



**Australian Government**

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**National Health and Medical Research Council**

**NHMRC Submission to the Review of the National  
Innovation System**

**April 2008**

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## Background

National Health and Medical Research Council (NHMRC) is Australia's principal agency for funding fundamental and applied health and medical research; for developing health advice for the Australian community, health professionals and governments; and for providing advice on ethical behaviour in healthcare and in the conduct of health and medical research. NHMRC also has statutory obligations under the *Research Involving Human Embryos Act 2002*<sup>1</sup> and the *Prohibition of Human Cloning Act 2002*<sup>2</sup>.

We appreciate the opportunity to provide this submission to the Innovation Review.

On 1 July 2006, NHMRC became an independent statutory agency under the amended *National Health and Medical Research Council Act 1992* (the Act) with changed accountabilities for the CEO.

The objectives of NHMRC are to:

- (a) raise the standard of individual and public health throughout Australia;
- (b) foster the development of consistent health standards between the various States and Territories;
- (c) foster medical research and training and public health research and training throughout Australia; and
- (d) foster consideration of ethical issues relating to health.

Complementing the Act, NHMRC has five strategic objectives as outlined in the *Strategic Plan (2007-09)*. These are:

- Objective 1: The Best and Most Relevant Research;
- Objective 2: Evidence Base for Health Policy and Practice;
- Objective 3: High Ethical Standards;
- Objective 4: Increased Investment (The Virtuous Cycle; see **Attachment A** for further details); and
- Objective 5: To Build a Better NHMRC.

NHMRC is the research and development arm of the Australian healthcare sector and provides funding to support health and medical research in two broad categories: support of research and support to build Australia's health and medical research capacity.

Research support includes the following:

- *Project Grants* enable individual researchers or a group of researchers to undertake scientific investigation in the biomedical, clinical, public health or health services field. Project grants target a specific hypothesis or question(s) and are awarded on the basis of significance, relevance, science, and track record;

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<sup>1</sup> [http://www.nhmrc.gov.au/publications/\\_files/embryact.pdf](http://www.nhmrc.gov.au/publications/_files/embryact.pdf)

<sup>2</sup> [http://www.nhmrc.gov.au/publications/\\_files/prohibit.pdf](http://www.nhmrc.gov.au/publications/_files/prohibit.pdf)

- *Program Grants* support teams of researchers to pursue broadly based collaborative research activities. These are awarded on the basis of recent record of achievement in research and research translation;
- *Strategic awards* provide NHMRC with a mechanism to respond to opportunities for pursuing innovative projects and national and international collaborations at the frontiers of health and medical research. Recent examples include palliative care, potential avian influenza-induced pandemic, preventive healthcare, and Type 1 diabetes.

Support to increase Australia's research capacity includes:

- *NHMRC Fellowships* provide support for internationally competitive Australian researchers to undertake research that is both of major importance in its field and of benefit to Australian health;
- *Career Development Awards* support middle career researchers build Australia's health research skills, increase knowledge, and encourage the growth of knowledge-based industries in Australia;
- *Capacity Building Grants in Population Health and Health Services Research* provide support to develop capacity within teams of population health and/or health services researchers by funding new expertise and developing less experienced researchers to become research leaders;
- *Training Fellowships* provide opportunities for early career Australian researchers to undertake research that is both of major importance in its field and of benefit to Australian health;
- *Scholarships* scheme provide support for PhD students groups not normally supported by the Department of Education, Employment and Workplace Relations (DEEWR);
- *Enabling Grants* assist Australian researchers to continue high quality, world-class research by providing support for specific facilities and/or activities to enhance the national health and medical research effort; and
- *Equipment Grants* and *Infrastructure Grants* provide funding for specific equipment and overhead infrastructure.

## **Australia's Health and Medical Research is World-Class**

Australia is among the world leaders in terms of health and medical research, and has long boasted some of the best scientists and health and medical practitioners in the world. All Australians should be proud of the achievements of our researchers, with Nobel Prizes for Physiology or Medicine won in the last half century by Barry Marshall and Robin Warren (2005), Peter Doherty (1996), John Eccles (1963), and Macfarlane Burnett (1960). Other researchers have been recognised as Australians of the Year for their contributions to health through research. These include Ian Frazer (2006), Fiona Wood (2005), Fiona Stanley (2003), and Sir Gustav Nossal (2000).

Australian health and medical researchers also perform outstandingly against international benchmark citations. Independent bibliometric analysis of Australian health research publications shows that Australia has a number of research areas in the top 1% of most

highly cited literature. Australia also exceeds the world average in terms of citations per publication (6.6 vs. 6.5 CPP respectively). This is particularly true for NHMRC, which has almost 50% more citations per publication (9.4) than the world average<sup>3</sup>.

Another independent indicator of the quality of our research is the support we have received from the world's largest health and medical research funding agency, the United States National Institutes of Health (NIH). In 2006, Australia was the third highest recipient of international research funding from NIH (AU\$31 million), just behind Canada and the United Kingdom.

Australian health research also levers foreign capital into our country. We have recently analysed the outcomes from over 1200 NHMRC end-of-grant reports received over 2003-05, and found that the research funded attracted another 28 cents from overseas for every NHMRC dollar, and another 27 cents from Australian sources. An example of Australian scientists winning competitive funding internationally is the Human Frontier Science Program (HFSP). The HFSP supports novel, innovative, interdisciplinary, and international collaborative research focused on the complex mechanisms of living organisms. Topics range from molecular and cellular approaches to systems and cognitive neuroscience. In March 2008, eight Australian researchers were awarded funding of USD \$2.1 million in funding by the HFSP.

