HEALTHIER LIVES, STRONGER ECONOMY

Victoria's Health and Medical Research Strategy 2016–2020

VICTORIA
State Government

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Contents

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p. 14: Professor Euan Wallace and Associate Professor Caroline Gargett, Hudson Institute of Medical Research. Credit: Hudson Institute of Medical Research.

p. 18: Dr Hong Zhang, Centre for Eye Research Australia. Credit: Centre for Eye Research Australia.

p. 20: Australia's first 3D printed jawbone. Credit: Dr David Ackland, University of Melbourne.

p. 22: A/Prof Gavin Wright, St Vincent's Hospital Melbourne. Credit: St Vincent's Hospital Melbourne.

Foreword

Victoria is acclaimed as a world leader in health and medical research. The Andrews Government is establishing the platform to drive collaboration and coordination for life saving results, improved healthcare and higher returns for discovery.

This strategy supports Victorian researchers to maximise the outstanding talent, expertise and capacity in our state. The Victorian Government's strategy aims to accelerate the translation of health and medical research into clinical practice and innovation, vital to saving lives, improving health and delivering benefits to the Victorian society and economy and also improving lives nationally and internationally.

Healthcare is evolving rapidly and confronting challenges associated with an ageing population, the growing incidence of lifestyle related chronic diseases and the need to address emerging threats from infectious diseases. The Victorian Government is establishing a more strategic approach to address these global healthcare challenges which are placing increasing pressure on the health system.

To build on Victoria's success and to prepare the state for national and international opportunities, the Andrews Government has collaborated with the sector to develop *Healthier lives, stronger economy: Victoria's health and medical research strategy 2016–2020*. This strategy supports and complements the *Future Industries Medical Technologies and Pharmaceuticals Sector Strategy* and *Victoria's International Health Strategy 2016–2020: Partnering for a healthy and prosperous future*.

Healthier lives, stronger economy: Victoria's health and medical research strategy 2016–2020 will support the health and medical research sector to deliver research excellence as it adapts to evolving and emerging trends including genomics and precision medicine, convergence science and big data.

We thank each stakeholder who contributed their expertise to the development of this strategy. We look forward to working with you to drive discoveries for the benefit of Victorians and people around the world.

The Hon Jill Hennessy MP
Minister for Health
Minister for Ambulance Services

Mr Frank McGuire MP
Parliamentary Secretary
for Medical Research

Executive summary

Victoria's Health and Medical Research Strategy 2016–2020 (the strategy) is designed to embed health and medical research into the Victorian health system and accelerate the translation of research into clinical practice. The vision of this strategy is to position Victoria as a global leader in health and medical research, improve the health outcomes of Victorians and strengthen the state economy.

Victoria has a world-class health system, excellence in health and medical research, education and training, and a vibrant biotechnology, medical technology and pharmaceuticals sector. These essential building blocks provide the foundation for one of Victoria's critical competitive advantages. Nurturing our dynamic system will promote economic diversity, build scale, foster innovation and promote collaboration.

Strategic investment into health and medical research will lead to a better understanding of the mechanisms of disease; improved measures to prevent disease; and new discoveries, treatment options, diagnostic tools and applications that better predict disease progression.

The strategy will facilitate the delivery of improved health outcomes and economic benefits for Victoria and the nation by investing in areas of excellence and addressing areas in need of further development. The six key strategic directions that form the basis of the strategy are:

1. Integrating research, education and healthcare

The importance of integrating research, education and healthcare has come to prominence over recent years through the establishment of Academic Health Science Centres (AHSCs). AHSCs have been established to advance research translation and improve health outcomes through a tripartite mission of excellence in research, clinical service and education.

The Victorian Government's objective in encouraging integration between universities, health services, medical research institutes and industry is to accelerate the pace, scale and impact of innovation, culminating in improvements in patient care and subsequently, health outcomes.

2. Developing an advanced convergence science capability

The convergence of the life sciences with fields including physics, chemistry, mathematics, computing, engineering, and social sciences is a key approach to addressing complex challenges and achieving innovative solutions. The importance of such a holistic and collaborative approach has gained prominence through emerging disciplines such as health services research, biomedical engineering, precision medicine and genomics.

The Victorian Government's objective is to build a world-leading convergence-enabled research capability in these emerging disciplines. Such capabilities will facilitate the delivery of better evidence to inform clinical decision making and new clinical applications, medicines, devices and diagnostics.

3. Enhancing a world-leading clinical trials system

A robust clinical trials industry provides many health and wealth-associated benefits. Victorian patients are given access to the latest medical treatments, and clinical trials activity generates significant revenue. Indeed, estimates suggest that annual Australian investment in clinical trials exceeds $1 billion, with Victoria's share accounting for approximately $300 million.

The objective of this strategic direction is to optimise the performance of the Victorian clinical trials sector by improving the timeliness, reliability and efficiency of clinical trial processes.

