PRESS RELEASE

SINGAPORE LAUNCHES PHASE III OF NATIONAL PRECISION MEDICINE (NPM) PROGRAMME FORMING STRATEGIC PARTNERSHIPS FOR BETTER HEALTH

- *Phase III of the National Precision Medicine (NPM) Programme was launched today* with the goal of scaling research insights into tangible outcomes that will translate into real-world healthcare outcomes.

- *The event, graced by Guest-of-Honour, Minister Ong Ye Kung, Minister for Health and Coordinating Minister for Social Policies, was marked with the signing of a Memorandum of Understanding (MOU) with public healthcare clusters, NHG Health, National University Health System (NUHS) and SingHealth.*

- *The next phase of the NPM programme will gather robust genomic research insights from patient cohorts, which would support doctors and patients in making informed decisions for preventive care, in the future.*

- *This development comes at the back of the completion of Phase I and Phase II of the NPM programme. Phase I sought to study the genomes of 10,000 Singaporeans, which progressed to Phase II, a comprehensive population health study to map the DNA of 100,000 people in Singapore.*

SINGAPORE, 14 NOVEMBER 2025 – The Precision Health Research, Singapore (PRECISE) marked the launch of Phase III of the National Precision Medicine (NPM) programme, with the signing of a Memorandum of Understanding (MOU) between PRECISE and senior representatives from NHG Health, National University Health System (NUHS) and SingHealth.

The MOU reflects the shared commitment of PRECISE and Singapore's three public healthcare clusters to work together and enrol about 10% of Singapore's local resident population as study participants over the next five years.

NPM Phase III will be conducted as a large-scale research initiative to generate robust, population-specific evidence as to the cost and effectiveness of using genomic information in healthcare when scaled beyond pilots to population levels. These insights will help guide how genomic information could, in future, be responsibly integrated into healthcare to support physicians and patients in preventive and more targeted care.

NPM Phase III: From Research Insights to Real-World Impact

“We are pleased to work with our colleagues from the healthcare clusters to launch Phase III and research partners in A*STAR and the ecosystem,” said Professor Patrick Tan, Executive Director of PRECISE. “In Phase II, we studied healthy cohorts to contribute to population health research. In Phase III, we will work with individuals receiving medical treatments and clinical services, including those with specific disease conditions. This will allow important studies to better understand how genomic information may be used to support improved health outcomes. Importantly, Phase III is about understanding and addressing the practical challenges of integrating precision medicine into clinical care in a thoughtful, sustainable, and equitable way.”

"DNA (genetic) testing is already making a difference in selected clinical settings—helping doctors detect conditions earlier, explore targeted therapies, and refine care approaches," said Professor Tai E Shyong, Chief Medical Officer at PRECISE. "Over time, as more gene-disease pairs are identified, greater awareness of how genes and genomic background can predispose some individuals to inherited conditions could encourage more preventive and timely healthcare, helping individuals make informed choices earlier. Insights from one patient's data could, in turn, guide better care for the next."

Building on Strong Foundations

Precision medicine is a key strategic priority initiated under Singapore’s Research, Innovation and Enterprise (RIE) 2025 plan, and is recognised by the Ministry of Health as a key enabler of future-ready healthcare. **Professor John Chambers, Chief Scientific Officer at PRECISE, said, “Singapore is uniquely positioned to lead precision medicine in Asia. Our multi-ancestry population, strong public healthcare and research infrastructure, and ability to integrate health and research data make it possible to generate insights that are clinically relevant for Chinese, Malay, Indian and other Asian communities.”**

“We are working to apply recent biomedical advances to expand the role of genomics in healthcare,” said Clinical Associate Professor Tan Ee Shien, Chief Innovation Officer at PRECISE. “Together with our hospital partners and MOH, we are working systematically to assess clinical utility, population health impact, system readiness, and patient perspectives of more disease areas so as to guide these innovations through the appropriate pathways for clinical adoption.”

Contributing to Research that can Shape the Future of Healthcare

To date, the NPM programme has sequenced over 100,000 Singapore citizens and Permanent Residents, driven innovations in screening and diagnosis, and positioned Singapore as a regional leader in genomics research and implementation. As Phase III begins, members of the public receiving care in public healthcare institutions may be invited to participate.

