

HealthTech Advisory Centre (HTAC) Seminar

Spotlight on Success: Pioneering HealthTech Stories in Singapore

21 Feb 2025

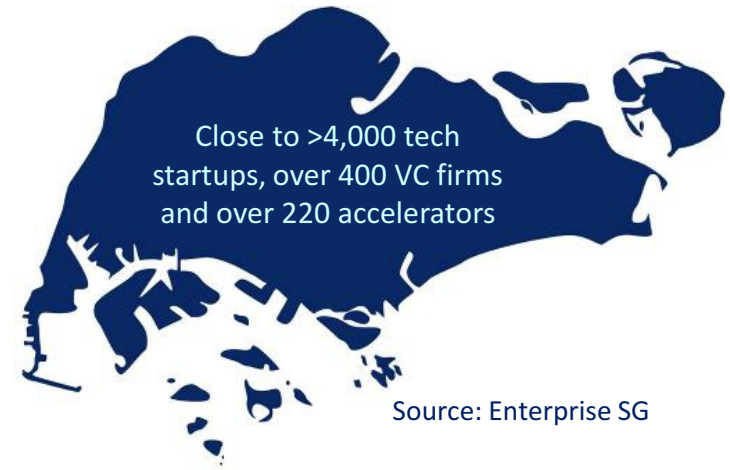
Gordon Xiong, Ph.D

Assistant Director, HealthTEC.SG

Singapore Innovation Indicators

GLOBAL STARTUP ECOSYSTEM RANKING 2024 (StartupBlink)

Ranked **#6** Worldwide
Ranked **#1** in Asia-Pac



Source: Enterprise SG

Digital Innovation



National AI program to anchor Singapore's AI capabilities through funding and education

SEA-LION (*Southeast Asian Languages In One Network*)



Open-source LLM for Southeast Asian languages



Singapore launches AI Verify Foundation to shape the future of international AI standards through collaboration



Goals

Trust: Security of digital infrastructure

Growth: Empower individuals and enterprises

Community: Inclusion & bridging digital divide

Singapore tops Asia-Pac in AI readiness

Table 1: Overall, Business, and Government AI Readiness 2023 (scores out of 100)

Ranking	Overall AI Readiness 2023 score	Business AI Readiness 2023 score	Government AI Readiness 2023 score
1	Singapore (70.1)	Singapore (53.6)	Singapore (86.5)
2	Japan (59.8)	China (43.1)	Australia (77.7)
3	China (59.7)	South Korea (42.7)	Japan (77.5)
4	South Korea (59.2)	India (42.2)	China (76.3)
5	Australia (58.2)	Japan (42.1)	South Korea (75.7)
6	New Zealand (54.6)	Australia (38.7)	New Zealand (72.9)
7	India (49.8)	New Zealand (36.2)	Malaysia (64.4)
8	Malaysia (47.3)	Malaysia (30.3)	Thailand (59.9)
9	Thailand (43.6)	Thailand (27.3)	India (57.4)
10	Indonesia (39.3)	The Philippines (25.4)	Indonesia (55.0)
11	Vietnam (36.5)	Vietnam (25.0)	Vietnam (48.1)
12	The Philippines (35.7)	Indonesia (23.5)	The Philippines (46.0)