4. Optimising big data and informatics

Data intensive sectors such as healthcare and biosciences are experiencing a data deluge. Getting high-quality data in the right format at the right time with the right analysis will turn Victoria's data into clinically and commercially actionable information.

The Victorian Government's objective is to improve the coordination, integration and use of health and biomedical data, information and knowledge. Better, more efficient use of health and biomedical data will improve the coordination of healthcare delivery and the safety and quality of care.

5. Developing the next generation workforce

Victoria is home to a highly-skilled, diverse health and medical research workforce. However, many face challenges related to gender equality, job security and career progression. Addressing these issues is critical, as maintenance of our research excellence is reliant on the retention of our pre-eminent workforce.

The objective of this strategic direction is to maintain Victoria's highly skilled health and medical research workforce and bring the 'best and brightest' to Victoria by providing an environment that facilitates career development, gender equality and training.

6. Stimulating research/industry engagement and innovation

Victoria must improve its record of commercial translation in order to receive the full benefits from investment in health and medical research. In order to achieve this, it will be necessary to increase engagement and collaboration between researchers and industry.

The objective of this strategic direction is to increase research translation, culminating in improved health outcomes and better productivity.

Victoria's health and medical research strategy 2016–2020 will bolster the state's reputation as a national leader in health and medical research and attract further investment into this world-class sector. With the successful passage of the Commonwealth Government's legislation to establish the Medical Research Future Fund, there is now a reasonable expectation that Victoria will attract a sizeable share of the fund in line with the state's track record in attracting funding from the National Health and Medical Research Council.

Introduction

Victoria's proud history of health and medical research excellence has delivered significant benefits to the state, the nation and the international community. This strong foundation has produced globally recognised biomedical researchers, several of whom have gone on to win prestigious international awards, including the Nobel Prize and the Lasker-DeBakey Award (Table 1).

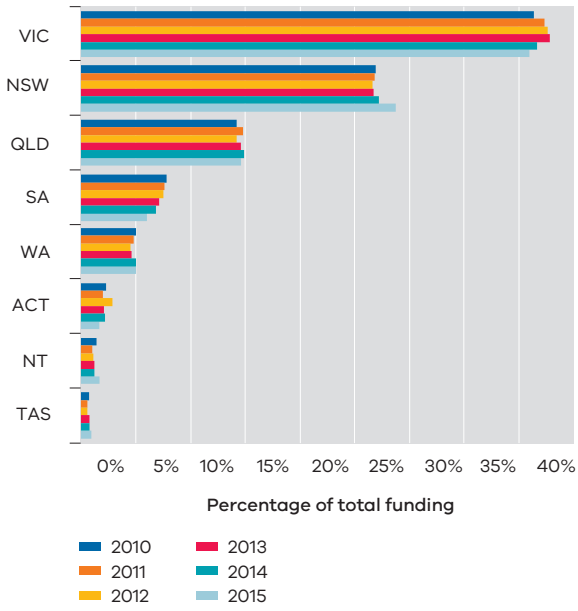
Victoria is the nation's undisputed leader in health and medical research, with the state consistently attracting more than 40 per cent of funding from the National Health and Medical Research Council (NHMRC) (Figure 1). Victoria's excellence in discovery and translation research continues to deliver significant benefits to the state, the nation and the international community. Research innovations have made a real impact on people's lives by delivering new treatments (for example, immuno-therapeutics), diagnostics (for example, point-of-care diagnostics) and medical devices (for example, bionic implants). Innovation in public health research has also led to effective programs in disease prevention.

Victoria is also home to world-renowned medical research institutes, hospitals and universities such as:

- The Walter and Eliza Hall Institute of Medical Research, which celebrated its centenary in 2015
- The Murdoch Childrens Research Institute, the largest child health research organisation in Australia
- the University of Melbourne, the leading university in Australia, ranked 33rd in the world
- Monash University, ranked 73rd according to the Times Higher Education World University Rankings.

Our health and medical research sector delivers significant economic benefits to the state and is the driving force behind the nation's knowledge economy. The sector is also supported by the investment community, and leads the nation in health innovation. Victoria is home to more than 40 bioscience companies listed on the Australian Stock Exchange, with a combined market capitalisation of approximately $AU40 billion.

Figure 1: NHMRC funding by state, 2010–2015



Over the previous 12 months, the Victorian Government has developed intersecting strategies around health and medical research, education and international trade to enhance Victoria's competitiveness and ensure that improved health, wellbeing and economic prosperity flow to Victorians. These intersecting strategies are:

1. *Victoria's International Health Strategy 2016–2020*
2. *The Future Industries Medical Technologies and Pharmaceuticals Sector Strategy*
3. *The Future Industries International Education Strategy*
4. *The Future Industries Professional Services Strategy*

Victoria's health and medical research sector provides a strong base for vibrant biotechnology, medical technology and pharmaceuticals sectors which collectively employ more than 20,000 people. Accordingly, *Victoria's Health and Medical Research Strategy 2016–2020* acts as an enabler for the abovementioned suite of complementary strategies. The linkages between these strategies, in particular, *Victoria's International Health Strategy 2016–2020* and *The Future Industries Medical Technologies and Pharmaceuticals Sector Strategy*, are outlined at various stages throughout this document.