By contributing to this study, patient participants can help **advance research that may shape future healthcare** for families and communities. Participation is voluntary, and all data collected will be securely stored and handled.

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For more information, visit: www.npm.sg

ANNEX 1

Background on Singapore's National Precision Medicine (NPM) Programme and what Phase III will entail

1. Singapore's National Precision Medicine (NPM) programme was designed as a multi-year, three-phase effort to realise the potential of Precision Medicine (PM) whilst managing associated challenges.

2. **Phase I (2017-2020) established proof of concept through development of SG10K_Health, one of the world's largest genomic datasets of multi-ethnic Asian populations**, comprising whole-genome sequences of 10,000 Singaporeans. This dataset in turn helped to establish Singapore's genetic normality, supporting clinical and biomedical research, and providing initial estimates of genetic disease burden in Singaporeans. SG10K: Discoveries from Mapping 10,000 Genomes

3. **Phase II (2020-2025) demonstrated proof of value by expanding to a 100,000-person longitudinal cohort (PRECISE-SG100K), linking whole-genome sequencing and phenotypic data to clinical records** through the TRUST [1] platform. Clinical Implementation Pilots (CIPs) identified implementation barriers and developed frameworks for evaluating healthcare costs and outcomes. Notable achievements include successful completion of PRECISE-SG100K, implementation of five CIPs involving over 6,000 patients, and supporting the national-scale implementation of Genomic Assessment Centres (GACs) for familial hypercholesterolemia screening. Phase II also attracted significant industry participation from multinational companies whilst supporting local enterprises.

4. **Phase III (2025-2031) remains a research initiative, but with the goal of gathering sufficient evidence to support the implementation of PM approaches at population scale.**

5. The launch of NPM Phase III marks a pivotal moment in Singapore's national precision medicine effort—expanding both in scale and scope to include about

[1] TRUST (Trusted Research and Real World-Data Utilisation and Sharing Tech) is a national health-related data exchange that enables anonymised health-related research and real-world data to be brought together, accessed, and used in an expeditious and secure manner. The platform supports health data analytics and innovation between public institutions, and between the public and private sectors to improve health outcomes and accelerate the data-driven improvement of healthcare. TRUST is co-developed by the Ministry of Health, the Ministry of Digital Development and Information, the Government Technology Agency (GovTech) and Synapxe.

400,000 - 450,000 residents, with a significant shift toward enrolling participants directly from healthcare settings.

6. This means that nearly 1 in 10 Singaporeans may encounter the project through their routine medical care, making it one of the most inclusive and impactful biomedical research initiatives in Singapore's health and biomedical research history.

7. Unlike Phase II, which focused on healthy individuals, Phase III will include patients across a wide spectrum of health conditions. This shift is critical: studying individuals with existing medical conditions allows researchers to uncover how genetic, lifestyle, and environmental factors interact in real-world clinical settings. It brings us closer to understanding disease progression, treatment response, and ultimately, how to tailor care to each person.

8. Moreover, the expanded sample size dramatically increases our ability to detect rare diseases and less common genetic variants—conditions that may not appear in a healthy cohort but are vital to understanding the full landscape of human health in Singapore. These insights will help clinicians and researchers develop more targeted preventive strategies.

9. Phase III will be done through four Work Packages:

   Work Package 1 will sequence about 10% of Singapore's local resident population (~400K-450K individuals) through the three healthcare clusters, complementing Phase II's healthy population cohort. The inclusion of patient cohorts is strategic as it will complement Phase II's healthy population cohort (PRECISE-SG100K), enriching for disease conditions that are important but represented at lower frequencies in the healthy PRECISE-SG100K cohort. The patient participant genomic data will be analysed for insights into disease mechanisms underpinned by genetic variants associated with disease onset, progression, and drug response. Work Package 1 will also collaborate with the healthcare clusters to develop and scale up a pharmacogenomics system to help doctors prescribe the right medicines based on patient participants' genetic profiles.

   Work Package 2 will establish research-centric Genomic Innovation Hubs (GIH) in each healthcare cluster to generate evidence for other genetic conditions that may be suitable for eventual mainstreaming. Another key function of the GIH is to ensure genomic advances and precision medicine applications are implemented ethically, securely, and equitably to improve population health and healthcare sustainability.

