Health & Biomedical Sciences (HBMS) in RIE2020

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National Medical Research Council
Ministry of Health
## Overview

- RIE2020 Governance and Research Domains
- HBMS Domain Vision and Strategies
- Funding Framework and Opportunities
  - Open Fund Programmes
  - MOH Research & Human Capital Programmes
- Ageing National Innovation Challenge (NIC)
- Robotics
- Summary
HBMS budget is approximately 20% of the overall RIE2020 budget of $19B.
Vision for HBMS Domain

To be a leading centre that advances human health and wellness and creates economic value for Singapore and Singaporeans, through the pursuit of excellence in research and its applications.

Objectives

• Advance Singapore’s economic and health missions
• Excel in priority areas where Singapore has the potential to be differentiated and internationally-competitive, and which Singapore needs to “build” locally as opposed to “buy” from external sources
HBMS RIE2020 Strategy

Key thrust #1: Five therapeutic areas of focus
• (i) cancers; (ii) cardiovascular diseases; (iii) diabetes mellitus and other metabolic/endocrine conditions; (iv) infectious diseases; and (v) neurological and sense disorders. Develop research roadmaps for the therapeutic areas and to direct R&D toward addressing healthcare expenditure and manpower challenges

Key thrust #2: Establish pathways to bring discoveries from bench to bedside within the five therapeutic areas

Key thrust #3: Deepen diversification beyond Pharmbio and MedTech

Key thrust #4: Increase focus on health services research (HSR)
Overview of Healthcare Research Strategy 2020

<table>
<thead>
<tr>
<th>#1: Promote excellence in healthcare research</th>
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<tbody>
<tr>
<td>(includes Translational and Clinical Research (TCR) and Health Services Research (HSR))</td>
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<tr>
<td>- Support top-down directed strategic research and invest research funding into strategic areas identified by MOH, including horizontal themes that span across disease areas e.g. ageing.</td>
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<td>- Allow room for bottom-up/investigator-initiated research to provide “strategic buffer” of ideas and greater flexibility</td>
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<td>- Increase emphasis on Health Services Research, including comparative effectiveness and implementation research</td>
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<tr>
<th>#2: Enhance translation of healthcare research into health and economic outcomes</th>
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<tr>
<td>- Enhance Non-Commercial Pathway to Impact</td>
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<tr>
<td>- Review research outputs and assess if findings have potential to be implemented within institutions or nationally</td>
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<tr>
<td>- Work closely with institutions e.g. School of Public Health, to translate research findings to support MOH’s health policy-making</td>
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<tr>
<td>- Enhance Commercial Pathway to Impact</td>
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<tr>
<td>- National Health Innovation Centre (NHIC) to coordinate across healthcare institutions and offer assistance on IP strategy and commercialisation</td>
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<th>#3: Nurture a vibrant research community of clinicians and scientists</th>
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<td>- Build and maintain critical mass of human capital for healthcare research at about 5% of public sector clinician-specialists, i.e. 160 clinician scientists</td>
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<tr>
<td>- Provide core funding to retain talent supporting healthcare research, e.g. clinical research coordinators</td>
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<th>#4: Develop enablers to support healthcare research strategy and the clinical trial landscape</th>
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<tr>
<td>- Develop enablers, including data/regulatory capabilities, infrastructure and policies.</td>
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<tr>
<td>- Be the preferred site for early phase clinical trials in Asia and play a leadership/coordinating role for multi-national clinical trials</td>
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<th>#5: Demonstrate benefits of healthcare research</th>
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<tr>
<td>- Outcomes to show economic value derived from healthcare research*</td>
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<tr>
<td>- Outcomes to show how standards of care have risen (e.g. adoption of diagnostics and interventions that have been proven effective into hospital practice)*</td>
</tr>
<tr>
<td>- Outcomes to show retention of talent in the public sector healthcare system*</td>
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*Outcomes are aligned with the objectives of MOH’s emphasis on clinical research laid out in 2006 Cabinet Memo

Contributes to Broader MOH Outcomes

Better Care
Better Value
Better Health
Better Future
HBMS Funding Framework

- Budget maintained at $4B
- Continue the direction of travel started in RIE2015
  - Ensure adequate support for clinician-scientists and academic medical centres, including enabling research resources
  - More open funding to tap on best performers across the ecosystem
  - Maintain budget for programmatic funding to preserve agility to respond to emerging opportunities
  - Maintain budget for large scale, thematic collaborations for impact
  - Continue to support investigator-led research through individual grants, to foster ground-up innovation
### Funding Opportunities for HBMS Researchers

#### Outside of HBMS Domain
- **NRF Competitive Research Programme**

#### Within HBMS Domain
- **Open Fund**
  - Large Collaborative Grant (LCG)
  - Individual Research Grant (IRG)
  - Young Individual Research Grant (YIRG)
- **MOH Research & Human Capital Programs**
  - HSR
  - HC awards

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**Industry Alignment Fund**
Details will be shared with the community upon finalisation
## Open Fund Programmes