Table 1: Victorian medical research pioneers

1960	Sir Frank Macfarlane Burnet from the Walter and Eliza Hall Institute of Medical Research awarded the Nobel Prize in Physiology or Medicine for the discovery of acquired immunological tolerance.
1973	Professors Ruth Bishop, Geoffrey Davidson, Ian Holmes, and Brian Ruck from the Royal Children's Hospital discover rotavirus (the major cause of death from acute diarrhoea in young children) leading to the development of rotavirus vaccines.
1973	Professors Alan Trounson and Carl Wood from Monash University achieve the world's first in vitro fertilisation (IVF) pregnancy. Five years later, based on their work, the world's first IVF baby was born in the UK.
1977	Professor Donald Metcalf and colleagues at the Walter and Eliza Hall Institute discover colony stimulating factors (CSFs). CSFs have helped millions of cancer patients to survive the damage to bone marrow caused by chemotherapy.

1984	The cochlear implant, or bionic ear, invented by Laureate Professor Graeme Clark AC at the University of Melbourne was approved by the US Food and Drug Administration for use in adults. More than 300,000 people worldwide with deafness or hearing impairment have since received cochlear implants.
1999	The influenza drug Relenza, designed by Professor Mark von Itzstein and his team at Monash University, becomes available in Australia. It is now available worldwide.
2013	Laureate Professor Graeme Clark AC awarded the Lasker-DeBakey award for the invention of the cochlear implant or bionic ear.

Victorian Government Investment in Infrastructure

Infrastructure is of fundamental importance to maximising the potential of health and medical research. The Victorian Government's significant investment in infrastructure over the previous 15 years has provided the impetus for continued innovation and enabled Victoria's research excellence to flourish. Indeed, since 1999, Victoria's investment in infrastructure and capability building in science, technology, innovation and medical research has exceeded $3.5 billion. Such investments have included the provision of physical space, enabling technologies and workforce development. Major infrastructure projects over the previous 15 years have included:

- Alfred Medical Research and Education Precinct
- Australian Genome Research Facility
- Australian Regenerative Medicine Institute
- Australian Research Infrastructure Network
- Australian Cancer Data Grid
- Australian Centre for Neuroscience
- Australian Stem Cell Centre
- Australian Synchrotron
- Australian Tissue Engineering Centre
- Austin-Burnet 'Super Institute'
- Barwon Health's teaching, training and research facility
- Bio21 Institute
- Biopharmaceutical Formulation and Finishing Sciences Centre
- Bio-resources Facility at Austin Health
- Brain Imaging Research Centre
- Brain Research Institute
- Centre for Drug Candidate Optimisation
- Centre for Health Innovation
- Clinical Trials Victoria
- Health Market Validation Program

- Melbourne Genomics Health Alliance
- Monash Centre for Electron Microscopy
- Monash Research Cluster for Biomedicine
- Monoclonal Antibody Technology Facility Monash
- Murdoch Childrens Research Institute
- Nanotechnology Victoria
- Orygen Youth Health
- Olivia Newton-John Cancer and Wellness Centre
- Proton Beam Therapy
- Science, Technology and Innovation programs
- Streamlining Ethical review of Clinical Trials
- St Vincent's Institute Redevelopment
- Technology Voucher Program
- Translational Drug Discovery Capability
- Victorian Bioinformatics Consortium
- Victoria's biomedical imaging capability
- Victorian Cancer Agency
- Victorian Cancer Biobank
- Victorian Centre for Medical Bionics
- Victorian Comprehensive Cancer Centre
- Victorian Heart Hospital
- Victorian Life Sciences Computation Initiative
- Victorian Microarray Technology Consortium
- Victorian Neuroscience Consortium
- Victorian Partnership for Advanced Computing
- Victorian Platform Technologies Network
- Walter & Eliza Hall Institute expansion

In addition to the initiatives outlined above, the Victorian Government's Operational Infrastructure Support Program, which contributes funds for the operational costs of medical research institutes, has provided approximately$400 million in funding since its inception almost 20 years ago.