   Work Package 3 will support cross-cutting data science, integrating genomic, phenotypic, and clinical information from all three NPM phases. This includes data standardisation and expanded data linkages through the TRUST platform.

Work Package 4 will coordinate stakeholder engagement, communications across all work packages, whilst participating in international forums to attract and establish long-term alliances with global consortia and institutions, thereby providing opportunities for the local health and biomedical ecosystem.

10. By programme completion, Singapore will possess a highly-powered multi-ancestry Asian cohort for long-term research, a healthcare system capable of implementing cost-effective PM pathways, and a robust industry ecosystem encompassing both multinational corporations and local enterprises. **This positions Singapore as a leader in precision medicine implementation and innovation in Asia.**

ANNEX 2

About the MOU

Parties signing the MOU	1. Precision Health Research, Singapore (PRECISE) 2. NHG Health 3. National University Health System (NUHS) 4. SingHealth
Areas of collaboration:	1. **Working Together for Better Healthcare.** PRECISE and the three healthcare clusters across Singapore will collaborate to guide this national initiative. 2. **Building Singapore's Genetic Database.** The aim is to enrol and collect genetic information of about 10% of Singapore's local resident population. This will help scientists and doctors better understand diseases that affect the Singapore population and improve healthcare outcomes for all. 3. **Making Genetic Testing More Accessible.** Support the set up of new genomic assessment centres across Singapore's healthcare system to study how genetic testing can improve patient care. 4. **Safer Medicine Through Genetic Information.** Develop and scale up a pharmacogenomics system to help doctors prescribe the right medicines based on patient participants' genetic profiles. 5. **Protecting Patient Participants' Data While Advancing Healthcare.** Creating a secure system to store and share genetic information, following strict privacy guidelines set by the Ministry of Health.

ANNEX 3

Demonstrating Real-World Value: Highlights from NPM Phase II

The second phase of the National Precision Medicine (NPM) Programme, led by PRECISE, has contributed to real-world developments that support national healthcare goals. Through research, clinical pilots, and collaborations with key stakeholders — including the Ministry of Health (MOH), public hospitals, and local startups — NPM Phase II's Clinical Implementation Pilots (CIPs) have provided data, tools, and insights that have steered and advanced precision medicine implementation in Singapore.

#1 – Supporting Earlier Diagnosis and Prevention of Familial Hypercholesterolaemia (FH)

Initial estimates of genetic disease burden in Singaporeans and CIPs from NPM Phase I and II respectively, supported national initiatives aimed at improving the early detection and management of FH, a genetic condition that increases risk of early heart disease. This includes work that informed the design and piloting of genomic care models, which supported the Ministry of Health's decision to launch a national genetic testing programme for FH, beginning in June 2025.

The new national FH genetic testing programme offers subsidised genetic testing for eligible Singapore citizens and permanent residents through Genomic Assessment Centres (GACs) across healthcare clusters.

FH was also included in the 2023 Clinical Practice Guidelines for Lipid Management, further strengthening its integration into routine care.

For more information, please visit

Getting to the Heart of the Matter for Familial Hypercholesterolemia

A Family Affair – Familial Hypercholesterolemia and the Need for Early Detection

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#2 – Clinical Pilots Exploring Precision Medicine at Scale

Five Clinical Implementation Pilots (CIPs) were initiated under NPM Phase II, in partnership with clinician investigators and health economists. These pilots explored how genetic testing could be embedded into care pathways to support early diagnosis, targeted prevention, and more effective treatment. The pilots focused on areas with potential for significant population health impact:

Clinical Implementation Pilot	**Focus Area**
Addressing the challenges in Case identification, Cascade Screening, Genetic testing and Treatment in Familial Hypercholesterolemia – a	Familial hypercholesterolaemia (early diagnosis, cascade testing)

cross-cluster clinical implementation programme by FHCARE (FH CARE)	
Improving access for clinical hereditary cancer (HC) genetic testing in Singapore Hereditary Cancers (HC)	Hereditary cancers (e.g. breast, ovarian, Lynch syndrome)
BREAst Screening Tailored for HEr (BREATHE)	Breast cancer risk stratification using polygenic scores
Clinical Implementation of Pre-emptive Pharmacogenomic Testing as a Precision Medicine Tool in Routine Clinical Practice in Singapore (PGx)	Pre-emptive pharmacogenomics to reduce adverse drug reactions and improve prescribing
Health and Economic Impact of Next Generation Sequencing in Primary Glomerular Diseases in Singapore (PGD)	Primary glomerular diseases to guide kidney disease treatment

These pilots were designed to test real-world feasibility in both hospital and primary care settings, and to provide data for future service planning.