Analysis of the end-of-grant reports also shows the quality of our research in the establishment of national and international collaborations. Our researchers reported that 65% worked in collaboration with international researchers, reflected in 35% of publications having at least one international author.

A further measure of the quality of our research is the number of successful Australian companies built upon original discoveries by medical researchers. These include the likes of Cochlear, ResMed and Ian Fraser's development, from basic research, of a vaccine against most forms of cervical cancer (Gardasil; see **Attachment B** for further information), which is now contributing to the success of CSL.

Despite the success of companies such as CSL, Cochlear and ResMed, Australian scientists, researchers and medical practitioners still face challenges to discover the causes of the many diseases that afflict us and to find out through research how to better prevent and treat chronic disease and ill health. Consequently, NHMRC supports a suite of initiatives to ensure that Australian researchers have the opportunity to collaborate with international colleagues working at the frontier of their research fields. International collaborations are vitally important as the provision of Australian health and medical research expertise to developing countries in our immediate region has the potential to positively impact on domestic health outcomes. An example of our leadership in terms of international collaboration is the International Collaborative Research Grants scheme (see **Attachment C** for further details).

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<sup>3</sup> NHMRC supported research: The impact of journal publication output 1999-2003.

While NHMRC will continue to work hard in collaboration with international colleagues, it is essential the Government continues to support the growth of research areas on the basis of merit, quality and social need, to ensure that Australia remains a world leader in health and medical research and to increase our capacity to be responsive to transnational health demands, such as that posed by the Avian influenza (i.e. bird flu).

## **The Need for Continued Innovation in Healthcare, Ageing and Aged Care and their Delivery**

The vertical integration of health and medical research within the healthcare delivery system, including primary and hospital care, is essential for social gain. As healthcare is Australia's largest single industry, a vibrant health and medical research sector is essential to the improvement of health in Australia, both at an individual and population level. It is also essential for driving productivity and economic growth.

Like all industries, research and innovation are essential to the healthcare system. The healthcare system is under enormous pressure to innovate due to ageing of the Australian society, lifestyle related chronic illnesses and increasing healthcare costs. Prevention is the key to better health for our population, particularly through delay of onset of chronic diseases. Improving healthcare service delivery within this milieu depends on having key resources that are well organised and managed. Undoubtedly, new technologies such as personal health systems, home-based monitoring tools, and wearable and mobile technologies are reforming the delivery of healthcare and empowering individuals to take a more active role in managing their health. However, there is much to learn if we are to prevent ill health and better maintain good health throughout life, to more effectively deliver healthcare based on best evidence-based practice, and if we are to discover and implement new therapies and cures. Consequently, there is a continued need to support innovation in healthcare, ageing and aged care and their delivery.

It is clear that the world is experiencing a science and technology revolution that is enabling innovation and is changing the way we operate and think in all sectors, including the service sector. Not surprisingly science and technology-led innovation can pave the way for entirely new service industries. Australia is well-placed to capitalise globally on our world-class medical science base and the expertise we are building in addressing our domestic challenges of providing health and education services to our remote and regional areas, addressing the imperatives of an ageing population and containing a potential blow-out in healthcare costs. Solutions developed to meet these challenges could in turn generate new services and export markets. For example, a breakthrough development in broadband technology has led to an innovative solution to the delivery of high quality care to regional hospitals. The outcome of such innovations in technology platforms and applications is likely to lead to further innovation, greater productivity and economic output. How Australia meets the opportunities and challenges presented by this new business paradigm, particularly in regard to services innovation, will influence not only Australia's future position in the world market, but also our ability to deliver effective, state-of-the-art domestic services.

While public sector investment is vital to the healthcare system, private sector investment is also an integral part of the research cycle. This is reflected in data released by the Australian Bureau of Statistics in their report *Research and Experimental Development (2004-05)*<sup>4</sup>. The report shows that of the total increase in medical and health sciences research and development funding (AUD \$615 million) from 2002-03 to 2004-05; almost half of this increase (49.6 percent) is attributable to private sector investment.

Although the private sector is assuming greater importance to the health and medical research sector, there are some areas, however, where industry is much less interested in picking up and utilising research. One example is Type 2 diabetes. To address this issue, NHMRC is working with industry and not-for-profit and philanthropic organisations, such as the Juvenile Diabetes Research Foundation and the Wellcome Trust in the UK in areas where private sector investment interest is less strong.

## The Nature of Innovation in Healthcare

Innovation is a key driver of productivity in healthcare and economic growth. Innovation positively impacts: competitiveness, healthcare delivery, treatment options, patient care, standards of practice, and access to best evidence-based treatments. The development of new or improved technology, including pharmaceuticals, medical devices, diagnostics, biomarkers and other therapeutics can also make healthcare better, more effective and cost effective. For example, the return on investment from innovation is substantial. The Productivity Commission Report (2007) showed that there were important economic, social and environmental benefits derived from investment in health and medical research<sup>5</sup>, estimating that for every dollar invested in health and medical research there is a return of up to five dollars in economic benefits<sup>6</sup>.

As posited by Dr Terry Cutler (2008), “Innovation is creating value by doing things differently”<sup>7</sup>. It is clear that the way we innovate is changing. Over the last few decades, the focus was on advances in new technologies, notably information and communications technology (ICT). Today, ICT is a fundamental general purpose technology and innovation centres on the creation, distribution and diffusion of knowledge and capabilities across the very knowledge networks that ICT enables.