There is now an opportunity to capitalise on this investment, in collaboration and partnership with domestic and international counterparts, to accelerate the translation of research into improved health outcomes and commercialisation opportunities. The strong investment into health and medical research in Victoria is testament to the state's strengths in the following areas:

- **Cancer:** Victoria's excellence in Cancer research will be strengthened with the completion of the $1 billion Victorian Comprehensive Cancer Centre which complements the programs of the Monash Partners Comprehensive Cancer Consortium and the Olivia Newton-John Cancer and Wellness Centre. In addition, the Victorian Government's commitment to the development of the National Centre for Proton Beam Therapy will result in Victoria leading the way in the clinical and research effort on proton beam therapy in Australia.
- **Infectious diseases and immunology:** Victoria continues to build pre-eminence in this area with expertise at the Peter Doherty Institute, Burnet Institute, the Walter and Eliza Hall Institute, CSIRO's Australian Animal Health Laboratory and Victoria's leading universities.
- **Cardiovascular diseases:** National leadership in this area is enabled by Victoria's leading hospitals, universities and the Baker IDI Heart and Diabetes Institute. Victoria will also be home to Australia's first stand-alone cardiac hospital, the Victorian Heart Hospital, following the funding commitment of $150 million from the Victorian Government. This facility will also house the Monash Cardiovascular Research Centre.
- **Child health:** Victorian excellence in paediatric research is undertaken across sites including the Murdoch Childrens Research Institute, the Melbourne Children's Trials Centre, the Royal Children's Hospital and Monash Children's Hospital.
- **Regenerative medicine:** The Hudson Institute of Medical Research, Stem Cells Australia, Australia Regenerative Medicine Institute, Mesoblast Ltd and Cell Therapies Pty Ltd showcase Victoria's strengths in regenerative medicine and stem cell research and therapy.
- **Bionics:** Victoria is the bionics capital of Australia with the first bionic ear and two distinct bionic eye programs undertaken by Bionics Vision Australia and Monash Vision.
- **Injury prevention, trauma and rehabilitation:** Alfred Health has helped to establish the first trauma centres in Sri Lanka, Southern China and, in the near future, Southern India and Saudi Arabia. It also served as a model for the United Kingdom's trauma system.
- **Neuroscience and mental health:** Victoria is home to leading medical research institutes such as the Florey Institute of Neuroscience and Mental Health; the Australian Centre for Neuroscience; and Orygen, the National Centre of Excellence in Youth Mental Health. The Victorian Government has committed $60 million to transform Orygen's Parkville facility into the world's largest research institute for youth mental health.

Strategic directions

Vision

To position Victoria as a global leader in health and medical research, improve the health outcomes of Victorians and strengthen the state economy.

Mission

To embed health and medical research into the Victorian health system and accelerate the translation of research findings into clinical practice.

Delivering innovation that improves health outcomes relies on effective partnerships between governments, industry, and the investment and philanthropic sectors. Likewise, maintaining and enhancing our international competitiveness depends on the ability to deliver value from investments in terms of measurable outcomes through commercial translation and changes to clinical practice.

Victoria's health and medical research strategy 2016–2020 arose following the Victorian Government's initiative to streamline activities in the health and medical research sector with health service providers, universities, medical research institutes, industry and philanthropy. This streamlining approach will lead to greater alignment of strategic directions between health and medical research and health services. It will also lead to more engagement of medical research institutes and universities with hospitals to drive outcomes-driven research. This will benefit the medical technology and pharmaceuticals sectors, because they will be better informed about the unmet needs of an evolving health system. This, in turn, will lead to industry demand-driven research with greater potential to develop marketable solutions that benefit the public.

The Victorian Government's commitment to advancing health and medical research is evidenced by the appointment of the inaugural Parliamentary Secretary for Medical Research, Mr Frank McGuire MP. Mr McGuire will lead the development of an expert panel (see Table 2) to drive the agenda for health and medical research.

Table 2: The Science, Medical Research and Technology Panel

Victoria is Australia's leader in medical research. On merit and performance Victorian institutions are regularly awarded more than 40 per cent of funding from the independent experts, the National Health and Medical Research Council. To drive leadership and excellence the Victorian Government will establish the Science, Medical Research and Technology Panel to provide strategic advice to government on:

- Commercialising research knowledge
- Accelerating ideas to industry
- Maximising contributions from the investment and philanthropic sectors
- Securing patents and maximising return on investment
- Fostering international health partnerships and opportunities
- Accessing more markets – nationally and internationally

The Panel will comprise leading scientists, academics, clinicians and industry experts.

Victoria's health and medical research strategy 2016–2020 is focused on the key enablers that are essential across the research spectrum. The six key directions are:

1. Integrating research, education and healthcare

2. Developing an advanced convergence science capability

3. Enhancing a world-leading clinical trials system

4. Optimising big data and informatics

5. Developing the next generation workforce

6. Stimulating research/industry engagement and innovation.

1

Integrating research, education and healthcare

Objective

To accelerate the pace, scale and impact of innovation by integrating research, education and healthcare within the Victorian health system.