For more information, please visit Clinical Implementation Pilots

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#3 – Improving Access to Pharmacogenomic Information Through Innovation

As part of efforts to support safer prescribing, NPM Phase II collaborated with local healthtech startup NalaGenetics to co-develop a patient-facing mobile app—Nala Personal Health Manager. The app enables individuals to securely access, view, and share their pharmacogenomic test results across care settings, including clinicians from the private sector.

Designed with a focus on Asian populations, the tool was developed based on insights from patient and clinician interviews and real-world research, addressing the fact that >90% Singaporeans carry genetic variants that may affect medication safety or effectiveness. It complements ongoing pharmacogenomics research and clinical pilots, helping to bridge information gaps and improve care coordination.

For more information, please visit

Empowering Seamless Access: Personalised Pharmacogenomic Information On The Go

Nalagenetics

ANNEX 4

Significant milestones of the NPM programme since 2017

Over the past eight years, Singapore's NPM programme has made significant research progress.

- Research from Phase I and Phase II (PRECISE-SG100K) supported national initiatives such as the Genomic Assessment Centres (GACs), which will enable earlier diagnosis and better management of familial hypercholesterolemia, a genetic condition that can cause early heart disease.

- Five clinical pilot studies, involving over 6,000 patient participants, explored how genetic information could guide drug use, assess disease risk, and improve clinical outcomes.

- A partnership with local startup Nalagenetics developed a pharmacogenomics patient app that provides genetic-based prescribing advice tailored to Asian populations to minimise severe life-threatening drug allergies.

ANNEX 5

PRECISE Spokespersons' Names (Mandarin)

No.	Name/Designation (English)	Name/Designation (Mandarin)
1	Professor Patrick Tan Executive Director, PRECISE	陈文炜 教授 执行董事 新加坡精准健康研究所
2	Professor Tai E Shyong Chief Medical Officer, PRECISE	戴一雄 教授 首席医务官 新加坡精准健康研究所
3	Clinical A/Prof Tan Ee Shien Chief Innovation Officer, PRECISE	陈玉娴 临床副教授 首席创新官 新加坡精准健康研究所
4	Professor John Chambers Chief Scientific Officer, PRECISE	约翰·钱伯斯教授 首席科学官 新加坡精准健康研究所

ANNEX 6

Glossary of Terms

- **Clinical Genetic Testing**
  Medical tests that analyse a person's DNA to identify genetic changes that may cause disease or increase the risk of developing certain health conditions, helping doctors make more informed decisions about prevention, diagnosis, and treatment.

- **Clinical Pilot Studies**
  Preliminary research projects conducted to test the feasibility and effectiveness of new medical approaches before broader implementation.

- **Clinical Pathways**
  Standardised, evidence-based guidelines that outline the optimal care process for specific medical conditions.

- **Data Linkage**
  Data linkage is the process of connecting information from different sources—such as medical records, genetic data, and health surveys—to create a more complete picture of a person's health. This helps researchers and doctors understand how various factors work together to affect diseases and treatments. All data access and processing comply with Singapore's national data protection laws and international best practices, with strict controls in place from data collection through to analysis and access.

- **DNA (Genetic) Testing**
  A laboratory test that examines a person's genetic material (DNA) to identify changes or mutations. This includes both research-grade and clinical-grade testing for various purposes including disease risk assessment, ancestry analysis, and scientific research.

- **Genomic Information**
  Data derived from an individual's DNA that can offer insights into health risks and responses to treatments.

- **Precision Medicine**
  An approach to healthcare that considers genetic profiles, lifestyle, and environment to adjust medical care.

- **Precision Medicine Applications/Approaches**

  Cascade Testing - Once a genetic condition is identified in a patient, close relatives can be systematically tested for the same variant. Helps in early detection, prevention, or targeted surveillance in family members at risk.

