral revascularisation).

**Membership.** This will require significant flexibility as different Workgroups will have different demands and therefore may require more (or less) representatives. The proposed core members for each of the individual workgroups are summarised in Table 4.

**Workgroup Lead** – this person will be responsible for the Workgroup achieving its objectives.

**Director of the Appropriateness & Performance Criteria Committee** – this person will be responsible for establishing nationwide appropriateness and performance criteria. This will involve establishing a representative committee that will obtain a consensus opinion. The criteria should be endorsed by affiliated professional societies.

**Director of the Clinical Registry Management Committee** – this person will be co-ordinate the management of the clinical registries, ensuring national uniformity in data collection.

**Director of the Quality Care Monitoring Committee** – this person will co-ordinate the data-analysis and assessment feedback to the participating sites.

**Governance Officer** – this person will ensure that appropriate governance processes are in place for the registries and quality care feedback.

**Scheduled Meetings.** At least quarterly.

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<th>TABLE-4. Cardiovascular Quality Care &amp; Outcomes Research Network Workgroup Core Members</th>
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<td>• Workgroup Lead</td>
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<td>• Director of the Appropriateness and Performance Criteria Committee</td>
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<td>• Governance Officer</td>
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**Modus Operandi.** The CVD-QCOR Network will operate within the NHMRC Research Translation Faculty and therefore have the capacity to utilise its infrastructure (particularly the website portal) to promote communication and undertake activities such as:
- Scheduling meetings
- Teleconference facilities
- Face-to-face annual meetings at the NHMRC Research Translation Faculty Symposium
- Distribution of committee documents
- Conducting forums for feedback on appropriateness and performance criteria
- Engagement with clinical researchers
In addition to the Research Translation Faculty, the CVD-QCOR Network could potentially utilise other NHMRC infrastructures to educate the broader community on the importance of appropriateness and performance assessment.

**Key Performance Indices.** The success of the CVD-QCOR Network could be assessed by the following key performance indices:

1. Number of published appropriateness and performance criteria
2. Number of appropriateness and performance criteria endorsed by professional societies.
3. Number of established national clinical registries (with representation from each State)
4. Number of institutions participating in each national clinical registry
5. Timing of feedback to participating institutions (i.e. date of collection to returned analysis)
6. Number of institutions modifying practice as a result of feedback
7. Number of institutions demonstrating improved performance.

The timing to assess these indices will be 2 years at the earliest, with some requiring up to 5 years.

**B. Establish National Appropriateness and Performance Criteria**

Each of the three CVD-QCOR Network Workgroups will be responsible for establishing Australian Appropriateness and Performance criteria. These will require a national consensus and are best undertaken in collaboration with affiliated professional bodies and published in relevant scientific journals. The criteria will assist those developing and managing cardiovascular registries to ensure that appropriate data elements are collected. They will also provide guidance to the groups responsible for analysing and providing quality feedback to the participating institutions.

In developing the Appropriateness and Performance criteria, it would be rational to first develop performance criteria as these are generally simpler, well established and extensively used. In contrast, appropriateness criteria are often more complex and controversial. Which performance criteria should be developed first will also vary between the workgroups but generally those that are based upon hospital admissions are easier to adopt.

Specific directions that each of the CVD-QCOR Workgroups should consider are outlined below.

**Cardiology Outcome Workgroup.** Many performance and appropriateness criteria have been published from American-based professional societies (Table 2). The first performance criteria that should be evaluated by this group relates to Acute Coronary Syndromes. The Australian Commission for Safety & Quality in Health Care have developed and recently published an Acute Coronary Syndrome Clinical Care Standard. This would be a useful basis for the performance criteria and an ideal candidate to first develop.

**Stroke Outcome Workgroup.** The Australian Stroke Clinical Registry is well established and already has a well developed performance measure for stroke. Moreover, it is one of the few stroke registries internationally also to collect and report patient three month follow-up data. Participation of additional institutions/stroke collaborations will further strengthen this national registry. The Australian Commission for Safety & Quality in Health Care are currently finalising clinical care standards for stroke and thus the performance criteria should incorporate the elements from these sources.

**Peripheral Artery Disease Outcome Workgroup.** The Australian Vascular Audit is also well established and may be used as an initial basis for developing peripheral artery disease performance criteria although significantly more details will be required.