The Victorian Government will:

- Support approaches for integrating findings from health services research into policy and practice
- Work with major health services to include clinical research as a key performance indicator
- Work with the Advanced Health Research and Translation Centres to determine Victoria's health services research priorities
- Support the development of research training programs
- Implement *Victoria's International Health Strategy 2016–2020* to support Victorian research organisations' ability to attract investment and international partnerships
- Support the establishment of the Science, Medical Research and Technology Panel (see Table 2) which will provide strategic advice on attracting new partnerships and funding
- Contribute $150 million to the Victorian Heart Hospital
- Provide $60 million to rebuild the Orygen Youth Health facility in Parkville, a major clinical and research facility for younger people across Victoria with serious mental illness
- Provide $10 million for the Better Care Victoria Innovation Fund to invest in public hospital-led improvement and innovation projects which will enhance access to hospitals, and improve quality of care and hospital performance
- Provide $3 million towards planning for the development of the Parkville Biomedical Precinct. This planning will address key issues such as changing models of service delivery.

The Academic Health Science Centre (AHSC) model involves a leading university joining with a major tertiary healthcare provider in a tripartite mission of excellence in clinical service, research and education. The Victorian Government recognises the potential of this approach to improving health outcomes and has funded the establishment of the Melbourne Academic Centre for Health and Monash Partners Academic Health Science Centre. This model has also been adopted in parts of regional Victoria.

The international standing of Victoria's AHSCs was recognised when the National Health and Medical Research Council awarded Advanced Health Research and Translation Centre (AHRTC) status to: (1) Alfred Health and Monash Health and Partners AHRTC and (2) Melbourne Healthcare Partners AHRTC. These two centres gained recognition for excellence in research, translation of evidence into patient care, and in demonstrating a strong research and translation focus in the education of health professionals.

There is significant potential for the Academic Health Science Centres and Advanced Health Research and Translation Centres to play a key coordinating role in:

- Improving the linking and integration of datasets for a system-wide approach in patient reported outcome measures
- Incorporating genomics into clinical practice
- Improving the use of clinical registries in randomised clinical trials
- Health system performance and population health monitoring that addresses unwarranted medical practice variations and stimulates improvements in quality of care.

Benefits/outcomes

Integration of research, education and healthcare will:

- Deliver improved health and wellbeing through increased knowledge and productivity
- Improve the effectiveness, efficiency, safety, and quality of healthcare in Victoria
- Embed the practice of research in healthcare delivery
- Attract partnerships with industry, philanthropic and investment sectors.

2

Developing an advanced convergence science capability

Objective

To build world-leading convergence-enabled research capability in precision medicine, genomics, biomedical engineering and health services research.

The Victorian Government will:

- Provide funding for researchers and postgraduates to undertake convergence science projects in genomics, bioinformatics, biomedical engineering and health services research
- Undertake an internal review of infrastructure and technology requirements for better integration of genomics data with electronic medical record systems in hospitals
- Improve communications to the public on precision medicine by supporting public seminars and events offered by the Convergence Science Network and by providing up-to-date resources, particularly in the evolving field of genomics.

A growing number of institutions around the world are investing in ways to foster and facilitate transdisciplinary research. The convergence of the biomedical sciences with fields including physics, chemistry, mathematics, computing, engineering, and social sciences is a key approach to addressing complex challenges and achieving innovative solutions. Convergence science has gained prominence through emerging disciplines such as health services research, precision medicine, genomics and biomedical engineering.

Victoria has taken leadership in convergence-enabled research through a number of initiatives including:

- The Victorian Academic Health Science Centres and the two NHMRC recognised Advanced Health Research and Translation Centres
- The Monash Institute of Medical Engineering
- The Graeme Clarke Centre for Biomedical Engineering at the University of Melbourne
- A commitment of $60 million towards the proposed Aikenhead Centre for Medical Discovery at St Vincent's Hospital
- The Graeme Clark Oration, Australia's most prestigious free public science annual event hosted by the Convergence Science Network. This network is an initiative that promotes an understanding of convergence science to the public
- The Melbourne Genomics Health Alliance, whose program to build genomics capability and capacity will be strengthened by Victorian Government funding of $25 million over four years.

Benefits/outcomes

The expected benefits from developing an advanced convergence science capability include:

- Better evidence to inform public health, policy and clinical decision-making
- Discovery of new biomarkers through better quality genomics research
- Development of new clinical applications, medicines, devices and diagnostics
- Enhanced collaboration between healthcare agencies, patients, consumers and industry resulting in the development of marketable healthcare solutions.

3

Enhancing a world-leading clinical trials system

Objective

To optimise the performance of the Victorian clinical trials sector and position the state as the premier destination for clinical trials in the Asia-Pacific region.