Pharmacogenomics (PGx) - Using an individual's genetic profile to guide drug choice and dosage. Prevents adverse drug reactions and improves drug efficacy (e.g., choosing the right antidepressant, blood thinner, or cancer therapy).

Companion Diagnostics - Tests developed alongside specific drugs to identify which patients will benefit (e.g., HER2 testing for breast cancer to guide trastuzumab treatment).

- **Preventive Care**
  Healthcare services aimed at preventing diseases or detecting them early when they are more treatable.
- **Population Health**
  The health outcomes of a group of individuals, including the distribution of such outcomes within the group.
- **Research, Innovation and Enterprise (RIE) 2025 Plan**
  Singapore's national 5-year plan to advance research and innovation for economic and societal benefit.

ANNEX 7

The following patient, public and healthcare professional profile stories illustrate examples of promising research outcomes from our Clinical Implementation Pilot (CIP) studies. While these findings demonstrate the potential for tangible benefits that could translate into real-world healthcare outcomes, these areas require further evaluation before they are ready for immediate mainstreaming into routine clinical practice.

Patient / Public profiles

Angle: Primary Glomerular Disease – Finding answers: Doing a genetic test means a peace of mind, providing clarity

1. **Featured spokesperson:**

    - **Mr Anand**, parent who can share about his son who experienced hereditary kidney disease and kidney failure, even though both parents are fine.
    - **Dr Ng Kar Hui**, Senior Consultant, Division of Paediatric Nephrology, Dialysis and Renal Transplantation, Department of Paediatrics, Khoo Teck Puat — National University Children's Medical Institute, National University Hospital.

- When Mr and Mrs Anand's son was two years old, the second-time parents were looking forward to witness milestones of toddlers that age all over again – language milestones to express himself in simple words, and motor skills such as jumping, climbing.

- Instead, they were met with a crying child who was in constant pain – his son was limping, with swelling in his legs when he was two. At first, Mr Anand brushed it off, thinking it was temporary growing pains or due to outdoor play. However, as the symptoms persisted, they brought their son to the hospital for a check-up.

- What followed, as Mr and Mrs Anand described, was "nearly 2 years of going round and round." **Test after test raised possibilities such as leukaemia, autoimmune conditions, Rheumatoid Arthritis etc but results remained inconclusive.** They even visited a children's hospital in Australia for a second opinion. The family was **stuck in an endless loop**, each test or consultation raising more questions than answers.

- Finally, they were referred to the Division of Paediatric Nephrology at National University Hospital (NUH) at aged 4, where doctors detected excessive proteins in their son's urine. By then, he was formally diagnosed with glomerular disease where the filters in the kidneys were damaged. This condition causes large amounts of protein to leak from the blood into the urine, resulting in a lack of protein in the blood and swelling in the legs.

- Although the child was given medications to manage the condition, the progressive scarring in the kidneys could not be stopped and he went on to kidney failure. He had to undergo dialysis before he was able to receive a kidney transplant subsequently.

- When his second son was in his early teens, A/Prof Ng Kar Hui, Senior Consultant, Division of Paediatric Nephrology, Dialysis and Renal Transplantation, Department of Paediatrics, Khoo Teck Puat — National University Children's Medical Institute, National University Hospital offered genetic testing to him, since he had kidney failure at a young age and the exact diagnosis had remained unknown. A/Prof Ng was involved in a research programme, called **Renal Alliance for Precision Diagnosis in Singapore (RAPIDS)** which comprises a multi-institutional, multi-disciplinary network of kidney and genomics experts and aims to implement genomics medicine in kidney clinical practice.

- A/Prof Ng explained genetic testing to them in simple terms, and Mr and Mrs Anand began to understand the importance of it.

- When the genetic test results returned, the family finally had an answer – the root cause. Mr Anand shared, “The many years of testing and uncertainty without answers is something that we do not wish other parents have to go through. Had we known about such (genetic) tests earlier, we would have been able to steer the direction of care for him much earlier”. **Early intervention and treatment can avoid a diagnostic odyssey**.

- Mrs Anand also **reinforces the benefits of genetic testing as a clinical and research tool that can assist in developing treatments and offering parents** options to provide suitable care for their offspring.

- However, Mr and Mrs Anand highlighted that for parents considering genetic testing, it was important to **establish a level of trust between parents and doctors as the journey can be emotionally charged.** In their case, they had strong communication with their clinicians, which fostered a high level of trust.

