The Australian Society for Medical Research

Submission to:

The Chief Scientist of Australia

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Review of Research

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Declaration of interests

The Australian Society for Medical Research (ASMR) represents members from the health and medical research sector including researchers from universities, hospitals, research institutes, medical colleges and patient groups.

Some members are recipients of funding from the Australian and/or State Government bodies, including the National Health and Medical Research Council (NHMRC), and the Australian Research Council (ARC).

ASMR receives direct funding from the NHMRC for ASMR Medical Research Week®, a public outreach program that raises public awareness of medical research in Australia.

The Australian Society for Medical Research

The Australian Society for Medical Research (ASMR) is the peak professional body representing Australian health and medical researchers. In addition to the more than 1600 direct members, ASMR represents the sector through 58 affiliated professional societies, medical Colleges and patient groups, representing an additional 18,000 people actively involved in health and medical research. Our corporate and disease related foundation memberships bring a further 100,000 Australians with and interest in health and medical research into association with ASMR. Our mission is to foster excellence in Australian health and medical research and to promote community understanding and support through public, political and scientific advocacy.

The ASMR is comprised of research active health and medical researchers from across the sector. This group is best placed to identify new trends and expectations for the next generation of research leaders. The ASMR has an unparalleled record of investigating and quantifying the engagement and benefits of research to the Australian community and economy. Furthermore, by communicating directly to schools and community groups about medical research, the ASMR has an immediate and first hand understanding of community perceptions and needs. The ASMR is the unified voice for the Australian health and medical research sector, and is well positioned to submit its recommendations to a review on innovation and productivity in Australia.

What are the top breakthrough actions that the Commonwealth and State/Territory governments, research agencies, universities and the business community can take, to fully utilise Australia's substantial research capability, to contribute to national productivity growth through innovation?

Innovative Australian health and medical research has consistently made significant contributions to the well-being, and economic prosperity of Australia[1-4]. Pioneering Australian discoveries have saved millions of lives around the world and returned billions of dollars to the Australian economy, through product commercialisation, and by maintaining a healthy, productive Australian population[1-4].

When considering 'breakthrough actions' that can be undertaken to boost Australia's productivity and growth through innovation, it is important to realise that innovation is a process that must be fostered from early education through to tertiary studies and beyond. By securing the future of the health and medical research workforce, consolidating research infrastructure, ensuring sustainable funding of health and medical research, and integrating research activity within the Asia-Pacific region, Australian innovation will thrive and drive the future prosperity of Australia.

ASMR welcomes this Review of Research in Australia as a forum to highlight strategic initiatives that will stimulate research innovation, leading to improved national productivity and economic growth.

Recommendation 1: Prepare science graduates with the skills for a successful career in health and medical research

A career in health and medical research is not based solely on laboratory science. Prospective health and medical researchers need to possess a broad range of skills to build successful research programs that contribute to the innovative capacity and prosperity of Australia.

Recommendation 1.1: Prepare science graduates to interface with industry

A stronger bi-directional interface between health and medical researchers and industry must be established to facilitate increased interaction and productivity between these two groups. It is important for health and medical researchers to be educated, via tertiary studies and web resources, about intellectual property, commercialisation of their discoveries, and how to engage with industry and develop effective partnerships. This approach will generate funds for future research and innovation, and have flow on effects for the Australian economy, through generation of local start-up companies, triggering employment opportunities, and attracting venture capital investment. These strategies are evident in the oft-quoted Mayo clinic and Stanford models[5-6].

Industry education should begin during post-graduate studies. It is recommended that universities offer courses designed to educate researchers on how to identify commercial opportunities, protect intellectual property and the commercialisation process of research.

Recommendation 1.2: Foster a trans-disciplinary research culture in graduates and early/mid-career researchers

True trans-disciplinary collaboration and interaction needs to be actively encouraged to drive innovative discoveries that will have paradigm shifting outcomes. Developing a broad range of skills in health and medical researchers, including networking, communication and team building is a priority in young graduates and researchers.