Knowledge-driven innovation is not only changing the way we communicate, but is revolutionising the way key services and products are delivered in the private and public sectors. The way that scientific research now depends on collaboration and knowledge-sharing, the way health and education services are delivered (e.g. online communities of practice), the way people care for each other, and the way people interact socially are all

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<sup>4</sup> <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/8112.02004-05?OpenDocument>

<sup>5</sup> Productivity Commission (2007). Public support for science and innovation, research report: Productivity Commission, Canberra.

<sup>6</sup> Access Economics (2003). Exceptional returns: The value of investing in health R&D in Australia.

<sup>7</sup> Cutler, T. (2008). Review of the national innovation system: A call for submissions.

experiencing an innovation-driven revolution.

Despite non-technological forms of innovation becoming increasingly important, the development of health and medical products continue to be predominantly designed incrementally, modifying and improving on previous developments. Small scale innovation means that these design changes are not always patentable, but design protection can be used to ensure the end product cannot be copied by competitors.

Examples of Australian companies that have been built upon original discoveries by medical researchers include:

- Cochlear, which is responsible for Cochlear implants (also known as the world's first 'bionic ear'), arose from research in Melbourne by Professor Graeme Clark. The device has enabled thousands of profoundly deaf people around the world to hear; and
- ResMed, which is a leading developer of products for the diagnosis and treatment of sleep-disordered breathing and other respiratory disorders. ResMed is also raising awareness of the serious consequences of sleep apnoea. It took twenty years from the development of a mask to treat sleep apnoea to find a company willing to commercialise the device.

In some cases however, health and medical research comes from paradigm shifts, not from continuing current accepted wisdom. For example, Perth researchers Robin Warren and Barry Marshall won the Nobel Prize for Medicine and Physiology in 2005 for discovering that a bacterium *Helicobacter Pylori* causes most gastritis and stomach ulcers. Although initially met with scepticism by the medical community, the proven findings forced a complete rethink of treatment of a condition that affects millions of people, in a market worth billions of dollars. It has also reduced suffering and led to significant cost savings in the health system by reducing the need for surgery, hospitalisation and chronic drug treatment.

While the passage of health and medical ideas to market remains predominantly incremental, an opportunity exists to change the mix of grant allocation to encourage more creative initiatives. This is underlined by the increasing trend for international organisations, such as the Bill and Melinda Gates Foundation's *Frontiers* program or the NIH Director's *Pioneer Award* program to support innovative ideas and risk taking. In the context of this trend, and in light of recommendations received from the International Review of NHMRC research funding (2008), NHMRC is currently examining its internal funding mix to ensure that we support and facilitate creative and innovative ideas.

Many challenges remain in the incremental processes involved with translating research evidence into products or services, clinical practice or health policy in the Australian health system (eg Buchan, 2004<sup>8</sup>; Nutbeam, 2004<sup>9</sup>). These include the fit between research and

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<sup>8</sup> Buchan, H. (2004): Gaps between best evidence and practice: Causes for concern. *Medical Journal of Australia*, 2004; 180 (6 suppl): S48-S49.

policy needs, the gaps between what is known in healthcare and what is practised, together with the multiple interactions between researchers, clinical practitioners and policy makers. The complex processes in this continuous horizon-scanning for evidence-based decision-making are illustrated in **Attachment D**<sup>10</sup>. NHMRC has a key role in the continuous development of this knowledge and its effective translation into policy and practice within this health system.

## **NHMRC's Role in the Nature of Innovation in Healthcare**

NHMRC's vertical integration within the health system ensures comprehensive support for health system innovation. In ensuring that it supports the best and most effective health and medical research, NHMRC undertakes ongoing and direct interaction with all elements of the health system. This includes its close association with agencies within the Commonwealth Health and Ageing portfolio, state and territory health departments, professional medical colleges and societies, the community, non-government health research organisations (e.g. health consumer and patient advocacy groups), and researchers in universities, hospitals and medical research institutes. An example of NHMRC's community engagement is through participation of Indigenous community panels as part of the peer review process to help ensure that funding of Indigenous research grants is of direct relevance to Indigenous communities and their health service providers.

In addition to NHMRC's traditional role of funding and supporting best basic and applied research across the four pillars of health and medical research (basic biomedical, clinical, public health and health services) and ethics and advice, NHMRC recognises the opportunity to improve Australia's world-class research by enhancing its focus on translation of research and knowledge into practice, in all its relevant forms. Consequently, NHMRC develops health and medical guidelines as one vehicle for knowledge translation and practice improvement.

### **Guidelines**

Clinical practice guidelines are systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances. At present there is no systematic approach to the identification of areas where sets of clinical guidelines, evidence summaries or advice on specific clinical issues would make the most impact on care and health outcomes. This means that there is little co-ordination of guideline production within Australia resulting in both gaps and duplication of effort. In terms of innovation this could mean that Australia is not fully capitalizing on the available evidence and is missing opportunities to take a lead.

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<sup>9</sup> Nutbeam, D. (2004): Getting evidence into policy and practice to address health inequalities. *Health Promotion International*, Vol 19, No 2: 137-140.

<sup>10</sup> Lomas, J. (2003): Reaching for the clouds: Options for the support of health services research in the national health and medical research council of Australia. *Discussion document prepared for the NHMRC*.