Source: Access Partnership research

Snapshot of our Data Proportions

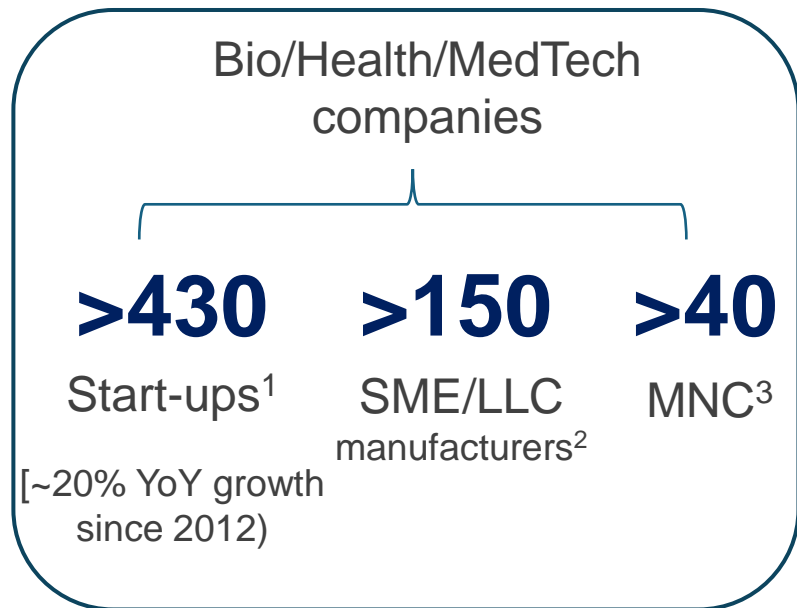


Singapore Health Tech Ecosystem

High growth of local & foreign startups

Growing pool of local and foreign investors¹


Open to talent and diversity




172 VCs / PEs / Angels / Family Offices / Corporate VCs

Notable Total Funding

 biofourmis US\$464 million, Series D

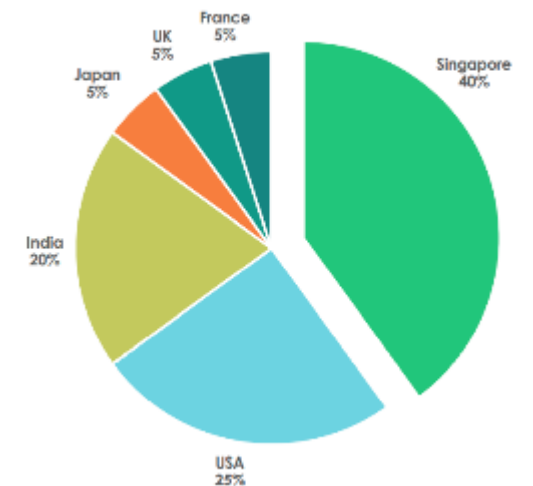
 MIRXES US\$218 million, Series D, IPO

 Doctor Anywhere US\$176 million, Series C

 Holmusk US\$109 million, Series B

 AWAK US\$60 million, Series B

Nationality Distribution Of Singapore-based Top 20* HealthTech CEOs



Source: Galen Growth (2020)