ASMR recommends consultation with academic, clinical and industry partners to develop a more cohesive integration of biology and health science with the pure sciences (mathematics, physics and chemistry) as well as IT, engineering and psychology. This could be achieved by universities encouraging, by financial or academic incentive, trans-disciplinary interaction beginning at under-graduate and post-graduate studies - for example, facilitating cross-disciplinary networking opportunities through professional development activities for post-graduate students; supporting the development of trans-disciplinary undergraduate courses, with opportunities for joint projects and co-supervision of honours and graduate students These initiatives would require input from all the overlapping disciplines and will establish the foundation for future collaborative interaction, and establish the framework for research innovation.

Recommendation 1.3: Up skilling of health and medical researchers to build a multi-disciplinary workforce

The rapid advances in health and medical research, including bioinformatics, genomics, proteomics and metabolomics, and the emergence of mixed-method designs in clinical and public health research have necessitated that researchers, in addition to their area of expertise, have a broad knowledge of multiple health research disciplines. ASMR recommends that this education is integrated into undergraduate and post-graduate training. This knowledge would equip future health and medical researchers with the tools and confidence needed to effectively build multi-disciplinary research teams, to foster innovative interactions.

Recommendation 2: Protect the future Australian health and medical research workforce by reforming science education

The number of high school students studying science is declining dramatically. Twenty years ago, 94% of year 11 and 12 students studied science subjects, today it borders on 50%[7].

It is critical to develop young scientists, beginning at primary school education, to ensure the outstanding reputation of Australian health and medical research is continued into the future.

It is simplistic to suggest that increased funding of high school and tertiary education, and the recruitment of better science teachers is all that is required to attract young Australians back to science. The problem is deep rooted and complex, requiring a holistic approach to reform science education in Australia. Science education must begin at primary school, engaging children with practical, hands on demonstrations and experiences. Several areas of primary school science curricula must be reviewed to understand why the interest in science isn't being fostered at this level:

1. Are primary school teachers adequately trained to teach science to their students?
2. Are primary school teachers aware of scientists in schools programs and how to access these initiatives to allow interaction of students with scientists?
3. Are there any barriers to teachers engaging students with science? For example, do schools place any restrictions on practical science demonstrations for fear of litigation?
4. Are primary schools able to afford and access the tools required to teach science to students?

The seeds for science are planted at an early age, and when nurtured correctly, can be developed into an innovative, creative, highly productive workforce. It is critical to

understand the fundamental factors of why primary school students are not developing an interest in science and why this lack of interest carries on to high school education.

Recommendation 2.1: Review the perception of career pathways and opportunities in health and medical research

The image and branding of a career in science and the influence it has on the career decisions of young Australians cannot be underestimated. When promoting careers in health and medical research to students, the breadth of the industry and the career options available should be presented in its entirety. Health and medical research has moved well beyond just the bench scientist, and encompasses clinical and allied health researchers, research coordinators, intellectual property lawyers, science/health journalists, editors of scientific journals, science communicators etc.

Improving the image and brand of health and medical research, will attract more young scientists and secure a vibrant, innovative and productive future workforce. The ASMR recommends an approach to inform students of the broad range of professions in health and medical research, as well as the educational and training pathways required to achieve a successful career.

Young students planning their future careers will be not be attracted to a career pathway where there is no job security, low wages (relative to study and training required) and limited opportunity for promotion[6]. Without secured and long-term structured funding for health and medical research, these factors are impossible to address on their own. It is critical to immediately establish a secured investment model for health and medical research.

Recommendation 3: Secure the current health and medical research workforce

Australia has one of the world's most well trained and highly skilled health and medical research workforce[8-9]. This is the foundation for building and supporting innovation.

Australia is at risk of losing the knowledge, innovative capacity and intellectual property it has developed over many years and through hundreds of millions of dollars of Federal Government investment[8-9]. It is crucial to improve job security in health and medical research to secure the current workforce and create a realistic career option for future researchers.

The innovations of drug discoveries, medical devices and new approaches to treating and curing diseases are not instantaneous; however, their impact on the common good of human kind is immense. Health and medical research is a continuum of discovery, validation, clinical trial, and implementation. This process needs to be underpinned by job security to support long-term innovation and discovery.

Immediate steps must be taken to create defined and long-term secured career structures for health and medical research. This will be achieved by creating a sustainable funding model for health and medical research[4].