The Victorian Government will:

- Provide funding of $1.3 million per annum to the Streamlining Clinical Trial Research Program (within the Department of Health and Human Services) to consolidate the administrative functions of clinical trials
- Work with the Commonwealth to ensure that funding for clinical trials is available through the Medical Research Future Fund
- Support the NHMRC Clinical Trials Ready plan and 'good practice process' pilots
- Explore approaches to better position the state's clinical registries for use in clinical trials
- Develop a registry of Victoria's investigator-led trials to enable collaboration between clinical investigators and groups, and to identify and promote expertise and capacity.

Australia is an attractive destination to conduct clinical trials due to a world-class health system, a highly skilled clinical and research workforce, quality infrastructure, a diverse population for patient recruitment and a favourable regulatory system. Victoria's high-level clinical trial capability is supported by strong clinical networks and Melbourne-based service providers in the following areas:

- **Paediatrics:** Australia's first paediatric trials centre, the Melbourne Children's Trials Centre, was officially launched in August 2015. It is the largest trial centre of its kind in the southern hemisphere
- **Cancer and neuroscience:** Cancer Trials Australia, a not-for-profit clinical research organisation, conducts approximately 50 per cent of all first-in-human cancer trials in Australia. Neuroscience Trials Australia, a subsidiary of The Florey Institute of Neuroscience and Mental Health, has strategic alliances with many therapeutic disease groups
- **Early phase clinical trials:** Nucleus Network, a wholly owned subsidiary of Baker IDI Heart and Diabetes Institute, is a leading clinical research organisation for the conduct of early phase trials across a broad range of indications. Major hospitals in Victoria also conduct early phase clinical trials.

A number of initiatives are underway to improve clinical trials performance in Victoria and nationally. For example, Victoria led the development of National Mutual Acceptance for ethics approval for multi-centre clinical drug trials. The system, which is now in place, means that trial proponents need ethics approval only once, and that approval is accepted by all participating institutions. However, in order to further increase Victoria's competitiveness in the global clinical trials market, the efficiency of processes must be improved. The key areas to address are:

- Streamlined and timely ethics approval
- Support for common approaches within and between institutions
- Reliability in meeting participant recruitment targets and completing a trial within the agreed timeframe
- Accuracy in data collection and a process for reporting clinical trial performance across the state.

Benefits/outcomes

- Increase Victoria's international competitiveness and attract a greater volume of sponsored clinical trials to Victoria by minimising the fragmentation and duplication that currently characterises the sector
- Improve patient access to new therapies and increase the number of Victorian patients participating in clinical trials
- Protect an important source of revenue for Victorian health services and enable this revenue to grow substantially
- The Streamlining Clinical Trial Research Program will lead national reforms, coordinate and consolidate metrics and analytics, and act as an enabler across the sector. It also aims to develop further competence and efficiency within public hospitals that provide the clinical trial infrastructure for conduct of clinical trials and the industry sector more broadly.

4

Optimising big data and informatics

Objective

To improve the coordination, integration and use of health and biomedical data, information and knowledge.

The Victorian Government will:

- Establish a statewide clinical informatics group to act as a reference point for the Department of Health and Human Services and provide advice on advancements in data access and linkage, clinical informatics, genomics, and digital health
- Establish a digital health strategy and identify opportunities for integration of new technologies into electronic health records
- Provide $5 million to progress an electronic medical records system for hospitals in Parkville which will aid research, clinical decision support, medication management and patient and clinical work flow functions
- Provide $10 million for the Statewide Clinical Services Technology Refresh Program. This will involve replacing critical, patient related clinical services hardware and integrated software in Victorian public health services in order to deliver more effective acute patient diagnostic and other clinical information to the point of care.

Data intensive sectors such as healthcare and biosciences are experiencing a data deluge. This is largely driven by advances in high-throughput technology in genomics and related 'omics research, and the growing use of electronic health records, clinical registries and digital technologies. High quality clinical and biomedical data is an important asset for Victoria. The state has numerous initiatives and programs to collect and use data for clinical research and practice, safety and quality improvement, and population health monitoring. Such data is currently available from sources such as biobanks, the Department of Health and Human Services, and clinical registries.

From a clinical trials perspective, clinical registries are gaining importance. Recent Swedish and North American studies have shown that registry-based randomised trials can be undertaken at a fraction of the cost of running traditional clinical trials. Researchers are able to leverage the high-quality clinical data that is collected for the registries to quickly identify potential trial participants and speed up enrolment time.

However, turning data into clinically actionable information remains a challenge due to the volume, heterogeneity and complexity of data. Getting high-quality data in the right format at the right time with the right analysis remains challenging because of: the inability to access and share data; the lack of standardised data and technology; the inability to unlock valuable clinical information in electronic health records; and insufficient numbers of bioinformaticians, biostatisticians, mathematicians, computer scientists and engineers who have a sound understanding of biology and clinical principles and concepts.