¹Startup.SG directory as of Mar 2024

²Estimated SME manufacturers from Singaporemedtech.com

³Data from EDBi

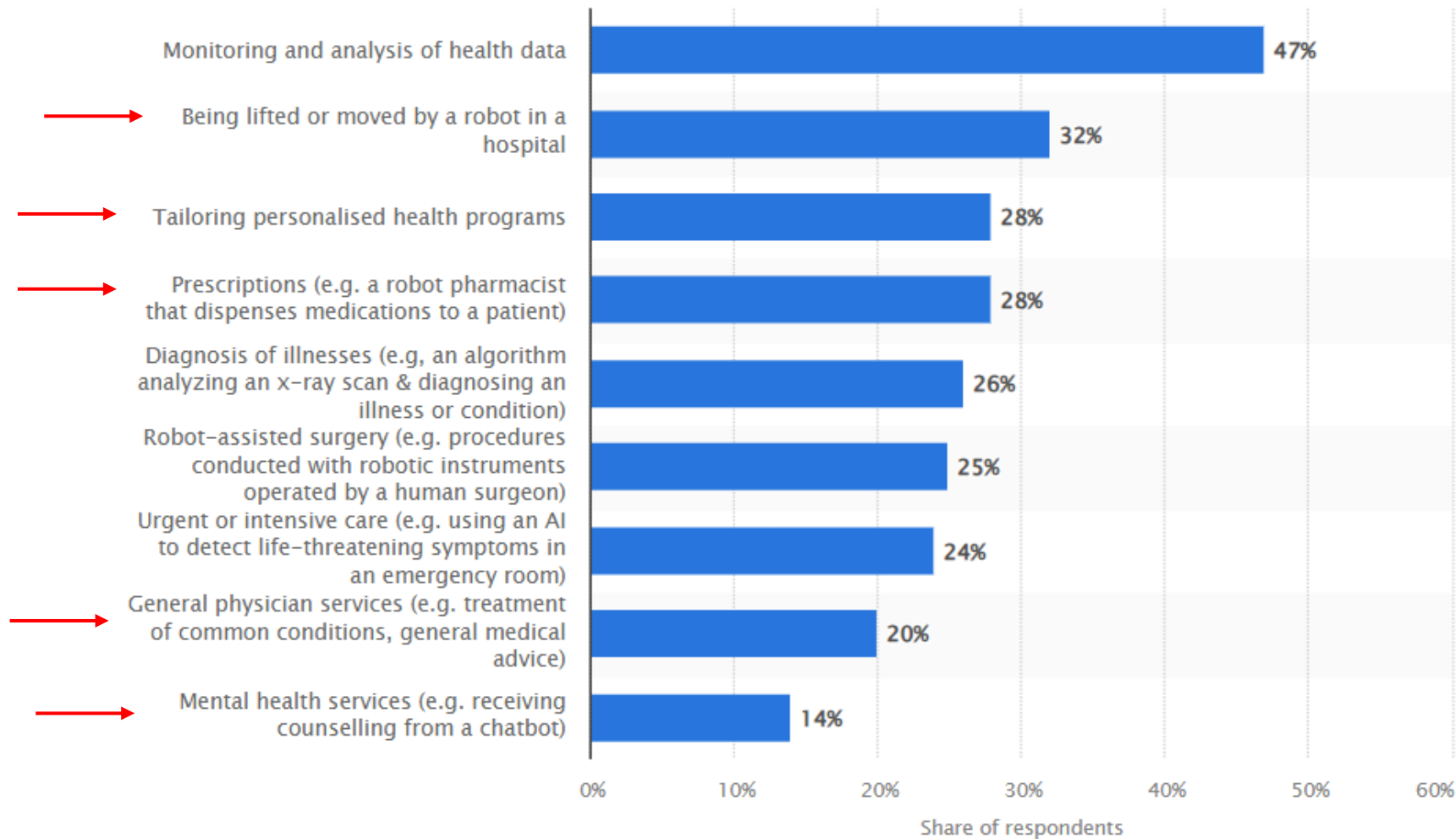
Top 10 Digital Health Domains by Venture Funding Value in 2024 (Global)



Source: Galen Growth, "Digital Health 2024"

What about patients?

% of patients who were open to receiving healthcare services from an AI or robot in Singapore (2023 survey)



Digital Health Adoption Trends in Singapore's Healthcare Sector

1

Consumer Health
& Wearables for
Prevention &



Mental health & wellness

Key drivers

1. Rising prevalence of chronic diseases due to ageing population
2. Tech-enabled shift towards home care (**Decentralization**)
3. Integrated and consolidated (**holistic**) care
4. Greater ownership in health and well-being

Remote Monitoring/IoT



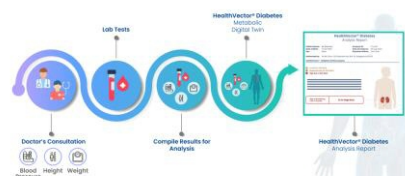
Fall detection

Analytics in Clinical
Solutions

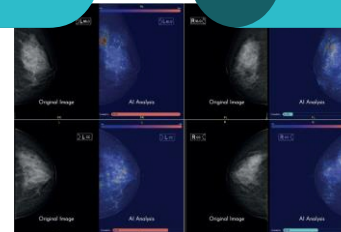


@MedicaMedica

HOW DOES HEALTHVECTOR® DIABETES WORK?



@Meshbio



@FathomX

3 Key Pillars of Growth for Bio/Medtech Enterprises

Precision Medicine



SG100K (2021-2025):

Insights from population genome sequencing of 100,000 healthy and 50,000 with specific diseases

National Cohort studies:

Health for Life (NTU)

SG Population Health Studies (NUS)

SG Epidemiology of Eye Diseases (SERI)

SingHeart (NHCS)

- Devices, assays, tools for sequencing
- New precision health biomarkers (biological, digital) for diagnostics & therapies

Digital Health / Medicine



(Established in 2011)

Next Generation Electronic Medical Record (NGEMR):

- Advanced central EMR to record entire patient journey from admission to discharge, including admin data
- 2 of 3 public healthcare clusters onboard
- Replaced 90 legacy systems

Endeavour AI: NUHS AI Platform

- Hospital waiting times
- CalSense- calcium scoring
- Potential to integrate others...