Recommendation 4: Peg investment in the NHMRC to 1% of the total health expenditure, increasing by 0.2% annually over 10 years to reach 3%

To preserve the outstanding calibre and international contributions of Australian health and medical research, the ASMR recommends an immediate revision of health and medical research funding strategies. Currently, Federal government investment in health and medical research is volatile and dependent on annual budget reviews, with no guarantee of sustained investment in the sector. This unsecured funding model stifles research innovation by:

1. Restricting ground breaking research programs, acknowledged internationally as excellent in their field, through staggered and unsecured funding
2. Driving well-trained and highly skilled individuals into alternative career options, leading to reduced research output and translation[9-10]
3. Additionally, the psychosocial stresses associated with reduced job and research security are contributing factors towards a potentially reduced quality in research output[9-10]

Australian health and medical researchers have made long-standing contributions to the global understanding of human health and disease[1-3]. Innovative Australian health and medical research has resulted in several breakthrough discoveries, including identifying the bacterium that causes stomach ulcers and developing vaccines for the virus that causes cervical cancer in women and rotavirus, which causes severe diarrhoea in children. These innovations have improved the quality of life for billions of individuals world-wide, and saved millions of lives. Furthermore, the fiscal return of these discoveries to the Australian economy is enormous, both through product commercialisation, but more importantly, through maintaining a healthy and productive Australian workforce[1-4].

It is critical for government to immediately revise the current, volatile funding mechanism of health and medical research. The ASMR has developed an evidence based, business investment strategy to link NHMRC funding to the national health budget[1-4]. This unique proposal will ensure that Australia is positioned to respond to acute health care challenges, and address projected future health challenges.

The ASMR presents an evidence based recommendation for government to lift NHMRC investment to 1.0% of total health expenditure as soon as possible, increasing by 0.2% annually to reach 3% in 2022[3-4].

Recommendation 4.1: Secure Australian Research Council funding and promote trans-disciplinary collaboration

The basic research undertaken by ARC funded projects can directly underpin future advances in health and medical research. A direct example is the pioneering work being undertaken by Australian researchers in photonics. Traditionally, this technology had only communications, military, and commercial applications. However, photonics sensing technologies now have broad application to medical devices, for example, in cancer detection[11]. Therefore, the ASMR recommends a secured funding model for ARC that is not subject to yearly review or downwards fluctuation. Furthermore, ASMR proposes that NHMRC and ARC apportion some of their funds towards a new funding category aimed at encouraging trans-disciplinary research collaborations, for example physicists and cancer biologists to develop new sensing technologies or cognitive behaviourists collaborating with clinician researchers to better manage chronic disease.

Recommendation 4.2: Increase the industry interface with health and medical research

Australia's highly skilled health and medical research workforce is underutilised by industry. According to the report 'Health of Australian Science', employment of scientists by Australian companies is amongst the lowest in the OECD - only employing 2.2 scientists with doctorates per 1000 people in the workforce, compared to 11 in the US, 20 in Germany and 28 in Switzerland[12].

Attracting industry partnerships will help to build innovation and discovery, and draw investment and growth into the Australian economy. Encouraging industry to collaborate with researchers, using tax incentives, is an immediate strategy that could facilitate development of partnerships between industry and research groups.

Australia needs to develop a 'knowledge and innovation economy', where Australia actively endorses and 'sells' the skills and capabilities of its health and medical research workforce. The ASMR recommends the creation of a central reference database that can be accessed by industry and researchers. This database would promote the skills and expertise of individual research groups, and also provide a forum for industry to advertise for solutions to their research problems. A cooperative approach between government, universities and industry is required to create such a database; however, this resource could facilitate the initial approaches between industry and researchers.

Recommendation 5: Consolidate research infrastructure and support investment into future infrastructure

Over the past five years, significant investment into research infrastructure has occurred in Australia, with the construction of several brand new research institutes as part of Federal and State Government stimulus funding. These research institutes have significantly bolstered the research infrastructure capacity of Australia. Despite these institutes being located in close proximity to health care centres, there is still a need to further integrate biomedical research scientists and clinician researchers.