Overcoming these challenges will require a transdisciplinary network of collaborators and partners, a scalable platform technology and the availability of analytical tools and informatics researchers to retrieve, analyse, integrate, visualise and interpret data and information.

Benefits/outcomes

Better use of health and biomedical data will enable:

- Policymakers to improve:
  - the coordination of health service delivery
  - the continuity of care
  - the safety and quality of care
  - population health management
- Clinicians to deliver the right treatment to the right patient at the right time and reduce duplication
- Patients to be better informed and empowered to be partners in their health and healthcare
- Payers (such as insurers) to better assess healthcare risks and lower the cost of premiums
- Pharmaceutical companies to improve patient stratification in clinical trials.

5

Developing the next generation workforce

Objective

To maintain Victoria's highly skilled health and medical research workforce and bring the 'best and brightest' to Victoria by providing an environment that facilitates education, training and career development.

The Victorian Government will:

- Provide $600,000 per annum to fund Postdoctoral Research Fellowships in a range of clinical domains and promote career pathways in medical research including specific support for careers in: health services research, genomics, bioinformatics, biostatistics and data science
- Guided by the *Medical Technologies and Pharmaceuticals Sector Strategy*, develop an education and training program to upskill researchers and clinicians in innovation management including commercialisation, entrepreneurship, and product development
- Support the Science in Australia Gender Equity Program and support women in biomedical research by encouraging Victorian research organisations to incorporate the Athena SWAN Charter into their gender equity programs
- Develop and deliver Victoria's first gender equality strategy. This will promote women's leadership through initiatives such as boosting female participation on Victorian boards
- Continue to fund the Premier's Award for Health and Medical Research which celebrates the contribution of early career researchers to Victoria's leadership in health and medical research
- Continue to fund the range of existing programs, scholarships and fellowships including:
  - The Victorian Postdoctoral Research Fellowships, the Innovation Fellowships and the Inspiring Women Fellowships delivered through the Victorian Endowment for Science, Knowledge and Innovation
  - The Victorian Cancer Agency's funding for translational cancer research (approximately $15 million per annum)
  - The Public Health Research Fellowships delivered through VicHealth.

The Victorian Government recognises the challenges that many researchers face with regard to career progression and stability, gender inequality, and increasing competition for limited Commonwealth Government funding.

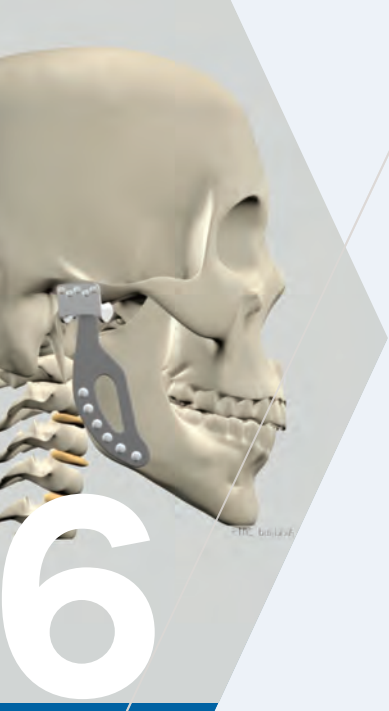
Acknowledging this, the Victorian Government supports and attracts the best researchers with a range of programs offered through organisations such as the Victorian Endowment for Science, Knowledge and Innovation (known as Veski), the Victorian Cancer Agency and VicHealth. Veski offers innovation and inspiring women fellowships, and awards including the Premier's Award for Health and Medical Research and the Victoria Prize for Science and Innovation. Veski also provides fellowships to Australian expatriates with outstanding skills in science and innovative technology to lead research in Victoria.

The Victorian Cancer Agency provides Clinical Research Fellowships, support for early career researchers via seed grants and PhD scholarship programs. In 2015 the Victorian Cancer Agency introduced a midcareer fellowship scheme and a health services research funding stream. The Victorian Cancer Agency will also explore the viability of introducing fellowships aimed at increasing researcher capability in commercialisation. VicHealth also supports outstanding public health research by awarding five-year Public Health Research Fellowships. Since 1999 VicHealth has funded 46 Fellows under this scheme.

Demand for skills and experience in transdisciplinary research is high and Victoria will need to develop and nurture leadership and talent in many emerging fields. In addition, as Victoria's health and medical research sector increases its engagement with industry, there will be an ongoing need to upskill researchers in the needs and expectations of industry. Offering programs in areas such as commercialisation and entrepreneurship will also broaden the capabilities and skills of researchers who wish to pursue a non-academic career path.

Benefits/outcomes

- A workforce that is skilled in transdisciplinary research will be better equipped to address the challenges faced in genomics, biomedical engineering and health services research
- Encouraging gender equity will increase the talent pool and improve research performance and productivity
- Fostering programs in innovation and entrepreneurship will enable the research and clinical workforce to better understand the needs of industry and increase the translation of research outcomes into marketable health solutions.