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<tr>
<th>Grant</th>
<th>General Description</th>
<th>Next call</th>
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</table>
| **Large Collaborative Grant (LCG)**             | • Up to $25M (inclusive of indirect cost) over a maximum of 5 years  
• Support “all the way” research  
• Best teams from the hospitals and national disease centres, universities and A*STAR Research Institutes to advance human health and wellness, and/or create economic value for Singapore and Singaporeans  
• Interdisciplinary collaboration preferred                                                                 | May 2016  |
| **Individual Research Grant (IRG)**              | • Up to $1.5M (inclusive of indirect cost) over a maximum of 5 years  
• Support basic and translational clinical research                                                                                                          |           |
| **Young IRG**                                    | • Sub-category of IRG  
• A step for new investigators to a first independent national level grant.  
• Up to $0.5M (inclusive of indirect cost) over 3-5 years.                                                                                               |           |
# MOH Research Programmes

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| Clinician Scientist IRG (CS-IRG) and New Investigator Grant (CS-IRG NIG) | • Up to $1.8M (inclusive of indirect costs) for 3 years, is provided to **CSs** to enable them to carry out medical research on a specifically defined topic.  
• NIG is a sub-category of CS-IRG and a step for new CS investigators to a first independent national level grant. Up to $240K (inclusive of indirect costs) for 2 years | May 2016  |
| HSR Research Grant                                                   | • For researchers to conduct HSR and enable the translation of HSR findings into policy and practice  
• Broad priorities and care themes will be emphasised                                                                                                                                   |           |
Human Capital Awards – STaR, CSA, TA

Prof Tan Eng King
National Neuroscience Institute
Duke–NUS Graduate Medical School
Research in Parkinson’s disease & Movement Disorders

A/Prof Raymond Seet
National University Health System
Detection of occult paroxysmal atrial fibrillation following ischemic stroke in a multi-ethnic Asian population and elucidating their significance in relation to recurrent stroke outcomes

A/Prof Lee Chi–Hang, Ronald
National University Health System
Sleep study–guided multidisciplinary therapy for patients presenting with acute coronary syndrome

Prof Mark Richards
National University Heart Centre
Improving Outcomes In Acute Myocardial Infarction Through Reversal of Early and Late Cardiac Remodelling (MMACULATE study)

Dr Nagaedran Kandiah
National Neuroscience Institute
Duke–NUS Graduate Medical School
Study to Elucidate the Influence of Cerebral White Matter Disease in the Pathogenesis of Alzheimer’s Disease and Parkinson’s Disease Dementia with Combined Structural–Functional Imaging

Dr Jimmy Lee Chee Keong
Institute of Mental Health
Duke–NUS Medical School
Analysis of blood–based biomarkers in first episode psychosis
Human Capital Awards – STaR, CSA, TA

**A/Prof Koh Woon Puay**
Duke–NUS Graduate Medical School

*Influence of midlife diet and lifestyle factors on telomere attrition and accumulation of chromosomal DNA damage in biological ageing*

**A/Prof Christopher Chen**
National University Health System

*Translational Research in Dementia: Mechanisms of Disease, Pathophysiology and Biomarker Discovery*

**A/Prof Poh Kian Keong**
National University Health System

*Cardiovascular structure and function in mildly overweight Asian Subjects of Mixed ethnicity following Early versus delayed lifeStyle intervention – a randomized controlled study (CASMES)*

**A/Prof Melvin Leow**
Tan Tock Seng Hospital
Nanyang Technological University

*The role of thyroid status in regulating brown adipose tissue activity, white adipose tissue partitioning and resting energy expenditure (TRIBUTE)*

**Dr Colin Tan**
Tan Tock Seng Hospital
Nanyang Technological University

*Non–invasive Optical Coherence Tomography Angiography for Deep Phenotyping and Diagnosis of Polypoidal Choroidal Vasculopathy*

**Dr Rinkoo Dalan**
Tan Tock Seng Hospital
Lee Kong Chian School of Medicine

*The Relationship of Haptoglobin Phenotype to Vascular Changes and Response to Vitamin E Supplementation in Patients with Diabetes Mellitus Type 2: The EVAS Trial*
Other RIE2020 Programmes

- Increased funding will be given to the National Health Innovation Centre (NHIC)
  - In RIE2020, on top of translating research into economic outcomes, NHIC will also facilitate translating research findings into healthcare outcomes

- MOH will also continue to support talent development programmes
  - Master of Clinical Investigation (MCI)
  - NMRC Research Training Fellowship
The National Innovation Challenge (NIC) on Active and Confident Ageing was announced by Minister for Health and Chairman of the Ministerial Committee on Ageing as part of the Action Plan for Successful Ageing on 26 August 2015.

This NIC seeks to catalyse innovative ideas and research in Singapore that can transform the experience of ageing in Singapore, tomorrow.
We want to find ways to **delay onset of disease and disability** so that our seniors can continue to lead active and productive lives.

### Lengthening “Health Span”

- We want to find ways to **delay onset of disease and disability** so that our seniors can continue to lead active and productive lives.