It is anticipated that at least one disease-based performance criteria will have been developed from each of these workgroups within the next 12 months. The total number and timeline for subsequent performance measures and eventual appropriateness criteria, will vary for each workgroup. Once the Appropriateness and Performance criteria are established, detailed work will be required to develop and maintain datasets that capture the data elements required to monitor the criteria.
C. Develop National Cardiovascular Registries

This is the major challenge of this ‘Call for Action’, since clinical registries are labour-intensive, expensive, and appropriate governance is critical. However, the individual CVD-QCOR Workgroups are well placed to facilitate the development of national registries. The current status of CVD registries within Australia is heterogeneous and thus each workgroup will face different challenges as outlined below.

The development of the registries will need to be coordinated with the development and rollout of electronic health records in public and private hospitals across Australia, to ensure that these incorporate the functionality needed to capture the registry minimum datasets.

**Cardiology Outcome Workgroup.** An Australian national registry of cardiac disease is the least developed of the three CVD. Currently several State-based clinical registries are established for cardiac catheterisation procedures (Table 1) and representatives from each of these should be included in developing a national registry. If the acute coronary syndrome performance criteria are the first to be evaluated, then these procedural registries will be of value but will not capture all patients nor all the data elements required for the Clinical Care Standard. Thus an acute coronary syndrome registry will need to be established.

**Stroke Outcome Workgroup.** The Australian Stroke Clinical Registry is the benchmark CVD registry as it is well established with regular performance monitoring. Participation of additional institutions will further strengthen this national registry.

**Peripheral Artery Disease Outcome Workgroup.** The Australian & New Zealand Society of Vascular Surgery has a Peripheral Artery Disease clinical registry although participation is limited. Work will need to be undertaken to recruit more institutions into this registry.

D. Feedback Reporting of Performance & Appropriateness Criteria

This is a fundamental component of the quality care improvement. From the above registries, performance and appropriateness criteria can be determined and must be reported back to the participating institutions to ensure there is an improvement in health care. Institutions would need to be compared with a national average to benchmark their achievements; this would be facilitated by:

- National Analytic Unit: academic institutions with the capacity to undertake rapid data analysis and feedback to participating institutions would be ideal. The NHMRC are well placed to facilitate this arrangement.
- Australian Commission on Safety and Quality in Health Care (ACSQHC) is the government agency responsible for co-ordinating safety and quality of health care in Australia and thus will need to be extensively involved in the process.

Based on experience in establishing registries, a 2-3 year period would be required to efficiently establish a national registry with a quality of care reporting capacity. This should be undertaken as modules with one disease process developed at a time.
POTENTIAL IMPACT

Implementation of this Case for Action would result in substantial improvements in cardiovascular healthcare over the next 5 years including the following:

1. **Improved insights into contemporary cardiovascular practice.** Except for the recently established Australian Stroke Clinical Registry, there are limited insights into current clinical practice in most cardiovascular disorders. Without measuring clinical outputs via clinical registries, we do not have knowledge if our clinical practice is poor or satisfactory; moreover we do not know where our clinical practice could be improved. Initiation of clinical registries will provide this knowledge.

2. **Improved clinical outcomes and care via adherence to clinical guidelines.** With the identification of contemporary cardiovascular practice via well-constructed clinical registries and efficient feedback to participating sites, there would be improved adherence to clinical guidelines that would translate to improved outcomes as detailed above.

3. **Reduced Health Costs.** Although there would be an initial outlay in expenses for the establishment of clinical registries, this would eventually translate to costs savings with more efficient health care delivery via the appropriate use of cardiovascular investigations and procedures, as well as reduced hospital admission due to the prevention of subsequent cardiovascular events.

4. **A Clinical Culture of Innovation in Healthcare.** By identifying deficiencies in clinical practices and outcomes to the ‘frontline health staff’, there is a potential for them to identify system methods to improve practices. This innovative culture should be fostered thereby enhancing clinician engagement, since these are the primary people responsible for the delivery of healthcare. Importantly, with this culture of innovation, successful practices at one institution could be translated to others resulting in significant healthcare improvements within the community. Furthermore, this would facilitate outcomes research and enlist the assistance of other disciplines to further improve healthcare.