- They recounted that the long and difficult search for a diagnosis was filled with internal blame and a deep sense of loss**. “Doing a genetic test means a peace of mind.** You know exactly where the problem is. It is not something you did wrong.” It also provides the **medical team with clarity on what steps they can take and more importantly, what not to waste time on.**

- Today, Mr and Mrs Anand volunteer in various kidney patient support groups, speaking with parents and patients while sharing their personal experiences. They highlighted, “A strong support system is critical, but it is equally important for patients to ask for help when they need it. You never walk alone.”

Angle: Familial Hypercholesterolemia – “All these years we just thought it was high cholesterol. We never imagined it was something genetic”

2. **Featured spokesperson:** Mdm Pisun, nurse clinician of 38 years (familial hypercholesterolemia (FH) patient ambassador, patient receiving care at Khoo Teck Puat Hospital (KTPH))

- “Life is like a box of chocolates,” Mdm Pisun often says. Though she rarely indulges in any. For most of her life, she has lived healthily by the book: no alcohol, no smoking, and a diet that helps lower cholesterol.

- Her mother, uncles and aunt were all diagnosed with high cholesterol in their 40s. Over time, five of them succumbed to heart failure in their early 50s, 60s. “Only making lifestyle changes was not enough,” Mdm Pisun reflects.

- Last year, her daughter in her twenties was found to have high cholesterol during a routine health screening organised by her workplace. She was referred to FHCARE, a clinical research programme since its initiation in KTPH in 2015. Her daughter tested positive for familial hypercholesterolemia (FH). Mdm Pisun was stunned but also curious.

- **“All these years we just thought it was high cholesterol,” she says. “We never imagined it was something genetic.”**

- She decided to get tested too with FHCARE. In February this year, her doctor diagnosed her with FH. For someone who had spent over two decades working as a neonatal nurse, accustomed to high-pressure situations, Mdm Pisun thought she had seen it all.

- But the news hit her harder than she expected. “Even though I wasn’t surprised (by the results), my anxiety increased double fold,” she recalls. “Why? How? What now? I didn’t even know what I needed to know.”

- Dr Sharon Pek from KTPH's FHCARE team provided counselling to Mdm Pisun regarding her FH diagnosis. During their session, Dr Pek emphasised the significance of cascade screening and offered practical advice on cholesterol management.

- Dr Pek also connected Mdm Pisun with FHCARE's FH Advocacy Circle, a support group where individuals and families affected by FH can share experiences and access the latest information about the condition.

- Looking back, she credits early testing for her current quality of life. “Understanding the genetic aspect helps us make sense of the chronic condition,” she says. For her and her daughter, **the clarity of a confirmed diagnosis meant being able to include early intervention by starting cholesterol-lowering medication early,** which can bring about more effective

results solely on lifestyle changes, which ultimately had not been enough for her uncles and aunt.

- **Today, Mdm Pisun serves as an FH ambassador, helping to build a resilient community of FH patients and their families.**

- Under the leadership of A/Prof Tavintharan Subramaniam, the principal investigator of the FHCARE programme, the team remains committed to empowering more individuals like Mdm Pisun as they navigate their FH journey together.

- These days, her condition is stable, with regular follow-ups only every nine months. “The unknown can be fearful,” Mdm Pisun admits. “But there’s no need to avoid it.”

Angle: Hereditary Cancer – Genetic testing for Hereditary and Familial Cancers to inform family planning and provide assurance

3. **Featured spokesperson:** Mdm Halijah Binte Mohamed Rian

- Halijah has two sisters - an elder and a younger - both of whom were diagnosed with cancer.

- Her elder sister was first diagnosed with breast cancer at the age of 24. When the cancer recurred in her 30s, she underwent genetic testing through the NCCS’ Cancer Genetics Service (CGS), supported by PRECISE’s Hereditary and Familial Cancers Clinical Implementation Pilot. She was found to carry the BRCA1 gene mutation, confirming that she had Hereditary Breast and Ovarian Cancer (HBOC) syndrome, which explains her early-onset breast cancer. She underwent a unilateral mastectomy and the cancer is currently in remission.