NHMRC is leading the development of evidence-based guidelines in Australia by providing the community, governments and health service providers with the best available evidence and guidelines on a range of public health and clinical issues. Recent examples of this work include “A Systematic Review of the Safety and Efficacy of Fluoridation”; the “Australian Drinking Water Guidelines” and “Ethical Guidelines for the Care of People in Post-Coma Unresponsiveness (Vegetative State) or a Minimally Responsive State”.

An important issue for NHMRC and Australia is how to translate the results of research into evidence-based practice statements that will assist healthcare practitioners to practice evidence-based medicine? Another important issue is how to use evidence effectively to inform policy makers so that evidence-based policy can become a reality? NHMRC recognises that research at the health services and policy levels is needed to understand why these “knowing – doing” gaps occur and to find the best ways to address them? NHMRC is actively working to address these issues.

### **Closing Evidence-Practice Gaps**

Reviews or syntheses of existing information provide the best opportunity of increasing access to and use of evidence by policy makers, practitioners and the community. NHMRC is attempting to address this by broadening its own research funding programs to include policy and practice focussed research and a strategic focus on developing evidence syntheses. Examples such as the interactive *Community Water Planner* (see **Attachment E** for further information) offer salutary lessons in identifying a solution that will fit the target audience. A further example is the booklet *Making Decisions: Should I use hormone replacement therapy?* This booklet is a decision tool that sets out the concept of risk and steps the reader through important decision points.

While the process of synthesising and disseminating the outcomes of health and medical research to inform health policy and practice may seem straight forward, commissioning the best and most relevant research is the beginning of a journey which may take many years to complete<sup>11</sup>. Moreover, effective knowledge transfer strategies rely on the capacity of higher education and research institutions to shape their knowledge transfer approaches and activities in partnership with their various communities, and to respond creatively to the distinctive needs of those communities.

NHMRC is working to close evidence-practice gaps. In April 2007 the National Institute of Clinical Studies (NICS) was incorporated into NHMRC. NICS focuses on closing gaps between best available evidence and current clinical practice – which is internally recognised as a dilemma in all areas, not just healthcare. It does so by:

- working in partnership with clinical groups and healthcare organisations to help improve evidence uptake;
- providing access to resources for health professionals; and

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<sup>11</sup> Balas, E. A., & Boren, S. A. (2000). Managing clinical knowledge for health care improvement. *Yearbook of Medical Informatics*.

- providing training to future Australian clinical leaders in methods to improve evidence uptake.

An example of the success derived from the implementation of evidence is the work conducted into venous thromboembolism prevention (VTE). The NHMRC-NICS VTE prevention program, known as the *Stop the Clot* program (see **Attachment F** for further details), has resulted in significantly improved VTE prophylaxis policies and practices in all participating hospitals. With approximately 30,000 cases of VTE hospitalisation in Australia annually, many of which result in death, this represents a major advancement in the treatment of VTE for sufferers.

While NHMRC is focusing on closing these gaps, we also need to focus on the adoption of new procedures and interventions to improve public health, preventative health and healthcare delivery. More specifically, we need greater application and adoption of the results of health and medical research by the health sector and Australian community in order to achieve good health for all and to realise the return on our investment in health and medical research.

### ***Knowledge Translation***

Knowledge translation, also known as knowledge transfer and evidence implementation, is increasingly attracting the attention of researchers, practitioners, health service managers and policy makers. It has been the subject of recent World Health Organization (WHO) reports with calls to establish or strengthen knowledge transfer mechanisms that support evidence-based public health and healthcare delivery systems, and evidence-based health related policies. Such resolutions are hard to act on without a national framework for knowledge transfer which incorporates innovation at each level, and is underpinned by a national data system to capture agreed key indicators or outcomes so that adoption of innovation and healthcare improvements can be measured.

Lavis, Lomas, Hamid, and Sewankambo (2006)<sup>12</sup> developed a framework (see **Attachment G** for further details) for assessing knowledge transfer at a national level and this provides a useful starting point for consideration of what Australia needs. Some of the elements are global responsibilities and resources intensive, however, Australia needs mechanisms to contribute to this international work, to access it and to localize it where necessary. The adoption of such a framework requires commitment from Government, the funders of research, researchers and the community, backed by appropriate resources.

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<sup>12</sup> Lavis, J. N., Lomas, J., Hamid, M., & Sewankambo, N. K. (2006). Assessing country-level efforts to link research to action. *Bulleting of the World Health Organisation*; 84(8):620-628.

## **Workforce**

In addition to developing guidelines for use by policy makers, practitioners and the community, NHMRC is committed to improving researcher access to education and skills development as a platform for productivity growth and workforce transformation. NHMRC supports the health and medical research workforce through its people support programs. NHMRC's vertical integration with the health system ensures that the best and most relevant research is supported and includes research and researchers in all sectors and at all levels of the health system. This is exemplified by:

- NHMRC Practitioner Fellowships and Centres of Clinical Research Excellence which provide support for people and capacity building in hospitals; and
- NHMRC research funding supports medical research institutes in hospital precincts across the nation.

NHMRC support also increases researcher access to skills and knowledge provided by industry and helps to bridge the gap between industry and researchers. This is highlighted by NHMRC Industry Career Development Awards and the Development Grant Scheme (see [www.nhmrc.gov.au](http://www.nhmrc.gov.au) for more information on these schemes). Such schemes also enhance the capacity for the creation of new career paths, new ways of working collaboratively, growing the economy, building a more competitive Australia, and increasing the knowledge of the health workforce<sup>13</sup>. NHMRC will continue to develop innovative long-term solutions to Australia's workforce challenges and to bridge the gap between industry and research. For example, later this year, NHMRC will release a paper tentatively titled, *Highways to Health*, which will outline innovative approaches to supporting the health and medical research workforce and health more broadly.