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Stimulating research/industry engagement and innovation

Objective

To increase research translation, culminating in improved health outcomes and greater productivity, by facilitating collaboration between research organisations and industry.

The Victorian Government will:

- Provide funding of $3 million per annum through the creation of a Victorian Medical Research Acceleration Fund to leverage co-investment from philanthropic, industry and international sources
- Establish the Science, Medical Research and Technology Panel to drive better engagement and integration between academia and industry through partnerships, collaborations, investment, philanthropic and commercialisation opportunities. This Victorian led initiative will play a key role in influencing the national agenda on health and biomedical research in relation to the Medical Research Future Fund
- Guided by the *Medical Technologies and Pharmaceuticals Sector Strategy*, create an environment that supports Victorian health start-ups that is in line with the Victorian Government's $60 million start-up initiative LaunchVic
- Guided by the *Medical Technologies and Pharmaceuticals Sector Strategy*, bring together the state's leading capabilities in translational drug discovery and development to create a world-class offering that will accelerate the commercialisation of new drugs. This will position Victoria as a leading biomedical hub and pharmaceutical innovation location
- Leverage investments from industry to increase the success rate of early stage innovation in moving along the commercialisation path
- Foster industry engagement with the Victorian Academic Health Science Centres and Advanced Health Research and Translation Centres to facilitate the translation of research into clinical practice
- Guided by *Victoria's International Health Strategy*, promote Victoria's health and medical research achievements to the investment and philanthropic sectors in Australia and abroad
- Provide an additional $111.4 million for the Future Industries Fund to grow priority sectors where Victoria can gain a future competitive advantage. One of these high priority sectors – Medical Technologies and Pharmaceuticals – is highly dependent on local health and medical research capabilities which form the basis of the State's long standing national leadership
- Provide $66 million to expand the Victorian Government Business Office network

Innovation is a key factor that drives Victoria's economy. Collaborations between research organisations and industry are essential building blocks in driving this innovation. Such collaborations lead to more efficient translation of research through sharing of knowledge, ideas, intellectual property, skills, facilities and technology. In addition, these collaborations drive further interactions and connectivity with networks across the value chain, both nationally and internationally.

The Victorian Government has provided a stimulus to innovation through the *Future Industries Fund* that targets eight high growth sectors including medical technology and pharmaceuticals. Victoria's medical technology sector is already delivering improved health outcomes for patients using the latest technology in 3D printing. The recent news of custom-made 3D body parts that have been successfully implanted into patients demonstrates the value of convergence-enabled health innovation that brings together surgeons, engineers and medical devices companies (Table 3).

Table 3: The age of custom made 3D implants: outcomes of collaborations between research and industry

Australia's first 3D printed heel implant

- A collaboration between St Vincent's Hospital in Melbourne, Anatomics Pty Ltd, a Melbourne medical device company, and CSIRO's Lab 22 led to the design and development of a 3D printed titanium heel bone that was implanted into a Melbourne man and saved his leg from being lost to cancer.

Australia's first 3D printed spine implant

- A collaboration between RMIT University's Centre for Additive Manufacturing at the Advanced Manufacturing Precinct and Anatomics Pty Ltd, a Melbourne medical device company, has led to the design and development of a custom-made titanium spinal implant using 3D printing (or additive manufacturing). The implant has been successfully fitted into a patient.

Australia's first 3D printed jawbone

- A collaboration between St Vincent's Hospital in Melbourne, Department of Mechanical Engineering at the University of Melbourne and OMX Solutions Pty Ltd, led to the design and development of a custom-made 3D printed titanium jaw that was fitted to a patient.

For Victoria, there is an opportunity to leverage Commonwealth programs and build on State programs that provide incentives for the health and medical research sector to collaborate with industry and the international research community. Of importance are programs that showcase the collective expertise, capabilities and capacity of the Victorian health and medical research sector to domestic and international industries, and the investment and philanthropic sectors.

The Victorian Government's *Future Industries Medical Technologies and Pharmaceuticals Sector Strategy* articulates the Victorian Government's broader approach to accelerating the commercialisation of new technologies and products, including improving the translation of research through industry/research collaboration and fostering a vibrant entrepreneurial environment for startups.

Benefits/outcomes

Stimulating research/industry engagement will:

- Improve health outcomes
- Increase quality of life
- Boost productivity
- Generate national wealth.

The expected outcomes and benefits of the Medical Research Acceleration Fund include:

- Increase the ability of Victorian research organisations to leverage third party funding (for example, from industry)
- Assist with the diversification of revenue sources for Victoria's health and medical research community
- Drive collaboration within the sector and international engagement
- Increase Victoria's ability to retain and attract high quality health and medical researchers
- Increase research translation, culminating in improved health outcomes and greater productivity, by facilitating collaboration between research organisations and industry.


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