- At that time, Halijah and her younger sister decided not to go for genetic testing, as they did not believe that they would have inherited the same BRCA1 gene mutation.

- In 2019, Halijah’s younger sister was diagnosed with breast cancer in her 30s and tested positive for the same familial BRCA1 gene mutation. She encouraged Halijah to go for genetic testing, due to their family’s risk of young breast cancers.

- Halijah decided to get tested. She attended a genetic counselling session and consented to genetic testing at CGS, to find out if she had inherited the familial condition of HBOC syndrome. This would allow her to make informed decisions about screening or preventive steps if she tested positive.

- The results came back negative. Halijah was assured that she did not inherit the familial risk of breast and ovarian cancers, and she **no longer had to deal with**

the uncertainty of not knowing if she was at high risk. She only needed to have 2-yearly breast mammograms from age 50, like the general population.

- Halijah believes in the importance of genetic testing - not just for oneself but also for the wellbeing of family members. Knowing if you have inherited a familial condition like HBOC empowers decisions for early detection and prevention, which can help reduce the incidence and mortality of cancer as a whole.

Angle: Hereditary Cancer – Genetic testing for Hereditary and Familial Cancers to inform family planning and provide assurance

4. **Featured spokesperson:** Joelle Kong

    - Joelle was diagnosed with colorectal cancer in November 2018 at the age of 27.

    - Before the diagnosis, she did not notice any symptoms except that her appetite was decreasing. As a sailing coach, she would expend a lot of energy every day. But she could only eat two meals a day and only finish half a portion for each meal.

    - Joelle's weight loss was so visible that her students' parents started asking if she was doing okay.

    - One morning, Joelle was sent to the A&E when she threw up after breakfast. Following checks and scans, she was diagnosed with stage 3 colorectal cancer.

    - Her father, who is a colorectal cancer survivor and completed treatment in 2014, assured Joelle that she would be fine.

    - Joelle underwent surgery to remove the tumour and two-thirds of her colon. She also received chemotherapy and experienced side effects including dry skin and tingling sensation in her limbs.

    - Because of her young age of diagnosis and family history of cancer, Joelle was referred to the NCCS' Cancer Genetics Service (CGS) for genetic counselling. She consented to genetic testing and was found to have Lynch syndrome, which is the most common form of hereditary colorectal cancer. She encouraged her sisters to go for genetic counselling so they could better understand their own health risks and make informed decisions about how to take care of their health in the future. Both her sisters tested negative for Lynch syndrome.

    - Sailing and coaching were Joelle's biggest motivation while she was undergoing treatment. By mid-2019, she completed treatment and went back to coaching just two weeks after completing chemotherapy.

- However, it wasn't smooth-sailing and she faced various challenges. With two-thirds of her colon removed, she experiences side effects including lactose intolerance and occasional faecal incontinence. She also gets tired more easily. But Joelle has not allowed these challenges to bring her down and found ways to work around them. She would always pack extra clothes, watch her diet and makes sure to get plenty of rest and at least 7 hours of sleep daily.

- Today, Joelle is cleared of cancer. She is grateful for the support of her friends, students and their parents who always check in on her to make sure she is doing okay.

- When her relatives visited while she was undergoing treatment, she learnt that two of her uncles also had colorectal cancer. As the older generation often view cancer as a taboo topic, Joelle never knew that they had cancer. Joelle hopes to encourage people to talk more openly about cancer to reduce the stigma and raise awareness on the importance of genetic testing for patients to make informed decisions for long term preventive care.

- To pay it forward, Joelle is a member in the NCCS Lynch Syndrome Support Group and is interested in helping and empowering others who are going through similar experiences.

- Joelle strives to live each day to the fullest and to inspire others. She also hopes to continue pursuing her passion as a sailing coach for many years to come.

- Joelle's advice for fellow patients fighting cancer: Do not be afraid to ask for help and never give up

Healthcare professional profiles

Angle: Power of precision medicine (Pre-emptive Pharmacogenomics Testing (PPGx) in unlocking medical mysteries – providing answers to patients to improved solutions

a. Healing By Design: How Genetic Testing Personalises Treatment After a Heart Attack

5. **Featured spokesperson: A/Prof Doreen Tan Su Yin**, Cardiology Specialist Pharmacist, NUHCS

- For one of A/Prof Doreen Tan's patients, who is a heart attack survivor, his journey took a hopeful turn after genetic testing guided his care team to make a switch to another antiplatelet medication, used to prevent blood clots from forming, which is better suited to his unique DNA. For A/Prof Tan, this isn't just science—it's personal. She shares how PPGx fuels her passion in

advocating for the heart patients who see her, and how the trust patients place in her and their care teams are both humbling and deeply motivating.