Despite the Government's existing commitment to the health and medical research workforce through the NHMRC, there is still a need for greater support in this area to ensure Australia remains internationally competitive in terms of attracting and retaining researchers. This issue is particularly relevant at a time when researchers are able to attract significantly higher remuneration packages overseas and because of the highly mobile nature of the research sector.

Further, the Government could consider ways of raising primary and secondary school students' awareness of health and medical research to levels consistent with other issues, such as the environment. The context for any awareness raising program would be to raise understanding of the excitement of science in health and medicine, with a view to increasing the number of school leavers undertaking research-based university degrees, and consequently the number of research-trained graduates entering the workforce.

In addition, the Government could consider developing innovative strategies to further support research-informed healthcare professionals and to target the health research workforce based on future career needs underpinned by relevant demographic data.

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<sup>13</sup> Australia's Health Workforce, Productivity Commission Research Report, (2005).

## The Importance of Infrastructure to Future Success in Innovation

NHMRC realises that further investment in the physical and social infrastructure of the healthcare sector is essential to the future success of innovation in Australia by continuing to drive Australia's productivity growth and thus raising living standards. In particular, NHMRC realises that an open and equitable process is needed to ensure that all elements of research infrastructure, such as facilities, equipment, and "platform technologies" are supported.

NHMRC, within the limited resources available, continues to assist Australian researchers, practitioners and clinicians have appropriate access to facilities and equipment, such as research tools and necessary ICT platforms, in which to perform basic and applied research. This is achieved through our various capacity building funding schemes.

We are also developing new ways of ensuring that the health of Australian's benefit from the outcomes of research. For example, we are providing researchers and the private and community sectors with access to new knowledge networks via the production of knowledge centres such as the proposed health and medical research portal, *HMR Central*. In addition, we are actively engaged with our stakeholders to support the diffusion and take up of innovative ideas to increase performance and to engender downstream healthcare benefits.

NHMRC recognises that Australia must do a better job at planning for the physical and social infrastructure needs of an ever demanding healthcare system. This demands substantial and sustained increases in the quantum of investment into health and medical research infrastructure needs. Such investment will provide the platform for future research and innovation. Without access to appropriate and adequate infrastructure, clinicians, medical practitioners and the higher education and research sectors, and the Australian community, will not reap the full benefits afforded by innovation in research. The National Collaborative Research Infrastructure Strategy is a successful model for providing researchers with major research facilities, supporting infrastructure and networks necessary for world-class research. This strategy also addresses issues of information sharing and data collation and management.

NHMRC also notes that the way in which funding for the indirect costs of research is provided for health and medical research varies between universities, medical research institutes and hospitals. This creates an environment which may inhibit intersectoral collaboration which is essential for effective innovation in healthcare. Consideration could be given to providing research funding bodies such as the NHMRC and the Australian Research Council (ARC) with the full indirect cost of research, which could then be tied directly to the funded grants.

### ***Intellectual Property***

The area of intellectual property rights poses an important challenge to innovation. As knowledge increasingly assumes greater importance to growth and competitiveness, the key policy question remains how to strike the appropriate balance between providing incentives and rewards to innovators and providing access to new knowledge for users. NHMRC is helping address this policy challenge through improving the research environment for innovation. We are doing this through co-managing (with the ARC) the Review of the National Principles of Intellectual Property, which govern the mandatory compliance of all IP generated by grant recipients in research institutions.

### ***Taxation***

While much has been written on what can be done to overhaul the tax system to stimulate the economy, NHMRC does encourage a review of the nexus between current taxation policy and Australian health and medical research to identify any possible impediments to, and drivers of, innovation.

## **Conclusion and Recommendations**

Australia benefits enormously from health and medical research, which should continue to be supported by the Australian community. This benefit is largely captured through an adequately resourced independent research funding agency that is vertically integrated within the healthcare system to both support the best research and lead the uptake of research into policy and practice.

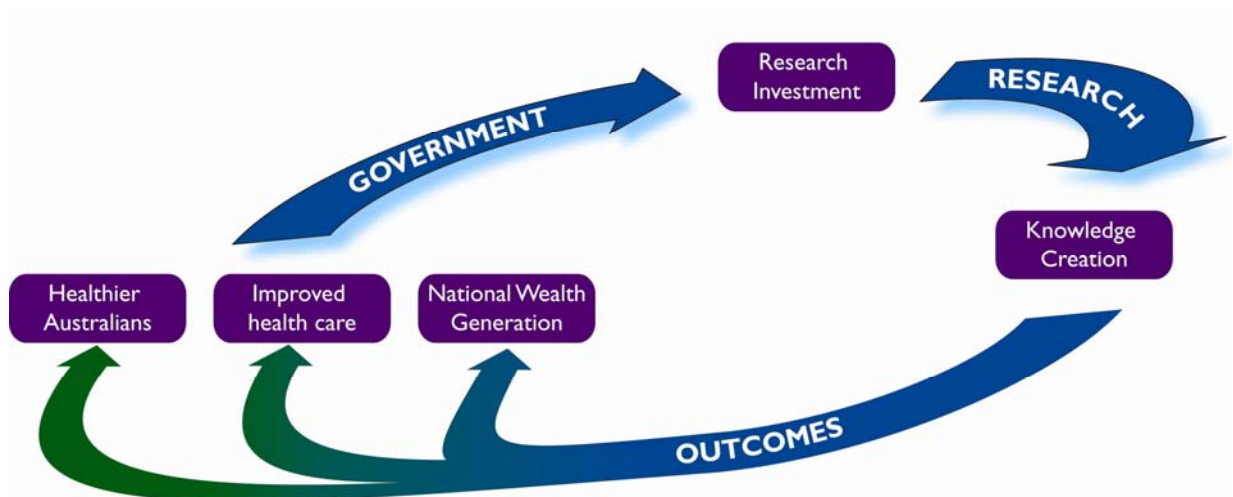
The NHMRC encourages the Innovation Review to consider and make recommendations relating to the:

- growth of basic and applied research as a way to ensure Australia remains a world leader in health and medical research and to ensure Australia remains responsive to any emergent national or transnational health demands;
- need for Government to develop and support innovative strategies to attract and retain our world-class health and medical researchers and to raise awareness of the benefits of health and medical research within the general community, and more specifically primary and secondary-aged school students;
- provision of large infrastructure items in an orderly and priority driven basis (health and medical research examples include wet laboratories at universities, hospitals and institutes, informatics capabilities, data linkage facilities, and population cohorts);
- provision of the indirect costs of research funding across all elements of Australian research; and
- need to further build Australia's research capacity to ensure international leadership in cutting edge research, in an era in which this part of the world – China, India, Korea, Japan, Singapore – will begin to dominate biomedical and public health research.

## Attachment A

### The Virtuous Cycle

The 'Virtuous Cycle' characterises a series of mutually reinforcing transitions between knowledge produced from research, and improvements in national health and wealth. This cycle highlights the complementary roles of funding, discovery, and delivery.



## Attachment B

### **Case Study: Translation of Australian and International Research into a Vaccine for Human Papillomavirus– Gardasil**

Gardasil is the world's first cervical cancer vaccine and has been hailed as a major breakthrough in the fight against cancer. Developed by NHMRC-funded scientist Ian Frazer, the drug halts the spread of four types of human papilloma virus (HPV), particularly HPV-16 and 18 which cause about 70 per cent of cervical cancers. HPV is highly contagious and may infect up to 80 per cent of people. In 98 per cent of cases, HPV clears by itself. However, if the virus persists and is undetected, it can lead to cervical cancer. This usually takes about 10 years. While most women who have HPV will not go on to develop cervical cancer, almost every case of cervical cancer is triggered by HPV. Preventing infection is a key factor in preventing these cancers developing.

Cervical cancer is the second most common cause of cancer death in women worldwide, resulting in an estimated 300,000 deaths annually, mostly in the developing world. In Australia each year there about 750 new cases, 1800 women who need treatment in hospital and 250 deaths.

Professor Ian Frazer, Director of the Centre for Immunology and Cancer Research at the University of Queensland, originally developed the vaccine. He received continuous NHMRC funding in the field of HPV immunology since 1985, which enabled him to continue research on the link between HPV and cancer as a practising clinician and pathologist while he was at the Princess Alexandra Hospital in Brisbane.

Using an animal model, Professor Frazer's research team identified two different reasons why vaccines had not worked and found a practical means of overcoming one of these. Trials then showed that a version of the new vaccine gave women 100 per cent protection against HPV-16, responsible for about half of all cervical cancers. A more powerful version was then developed to protect simultaneously against the two main strains of HPV that together cause around 70 per cent of all cervical cancers.

Professor Frazer was awarded the 'Australian of the Year' Award in 2006 for his work.

In 2007, Gardasil was made available for school girls aged 12 to 18 years under the National Immunisation Program (NIP). A free vaccine program for women aged 19 to 26 is also being delivered by general practitioners. Over 1 million Australian women and girls will be covered by the program.

Every year Australian governments invest more than \$90 million in the National Cervical Screening Program. This investment has cut deaths from cervical cancer by around 60 per cent since 1985 and has halved the number of cases of cervical cancer. As a result,

Australia currently has the second-lowest incidence of cervical cancer and the lowest mortality rate from cervical cancer in the world. Australia is also enjoying the benefits of Gardasil as the cost of the vaccine to the Australian public is outweighed by the increased productivity and taxes, decreased anxiety and impact on family and friends as a result of the treatment. That is, prevention is economically advantageous to treatment and the benefits to society are significant.

## Attachment C

### **Case Study: International Collaborative Research Grants Scheme**

The International Collaborative Research Grants (ICRG) scheme focuses on the health issues in the Asia Pacific region and builds research capacity into priority health areas both in the developing countries of the region and in Australia and New Zealand. NHMRC in collaboration with the United Kingdom Wellcome Trust and the Health Research Council of New Zealand (HRC) funds research into major health issues of developing countries.

To date, 11 research programs have been supported under the ICRG scheme. NHMRC has co-funded 10 of these research programs. Research funding of AUD \$29 million over 5 years (2004-09) has been provided by the funding partners, of which NHMRC contribution is over AUD \$11 million.