5. **Facilitate Cardiovascular Research.** Well-constructed clinical registries will provide clinical insights into cardiovascular patients who are frequently not included in clinical trials and thus not considered in clinical guidelines. Examples include, the elderly and patients with disabling systemic disorders such as end-stage renal disease or rheumatoid arthritis. Furthermore, the clinical registries will potentially provide an infrastructure to conduct clinical trials. The NHMRC should promote this cost efficient process.

6. **Feedback on Quality Care Processes.** An additional benefit of the clinical registries is to support other quality care processes within the health system. These include procedure safety monitoring, post-market surveillance of medications and new devices, and feedback to clinical guideline writing groups. These can be further enhanced by data linkage to established databases such as the PBS.

The importance of advancing this Case for Action strategy has been already realised by many developed countries and Australia must follow suit if we are to maintain our high standard of healthcare. If we continue without progressing this Case for Action, it is likely to result in continued spiralling health costs and no knowledge of where the problem lies or how to improve it.
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The declarations of interests of Steering Group members, authors and contributors to this Case for Action are listed below.

<table>
<thead>
<tr>
<th>Name and Role(s)</th>
<th>Interests declared</th>
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<tr>
<td><strong>Prof Bronwyn Kingwell</strong></td>
<td><strong>Relationships</strong>&lt;br&gt;• Baker IDI – Heart and Diabetes Institute&lt;br&gt;• Australian Academy of Sciences.</td>
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<tr>
<td>• Steering Group Chair</td>
<td><strong>Grants</strong>&lt;br&gt;• Grants held&lt;br&gt;• Future applications.</td>
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<td>•</td>
<td><strong>Speeches/lectures</strong>&lt;br&gt;• Scientific presentations including therapeutics.</td>
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<tr>
<td><strong>Prof John Beltrame</strong></td>
<td><strong>Relationships</strong>&lt;br&gt;• International representative for the American Heart Association Quality Care&lt;br&gt;Outcomes and Research Council&lt;br&gt;Collaboration with the American College of Cardiology National Cardiovascular Database Registry&lt;br&gt;International Consortium for Health Outcome Measurement – Member of Coronary Artery Disease and Heart Failure Working Groups&lt;br&gt;Principal Investigator of the Coronary Angiogram Database of South Australia (CADOSA)&lt;br&gt;Chair of Cardiology Network (SA Health) Data and Information Working Group.</td>
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<tr>
<td>• Steering Group member</td>
<td><strong>Grants</strong>&lt;br&gt;• National Heart Foundation&lt;br&gt;• South Australian Cardiovascular Research Development Program&lt;br&gt;• National Health &amp; Medical Research Foundation&lt;br&gt;• Hospital Research Foundation.</td>
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<tr>
<td>• Author</td>
<td><strong>Consultancy Fees/Honorarium</strong>&lt;br&gt;• Clinical presentations for Bayer Pharmaceuticals, Boehringer-Ingelheim, Pfizer and Servier Laboratories (possible).</td>
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<td><strong>Support for travel or accommodation</strong>&lt;br&gt;• Bayer Pharmaceuticals, Boehringer-Ingelheim, Servier Laboratoriesm Genram Research Foundation, Japanese Heart Foundation.</td>
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<td><strong>Prof Louisa Jorm</strong></td>
<td><strong>Grants</strong>&lt;br&gt;• Holder of NHMRC Project, Partnership Project and Capacity Building Grants and applicant and likely future applicant for NHMRC Project, Partnership Project and Centre for Research Excellence grants.</td>
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<tr>
<td>• Steering Group member</td>
<td><strong>Board membership</strong>&lt;br&gt;• Board member, NSW Bureau of Health Information.&lt;br&gt;• Member (Appointed by Minister for Health), Alcoholic Beverage Advertising Code (ABAC) Adjudication Panel.</td>
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<td>• Prevention and Community Health Committee (PCHC) primary contact</td>
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<td><strong>Prof David Thompson</strong></td>
<td><strong>Grants</strong>&lt;br&gt;• Holds NHMRC Centre for Research Excellence (CRE), Program and Project grants.</td>
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<td>• Steering Group member</td>
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<tr>
<td><strong>Prof Sandy Middleton</strong></td>
<td><strong>Relationships/activities</strong>&lt;br&gt;• Member, Stroke Society Australasia&lt;br&gt;• Clinical Council Member, National Stroke Foundation (NSF)&lt;br&gt;• Chair, Australian Clinical Stroke Registry&lt;br&gt;• Co-chair, Acute Stroke Nurse Education Network&lt;br&gt;• Board member, Agency for Clinical Innovation and Clinical Excellence Commission&lt;br&gt;• Various Stroke Committee memberships (not paid).</td>
