Singapore's Precision Medicine Strategy Forging RIE on a National Scale

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Value Proposition For Precision Medicine In Singapore



Precision Approaches for Population Health



Identifying Risk Factors Needs Large Sample Sizes



Risk of Heart Disease vs. Systolic BP

Lewington on behalf of the Prospective Studies Collaboration

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PRECISE Precision Health Research

Singapore

Singapore's National Precision Medicine Strategy

10-year national precision medicine research roadmap to accelerate biomed research, improve health outcomes and enhance opportunities for economic value across sectors



Achievements of NPM Phase I (2017 – 2021)

Regulation and Ethics



Genetic Testing

Code of Practice on Provision of Clinical Genetic Testing Services (2018)

Protection against Genetic Discrimination

Life Insurance Moratorium (2021)



- General support for a national PM programme.
- High levels of trust for hospitals, academic researchers and government to use their data responsibly.
- Permissible for a national PM prog. to share data with industry for R&D
- Strong need for a robust data governance framework to ensure data privacy and protection.

Enabling Platforms

- Sequenced 10,000 Healthy Singaporeans •
- Forming Singaporean reference genome

THE STRAITS TIMES

Singapore researchers create world's largest Asian genetic databank

- Identified >50 million novel • variants
- Insights into Singapore • population structure

Clinical Adoption

- Used by clinicians to accelerate genetic ٠ diagnosis
- Innovative Clinical Pathways for Returning **Results to Healthy Subjects**
- (eg Familial Hypocholesteremia, Breast/Ovarian, Colorectal Cancer)
- **25** Participants with Results **Returned and Potential for Disease** Prevention



IntERPret Industry Forum •



Received **>\$11M** of industry cash and in-kind funding.

Workforce Development

Identified key areas of development for a PM-ready workforce:

- Clinical geneticists
- Genetic counsellors
- Bioinformaticians



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Precision Health Research, Singapore (PRECISE)

PRECISE

A central entity incorporated to **coordinate a whole of government effort to implement Phase II** of Singapore's 10-year National Precision Medicine (NPM) strategy.



www.npm.sg



Singapore's National Precision Medicine Strategy

Phase II

"Proof of Value"

N = 100,000

Phase I

"Proof of Concept" N = 10,000

- Insights into Asian Genomes
 10K+ healthy population genomes
 Establish data analytics capabilities
- Innovative Clinical Pathways
 Identify clinical use cases
 Carry out economic modelling
- Stimulate Industry Interest
 Study the PM landscape
 Engage potential industry partners



- Embed Genetics in the Clinics
 Clinical implementation pilots
 Train PM-ready workforce
- Capture Economic Values
 Public-private partnerships
 Pre-competitive industry consortium



"Proof of Scale" N = 1,000,000

- Population Scale Genomics

 million genomes
 Link to social and environmental data
- Health System Implementation Asian-specific risk models Cost-effective analysis
- Catalyse Genomics Industry Export 'made-in-Singapore' tools Foster local start-ups

RESEARCH

Led by Prof John Chambers Chief Scientific Officer, PRECISE Professor of Cardiovascular Epidemiology, LKC-Med



Case-in-point:

 Partnering with NTU LKC-Med for SG100K Population Health Cohort Study



SG100K population health cohort study is supported by Ministry of Health, National Medical Research Council Open Fund-Large Collaborative Grant funding scheme (MOH-000271-00) Strategic collaborations with MOH, healthcare clusters, and institutes of higher learning on robust policies and frameworks for trusted & secure use of data within broad consent



Government

Academia

Industry Public Engagement

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SG10K_Health Web Portal

- Controlled access to the NPM web services: CHORUS, SNPdrug3D, Imputation, and PRS
- Application for access to SG10K_Pilot and SG10K_Health datasets



INNOVATION: CLINICAL IMPLEMENTATION

Led by Prof Tai E Shyong Chief Medical Officer, PRECISE Professor, Dept of Medicine, NUS Snr Consultant, Endocrinology, NUH



Case-in-point:

 Clinical implementation – to facilitate the incorporation of genetic/genomic tests into clinical pathways that improve patient outcomes while maintaining sustainable per capita cost, optimising healthcare experiences for both providers and patients



1. Standardised clinical workflow is implementable in local institutions

2. Clinical genetics services are clinical / cost-effective



 Implement services using standardised clinical workflow; Mainstream clinical genetics

services with demonstrated clinical / cost-effectiveness.

OOO OOO OOO PRECISE Precision Health Research singapore

Identified CIPs for Award (circa Jan/Feb 22)



Note: *Approval from PS(Health) and DMS will be sought before award

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Case-in-Point:

 Galvanising health economists together to examine how healthcare resources, supported under clinical implementation roadmaps, can be allocated to determine the best way to deliver efficient, cost-effective services; ensuring that dollars spent provide the widest array of services to the largest number of patients.



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ENTERPRISE: Strategic Collaborations & Network Development with Key Partners

in partnership with BMSIPO and EDB



Case-in-Point:

• Establishing networks to drive NPM; adopting best practices & global standards for alignment



- GA4GH, established in 2013
- Focuses on standards to enable sharing of genomic and health-related data
- Brings together 500+ leading organizations from healthcare, research, patient advocacy, life science, and information technology to create frameworks and standards that enable responsible, voluntary, and secure sharing of genomic and health-related data.
- GHIF, established in 2020; as 'off-shoot' of GA4GH
- A strategic partner of GA4GH
- Promotes adoption of GA4GH standards among global genomics initiatives as they pursue the common goal of advancing human health.
- G2MC, an equal partner of GA4GH, initially from NIH
- Serves as nexus, clearinghouse, and knowledge base for genomic medicine activities globally
- Develop opportunities for global genomic medicine demonstration projects
- **Capture and disseminate best practices for genomic medicine** (in bioinformatics, education, evidence, pharmacogenomics, policy) across the global genomic medicine community.
- IHCC, established in 2018
- A strategic partner of G2MC
- Forge cohort connections by providing sustainable data infrastructure
- Focus on building the systems, structures, policies, and practices that enable and sustain cohort collaboration.
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Key Takeaways

NPM is **a 10-year plan** to deploy Precision Medicine approaches to support data-driven healthcare and improve health outcomes

PRECISE will coordinate with partner institutions (research and clinical partners, government bodies and industry players) to implement NPM Phase 2



RESEARCH | Uncover Genetic Diversity SG100K population cohort Linkage to rich phenotypic data

HEALTH | Embed Genetics in the Clinics Clinical implementation pilots Train PM-ready workforce

ECONOMY | Capture Economic Values Public-private partnerships Pre-competitive industry consortium

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Thank You

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