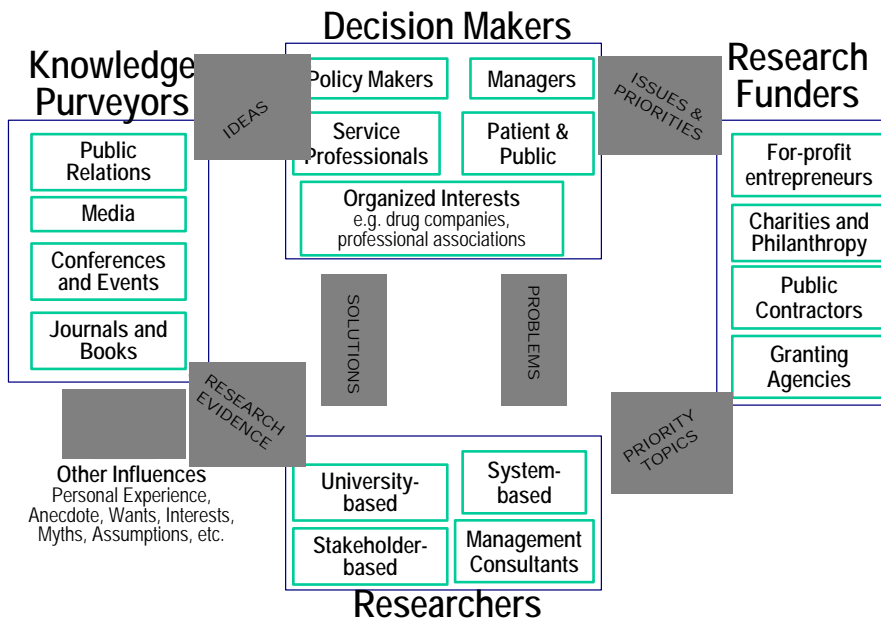
While the research programs have not yet been completed, there have already been a number of important achievements:

- treatment of uncomplicated malaria has been improved. This research was conducted as part of the ICRG research program 'Research and training to reduce morbidity and mortality from malaria in Papua (Indonesia) and Papua New Guinea' being undertaken by the Menzies School of Health Research in collaboration with the Indonesian Ministry of Health; and
- the first South Asian Clinical Toxicology Research Centre has been established. This Centre provides comprehensive human acute toxicity data and analysis on a number of pesticides. In addition, research results for magnesium bicarbonate and diazepam poisoning have been incorporated into national guidelines. This research has been undertaken by the Australian National University and the University of Colombo as part of the ICRG research program 'Reducing deaths from pesticide poisoning'.

Through this scheme, the Australian health and medical research sector has the ability to make an ongoing contribution to health in the Asia Pacific region, provided support is ongoing for this initiative.

Attachment D

Evidence-Based Decision Making Model



Source: Lomas (2003)

## Attachment E

### **Case Study: Translation of Australian and International Research into International Health Policy – Australian Drinking Water Guidelines**

The *Australian Drinking Water Guidelines* is Australia's premier resource for ensuring drinking water quality. Since 1972, the Guidelines have been developed by the National Health and Medical Research Council (NHMRC), with the Natural Resource sector collaborating with NHMRC on the Guidelines since 1987.

Until 1996, the *Australian Drinking Water Guidelines*<sup>14</sup> focused primarily on providing guideline values for contaminants in drinking water to be used by State/Territory regulatory agencies in establishing individual State or Territory standards or license conditions for drinking water. Following a number of significant water quality incidents in the 1990s resulting from failures within the water supply system, (Milwaukee, USA 1993; Sydney 1998), it became apparent that relying on monitoring water after it left the treatment plant did not offer the level of protection appropriate for the community. This concern was further highlighted by a serious contamination incident in Walkerton, Canada (2000) where seven people died.

In 1998, in response to these incidents, NHMRC, in collaboration with Monash University and the CRC for Water Quality and Treatment, initiated work on the development of a preventive risk management framework which would focus on managing and monitoring critical points within the water supply system to ensure the supply system was able to achieve drinking water quality that would meet the guideline values established by NHMRC. The approach would guide water supply managers through a catchment-to-tap examination of their water supply, and provide guidance on the management, monitoring and improvements. The Framework for Management of Drinking Water Quality was developed using leading Australian and international research, and was recognised by the World Health Organization and other international organisations and governments as the leading approach to preventive management of drinking water quality. Principles outlined in NHMRC's Framework were incorporated in the WHO *Guidelines for Drinking Water Quality* (2004)<sup>15</sup>.

In 2004, the Guidelines were further expanded to include an interactive decision support tool *The Community Water Planner: A tool for small communities to develop drinking water management plans*<sup>16</sup>. This innovative tool provides guidance to local drinking water supply managers on developing drinking water quality management plans, based on the Framework, that are tailored for their individual and specific water supplies. The Planner is

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<sup>14</sup> <http://www.nhmrc.gov.au/publications/synopses/eh19syn.htm>

<sup>15</sup> [http://www.who.int/water\\_sanitation\\_health/dwq/guidelines/en/index.html](http://www.who.int/water_sanitation_health/dwq/guidelines/en/index.html)

<sup>16</sup> <http://www.nhmrc.gov.au/publications/synopses/eh39.htm>

now widely used throughout Australia's rural and remote communities, and also in the South Pacific, North America, Asia, Europe and Africa. This tool provides a model which is robust and flexible enough to be useful in climates as diverse as Morocco and Iceland.

The development of the *Australian Drinking Water Guidelines*, the Framework for Management of Drinking Water Quality, and the decision tool has highlighted the expertise and international reputation of Australian water quality scientists, and NHMRC's ability to produce both nationally and internationally relevant health advice.