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<td>• Steering Group member</td>
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</table>
| Prof Sandy Middleton                | **Grants**  
|                                     | - Holds NHMRC Grants.  
|                                     | **Support for travel or accommodation**  
|                                     | - Clinical Council of National Stroke Foundation.  
|                                     | **Meals/beverages**  
|                                     | - NSF Clinical Council.  
|                                     | **Speeches/lectures**  
|                                     | - Numerous stroke-related presentations.  
|                                     | **Other organisational roles**  
|                                     | - Member National Stroke Foundation – Clinical Council.  
| Prof Amanda Thrift                  | **Grants**  
|                                     | - NHMRC Research Fellow 2013-2017  
|                                     | - Chief Investigator, NHMRC project grants, partnership grant, and Global Alliance for Chronic Disease (GACD) grant  
|                                     | - Current, past and likely future application to NHMRC for research and people support  
|                                     | **Activities**  
|                                     | - Past President and committee member of the Stroke Society of Australasia.  
|                                     | - Member, Stroke Society of Australasia and the High Blood Pressure Research Council.  
|                                     | **Relationships**  
|                                     | - Section Editor for the journal Stroke. No remuneration is received for this activity.  
|                                     | - Member, Cardiovascular Monitoring Advisory Committee of the Australian Institute of Health and Welfare.  
|                                     | - Committee Member for the Monash Partners Academic Health Sciences Centre  
|                                     | - Neurosciences and Mental Health Stream.  
|                                     | - Editorial board member of the International Journal of Stroke, and Neuroepidemiology  
|                                     | - Member, Australian Stroke Clinical Registry (AuSCR) Steering Committee  
|                                     | - Member, Australian Stroke Research Network Steering Committee  
|                                     | - Member, Deakin University’s Centre for Physical Activity and Nutrition Research (C-PAN) Advisory Committee  
|                                     | - Member, National Stroke Foundation Research Advisory Committee  
|                                     | - Employment  
|                                     | - Employee of Monash University as head of a research group.  
|                                     | **Board membership**  
|                                     | - Board Member, National Stroke Foundation.  
| Prof Graeme Hankey                  | **Relationships**  
|                                     | - The University of Western Australia, School of Medicine and Pharmacology  
|                                     | - Department of Neurology, Sir Charles Gairdner Hospital.  
|                                     | **NHMRC Grants**  
|                                     | - Program: Improving Stroke outcomes; attenuating progression and recurrence  
|                                     | - Project: Assessment of Fluoxetine in stroke recovery (AFFINITY)  
|                                     | - National Centre of Research Excellence to improve management of peripheral arterial disease, James Cook University.  
|                                     | **Honoraria**  
|                                     | - Received for serving on: the executive committees of the AMADEUS trial (Sanofi- Aventis), ROCKET-AF trial (Johnson & Johnson) and BOREALIS trial (Sanofi- Aventis); the steering committee of the TRA 2 P-TIMI 50 trial; the stroke outcome adjudication committee of the ACTIVE-W, ACTIVE-A, RE-LY and AVERROES trials, and for speaking at sponsored scientific symposia and consulting on advisory boards for Bristol-Myers Squibb, Boehringer Ingleham, Bayer and Pfizer Australia.  

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<th>Name and Role(s)</th>
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| **Dr Mark Wenitong**    | • Steering Group member  
                          • PCHC secondary contact  
                          • Chief Investigator on several NHMRC funded program grants as well as CRE  
                          ATSI Early Childhood  
                          • Chief Investigator on “Getting Better at Chronic Disease” NHMRC funded. |
| **Mrs Debra Cerasa**    | • Steering Group member  
                          • HCC secondary contact  
                          • Nil interests to declare. |
| **A/Prof Christopher Zeitz** | • Author  
                          • Nil interests to declare. |