- After experiencing a heart attack (myocardial infarction), her patient was prescribed a common antiplatelet medication for heart patients, known as Ticagrelor, which is used to prevent blood clots from forming by making the blood less “sticky”. However, the patient started experiencing symptoms of breathlessness. Unsure about what was causing these symptoms, he brought it up to A/Prof Tan.

- A/Prof Doreen Tan has been a **strong advocate for pre-emptive pharmacogenomics testing (PPGx)**, since the PPGx Clinical Implementation Pilot was introduced to her some two years ago. When she heard him describe his symptoms, she suspected that this patient, like many other heart patients, may be genetically predisposed to having a reaction to certain medications. She explained to the patient about the test that screens for a panel of genes, to see if the patient has genetic variants that could lead to a bad reaction to medications commonly used for patients with this patient’s condition or render them less effective or useless.

- More than 99 per cent of the population carry at least one genetic variant that can interact poorly with a drug. One in four Singaporeans carries a variant that raises the risk of life-threatening side effects to at least one medication.

- A/Prof Tan recalls that her patient agreed to the test, as the patient **saw the benefits that this simple blood test could bring – not only for their current condition, but also in future**, should the patient need other types of medication. Pre-emptive pharmacogenomics testing could save precious time and enable doctors to prescribe **targeted and effective medication** specific to the patient’s genetic makeup.

- The results showed that an alternative medication, Clopidogrel, was a suitable alternative.

- Since making the switch, her patient has had fewer side effects and **has recommended the PPGx CIP to his family members** and friends as he felt that genetic testing equips doctors with more precise information to make better treatment decisions. Despite privacy concerns such as personal health data protection and insurability eligibility, the patient feels that the benefits outweigh these concerns, **as genetic testing ensures that patients can receive the most effective medications without any unnecessary delays and discomfort**

Angle: Power of precision medicine (Pre-emptive Pharmacogenomics Testing (PPGx) in unlocking medical mysteries – providing answers to patients to improved solutions

b. From Side Effects to Solutions: How Genetic Testing is Transforming Psychiatric Prescribing

6. **Featured spokesperson: Dr Wan Yi Min**, Senior Consultant, Department of Psychiatry, Ng Teng Fong General Hospital and Department of Psychological Medicine, National University Hospital

- Senior Consultant Psychiatrist Dr Wan Yi Min shares her perspective on how pre-emptive pharmacogenomics (PPGx) is transforming the way psychiatric medications are prescribed—reducing the burden of trial-and-error and improving patient outcomes.

- In psychiatry, finding the right medication for conditions such as depression and anxiety often involves a lengthy process of trial and error. Patients may wait weeks or months to find a drug that works, which can take a toll on their mental health and motivation to continue treatment.

- Dr Wan is one of the doctors working with PRECISE's Pre-emptive Pharmacogenomics Clinical Implementation Pilot (PPGx CIP). She sees the initiative as a powerful tool to support mental health patients by tailoring treatment based on each individual's genetic profile.

- Working alongside pharmacists like Dr Elaine Lo, Principal Clinical Pharmacist at National University Hospital, who is also lead pharmacist of the PPGx pilot, Dr Wan advocates integration of PPGx into routine care pathways, especially for patients who have had limited success with conventional medications. In one memorable case, a patient struggling with treatment-resistant depression saw a marked improvement in quality of life after a PGx test helped identify a more suitable medication.

- Dr Wan believes PPGx has the potential to significantly reduce treatment timelines, improve adherence, and give patients renewed confidence in their care. In the near future, she hopes that with more widespread adoption and evolving technologies, PGx testing can be seamlessly integrated in clinical systems and made more accessible to reach more patients.

- While cost and awareness remain barriers, Dr Wan remains hopeful that with continued national efforts—like those led by PRECISE—PGx will become an integral part of preventive and precision healthcare in Singapore.