## Attachment F

### **Case Study: Translation of Australian and International Research into Clinical Practice for Venous Thromboembolism Prevention– Stop the Clot Program**

Venous thromboembolism (VTE) is a significant problem for hospitalised surgical and medical patients leading to the possibility of serious illness and risk of death. A number of evidence-based guidelines are available which outline the appropriate use of prophylaxis to prevent deep vein thrombosis (DVT) and pulmonary embolism (PE). In spite of the existence of such evidence, the problem of VTE in hospitalised patients persists and guideline recommendations continue to be under utilised<sup>17</sup>. The prevention of VTE has been identified internationally as a stand out opportunity to improve patient safety<sup>18</sup>.

During 2005-2007, in response to this challenge, NHMRC implemented a program aimed at translating evidence into clinical practice in 40 public hospitals from all States and Territories. State and Territory Health authorities in Victoria, New South Wales, Queensland and South Australia co-sponsored the program. The program adopted a whole of hospital approach to VTE prevention and implemented multiple active strategies informed by the findings of a systematic review of effective interventions to improve VTE prophylaxis in hospitalised patients, commissioned by NHMRC's National Institute of Clinical Studies<sup>19</sup>.

The program resulted in 20% absolute improvement in compliance with VTE prophylaxis in high risk admitted patients in participating hospitals. As a result, NHMRC in collaboration with its VTE Prevention Advisory Committee developed a guide to help other hospitals improve practice in their health service. The guide entitled *Stop the Clot: Integrating VTE prevention guideline recommendations into routine hospital care* was released in 2007<sup>20</sup>. It has been designed for use by hospital clinicians and risk managers and

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<sup>17</sup> National Institute of Clinical Studies 2003 Evidence-Practice Gaps Report, Volume 1, NICS, Melbourne. Available at [www.nhmrc.gov.au/nics](http://www.nhmrc.gov.au/nics)

<sup>18</sup> Agency for Healthcare Research and Quality 2001 Making healthcare safer: A critical analysis of patient safety practices. AHRQ Publication no. 01-EO57 Agency for Healthcare Research and Quality, Rockville, MD. Available at [www.ahrq.gov](http://www.ahrq.gov)

<sup>19</sup> National Institute of Clinical Studies 2003 Interventions to increase the uptake of venous thromboembolism prophylaxis in hospitals. Prepared by Australian Safety and Efficacy Register of New Interventional Procedures – Surgical (ASERNIP-S). NICS, Melbourne. Available at [www.nhmrc.gov.au/nics](http://www.nhmrc.gov.au/nics)

<sup>20</sup> National Institute of Clinical Studies 2007 Stop the Clot: Integrating VTE Prevention guideline recommendations into routine hospital care. National Health and Medical Research Council, Canberra. Available at [www.nhmrc.gov.au/nics](http://www.nhmrc.gov.au/nics)

sets out in a step by step fashion the key issues that need to be addressed to systematically integrate best practice guideline recommendations into every day practice.

Important implementation tools and resources were developed during the program and included in the guide, such as a VTE prophylaxis clinical audit form, database and user guide, a VTE risk assessment and management form, examples of locally adapted whole of hospital clinical practice guidelines for acute adult inpatients, a project planning template and a patient information brochure.

A second edition of the *Stop the Clot* guide is planned for late 2008 to support NHMRC's implementation of a new program aimed at translating evidence into practice in 40 private hospitals from a representative range of private sector healthcare companies. This program is funded by the Australian Commission on Safety and Quality in Healthcare and managed by NHMRC in recognition of NHMRC's expertise in translational research. A cluster randomised controlled trial methodology will be used to evaluate the effectiveness of this program in a more rigorous manner than the public hospital program which employed a more pragmatic quality improvement methodology.

Clinical indicators developed to monitor improvements in VTE prevention in the public hospital program were incorporated in the Australian Council on Healthcare Standards Equip manual in 2007 and a new manual of *Indicators for Quality Use of Medicines in Australian Hospitals* developed by the NSW Clinical Excellence Commission and NSW Therapeutic Advisory Group in 2008<sup>21</sup>.

The implementation of the VTE Prevention Program and resulting Stop the Clot guide and associated implementation resources have highlighted the expertise of Australian clinicians and implementation scientists and NHMRC's ability to translate research findings into the reality of day to day clinical practice and improve the safety and quality of healthcare in Australia.

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<sup>21</sup> Available at [www.achs.org.au](http://www.achs.org.au) and [www.nswtag.org.au](http://www.nswtag.org.au)

## Attachment G

### Framework for Assessing Knowledge Transfer

The four components of a framework for assessing knowledge transfer at a national level include:

1. “General climate”. A universal culture among those who fund research, those who do research (universities, research institutes and researchers) and those who use research about the value of knowledge exchange and adoption (knowledge transfer)
2. “Production of research”. Priority driven research, systematic reviews, evidence mapping and single studies based the needs of the end users of research. Activities to link research to adoption.
3. “Push efforts”: making opportunities to promote the key message from research  
Facilitating user pull: packaging research into high quality systematic reviews, establishing “rapid response” units, opportunistic communication.
4. “User pull”: developing infrastructure to support the access to and use of research in health services, the community and by decision makers Linkage and exchange; based on the establishment of partnerships between researchers and the end users of research to jointly develop and answer important questions or solve important problems.  
Evaluation of efforts to make the link between research and practice or policy.

Source: Lavis et al (2006)