AI Medical Platform (AimSG) by Synapxe

- Open and vendor-neutral
- Deployed in 2023, with AI-powered chest X-ray imaging (Lunit)

- AI on screening, diagnosis, interventions to hospital operations, patient care/service delivery

Medtech Manufacturing



Group of Singapore companies providing end-to-end manufacturing solutions in IVDs, wearables, consumables and box build assembly for global MNC.

For Startups/SMEs

- Low-volume prototyping
- Ideation to product services



National platform to enhance medtech product development and manufacturing capabilities

- Contract manufacturers that bring specialised capabilities
- Companies seeking end-to-end services

Opportunities for Industry

In Spotlight:

FATHOMX

Empowering Women for Better Health with Technology


Addressing Global Shortage of Radiologists for Breast Cancer Screening


Asia-Pacific Screening Rates


Countries	Number of Radiologist Per 100,000 women
USA	10
UK	8.5
European Union	13
Australia	7.3
India	1.0
Singapore	6.5
Thailand	2.7
Japan	7.6
Malaysia	1.9
China	0.5
Hongkong	2.0
Taiwan	2.8
Philippines	1.5
Africa	0.5
Indonesia	0.6


Asia Pacific (underserve)


Current screening Rate


Australia: 55% (2.48M) 


Singapore: 38.6% (0.23M) 


Japan: 44.9% (13.59M) 


Hong Kong : 34% (0.48M) 


Taiwan Rgn: 32% (1.32M) 


China: 22.6% (64M) 


Thailand: 5.9% (0.74M) 

Philippines: 4.1% (0.81M) 

Malaysia: 3.6% (0.20M) 

India: 9.8% (19.5M) 

Vietnam : 3.06% (0.6M) 

Indonesia: 9.8% (4.5M) 

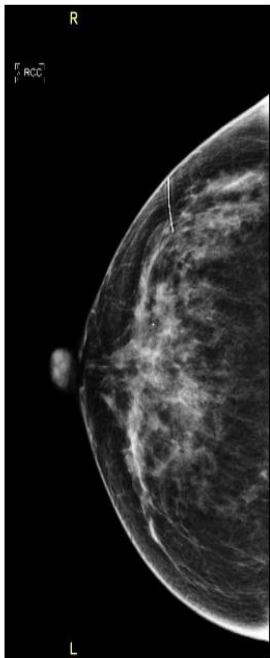
WHO Recommendation :
Target 70% Screening Rate
(Like USA) for developed
markets and 35% for less
developed markets

FathomX's Solution

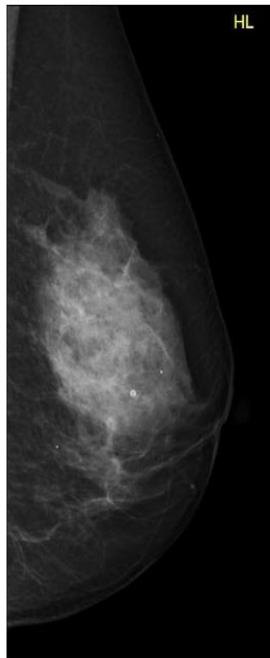
AI increase reading speed of Radiologists

User Interface and Ease of Use

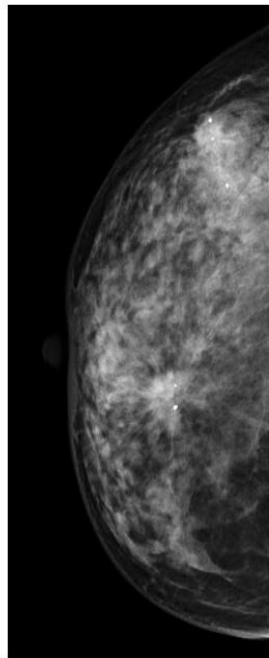
- ✓ Modern, intuitive design allows for seamless interaction.
- ✓ Quick image uploads and real-time analysis results.
- ✓ Simple navigation to ensure even users with minimal technical skills can use effectively.
- ✓ Zoom in and out of the thermal image for a closer view