Academic health science centres (AHSCs) are built on direct linkage of a research institute or universities, with a major tertiary health care provider, to achieve excellence in clinical service, research and education[13]. AHSCs drive a care continuum from innovation, to bedside, to the community, ensuring that the latest advances and highest standards reach patients[13]. AHSCs are commonplace in other developed nations, such as the USA, Holland and Canada; however, Australia rates poorly in comparison[13]. Diamantina Health Partners is an amalgamation of eight of Queensland's top research institutes, hospitals and universities and is one example of a newly emerging AHSC in Australia[14]. ASMR recommends real steps be taken to establish AHSCs in Australia to drive forward innovative health care solutions.

E-Health and virtual health centres have revolutionised health care and monitoring. Enhanced communication throughout our nation's health and medical research sector is paramount for the rapid translation of research outcomes. The potential value in linking all Australian health and medical research together, through database management (eResearch), would be an ambitious but world-first exercise in monitoring and continually improving our nation's health and medical research output. This approach comes at a time when new technologies and advancements in personalised medicine are being adopted into the clinic, and therefore we should also consider the cross-platform integration of electronic health (eHealth) and research (eResearch). This approach should lead to more effective translation of research outcomes, as well as enhance the potential for new discoveries.

Recommendation 6: Develop an Asia-Pacific Funding Union to maximise the transfer of Australian expertise to developing countries

International engagement, particularly in the Asia-Pacific region, is important, not only for building capacity but also to secure greater investment in Australian health and medical research through international partnerships and philanthropic investment.

To effectively assist in improving health in the developing world, ASMR believes in adopting a health and medical research collaborative approach rather than a paternalistic approach. For example, the value added Australia-India Strategic Research Fund was designed for Australia to work with the Indian Government in a collaborative effort. This international funding

mechanism has arisen through India's recognition for the need to invest in health and medical research as an approach to alleviate its nation's current and future health crisis associated with chronic disease and an ageing population[15].

However, the transfer of Australian health and medical research expertise to developing countries, such as India, is impeded by language and cultural barriers, as well as the high costs of delivering drugs and vaccines that often require cold storage. To facilitate the integration of our nation's health and medical research sector with neighbouring countries, the ASMR has proposed the formation of an Asia-Pacific Health and Medical Research Funding Union (APHMRFU), as a value-added investment mechanism. This model would be somewhat akin to the European Union's Seventh Framework programme but tailored to the health needs of our Asia-Pacific neighbours. The ASMR believes that such a funding union would stimulate greater collaborative engagement, leading to increased research capacity and productivity within Australia, and also securing greater investment in Australian health and medical research through international partnerships.

Recommendations

1. Prepare science graduates with the skills for a successful career in health and medical research
    - **1.1** Prepare science graduates to interface with industry
    - **1.2** Foster a trans-disciplinary research culture in graduates and early/mid-career researchers
    - **1.3** Up skilling of health and medical researchers to build a multi-disciplinary workforce

2. Protect the future Australian health and medical research workforce by reforming science education
    - **2.1** Review the perception of career pathways and opportunities in health and medical research

3. Secure the current health and medical research workforce

4. Peg investment in the NHMRC to 1% of the total health expenditure, increasing by 0.2% annually over 10 years to reach 3%
    - **4.1** Secure ARC funding and promote trans-disciplinary collaboration
    - **4.2** Increasing the industry interface with health and medical research

5. Consolidate research infrastructure and support investment into future infrastructure

6. Develop an Asia-Pacific Funding Union to maximise the transfer of Australian expertise to developing countries

Summary

Innovation, through health and medical research, generates significant benefits to Australia, with directly measurable outcomes, such as, improved medicines, health care, quality of life, economic returns and generating knowledge for the betterment of human kind. This sort of innovation can only be maintained through securing the future workforce and long-term structured investment into the health and medical research sector.

Reforming science education, from primary school right through to tertiary education, is critical for maintaining a future health and medical research workforce, equipped with the skills and creativity to drive increased productivity and improved health outcomes for all Australians. Furthermore, ASMR has developed a sound, economic business case to protect Government and community from the economic and health crisis facing our nation.

ASMR's recommendations will ensure the health and prosperity of our Nation and the consolidation of a world leading knowledge economy.

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