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<th>Research Areas</th>
<th>Potential/Current Research Projects</th>
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<tbody>
<tr>
<td><strong>Cognitive functioning</strong></td>
<td>Example: Cognitive functioning - Duke-NUS and SingHealth built on translating vascular dementia research in Asians into a structured, multi-component, primary chronic diseases care programme to determine its effectiveness on cognitive impairment</td>
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<td><strong>Physical function</strong></td>
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<tr>
<td>- Frailty</td>
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<td>- Fall prevention</td>
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<td><strong>Regenerative medicine</strong></td>
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<td><strong>Chronic disease management</strong></td>
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<td><strong>IT &amp; Health Management</strong></td>
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<td><strong>Pharmacogenetics</strong></td>
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Facilitate research and innovation in **work and education** to unlock the talent, energies and productivity in longevity, for the benefit of individuals, society and our nation.

### Research Areas

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<th><strong>Sustaining paid and unpaid work</strong></th>
<th><strong>Potential/Current Research Projects</strong></th>
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<tbody>
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<td>- Motivations to work</td>
<td><strong>Examples: Sustaining work</strong></td>
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<tr>
<td>- Work characteristics and cognitive and functional Health</td>
<td>• Study of assembly-line workers at car factory in Germany showed workers who <strong>changed tasks</strong> at least three times over 16 years <strong>function better cognitively</strong></td>
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<tr>
<td>- Age management</td>
<td>• BMW did simple <strong>workplace re-design</strong> to have better lighting etc. productivity improved for both older and younger workers</td>
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<tr>
<td>- Conditions for sustained volunteerism</td>
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<tr>
<td>- Social environment and work</td>
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<th><strong>Lifelong learning</strong></th>
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<td>- Motivations to learn</td>
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<tr>
<td>- Learning competence</td>
<td></td>
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<tr>
<td>- Adult didactics</td>
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### Productive Longevity
Leverage on research in science and technology to help seniors *age in place and live independently* despite physical frailty.

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<td>Enabled living</td>
<td><strong>Example: Enabled living</strong> - SMU collaborated with EHA, Goodlife! for SHINE seniors project through L2NIC funding. Looked at sensors and algorithm to provide appropriate response in times of need.</td>
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<tr>
<td>Mobility</td>
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<td>Productivity in care</td>
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<td>Caregiving</td>
<td></td>
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<td>Effective care</td>
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Innovation is critical to Healthcare to continue to deliver on its mission

**National Level Challenges**

- Increasing demand from rapidly ageing population
- Shrinking workforce
- Healthcare Cost inflation

**Coupled with local constraints**

- Population disease profiles
- Shrinking family size and aging caregivers
- Not sustainable for workforce to grow in tandem with demand
- Limits to physical growth in healthcare facilities

Leverage on biomedical & robotics technology to address these needs cost effectively
Why use assistive & robotics technology?

i. **Enable Productivity Gains** – Enable manpower across care settings to discharge their clinical and operational duties more efficiently

ii. **Support our Ageing Workforce** – Augment/substitute labour-intensive and occupational hazardous aspects of operations, maximising the job value of our healthcare workforce and allowing them to work longer

iii. **Improve Health and Clinical Outcomes** – Assisting care teams to extend human capabilities and deliver improved health and clinical outcomes

iv. **Support ageing population and facilitate care in the community** – Reducing the overall demand for our healthcare facilities like nursing homes. It will also help to make the job of nursing more pleasant and thus able to attract more locals into the profession.
CHART provides a collaborative platform that will enable healthcare professionals to work closely with academia, industry and research institutions to develop impactful healthcare solutions leveraging on robotics and assistive technology.

Early Blood Leakage Detection at Catheter Extraction Points

Assistive technology to increase recovery and improve functionality
Rapael Smart Glove – Wearable Training Device for Hand Rehabilitation

• The Rapael Smart Glove is a wearable rehabilitation glove that will help stroke patients regain movement through repeat hand and arm movements in a virtual reality-type setting.
  
  ❖ Built in sensors that measure the patient’s movements – better quantifies outcomes of rehabilitation
  ❖ Gamification elements help keep patients engaged and maintain interest in the repetitive rehabilitation exercises, as well as motivate the patient throughout the rehab process
Leg Rehabilitation Robot (LR2)

• The LR2 (Leg Rehabilitation Robot) includes functions of CPM (Continuous Passive Motion) for the lower extremities. It offers 6 exercise patterns that control the hip, knee and ankle joint simultaneously and independently

  - Can be applied on a wide range of conditions from orthopaedic diseases, central nerve diseases, to improve activity and flexibility
  - Saves PTs’ time for full-scale therapeutic exercises, and improve rehabilitation efficiency.
BY 2020
1 IN EVERY 5 SINGAPOREANS
WILL BE AGED 65 AND ABOVE

BY 2030
THERE WILL BE 5 MORE ACUTE
GENERAL HOSPITALS IN SINGAPORE

BY 2020
SINGAPORE WILL NEED 20,000 MORE
HEALTHCARE PROFESSIONALS
AS COMPARED TO 2011

OVER THE LAST 5 YEARS
GOVERNMENT EXPENDITURE ON HEALTHCARE
HAS INCREASED BY MORE THAN 15% ANNUALLY
AND WILL KEEP GROWING

WHO CARES?
THANK YOU