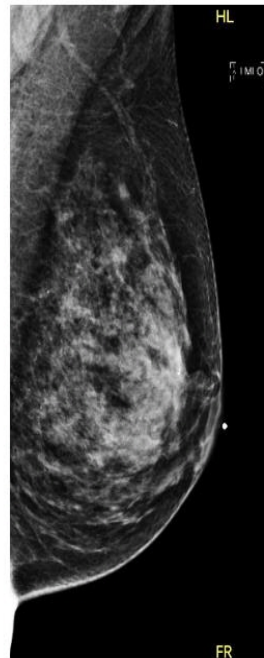
Architectural Distortion



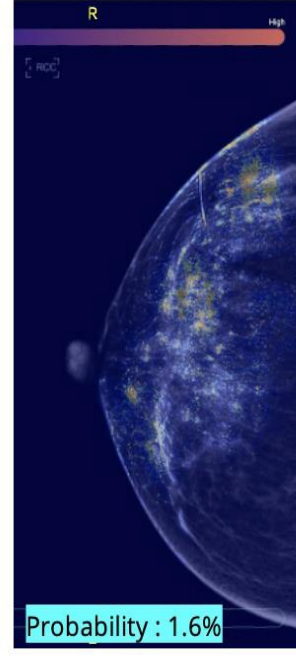
Calcification



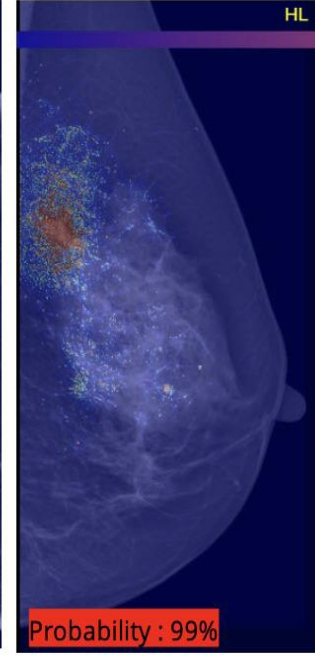
Mass



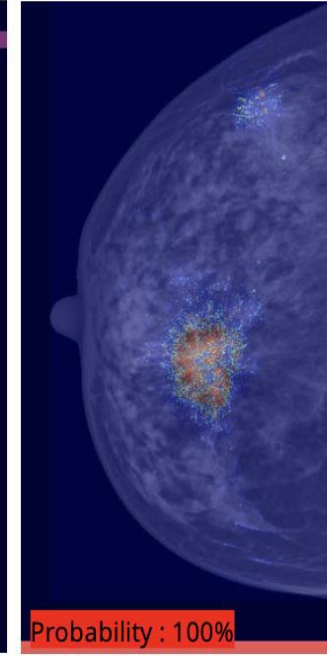
Asymmetric Density



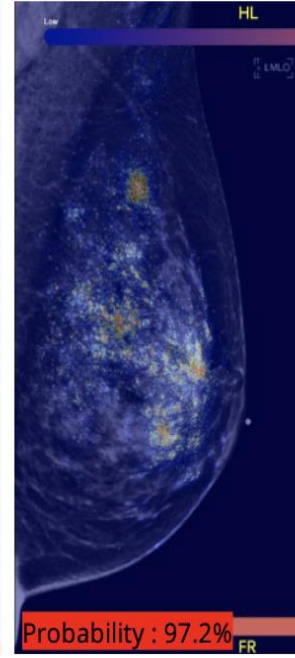
Architectural Distortion



Calcification



Mass



Asymmetric Density

Identification of Different Types of Cancer

Triage of Screening Examinations

FathomX's Management Team



Professor Mikael Hartman
Founder/ Chief Medical Officer

- 21 years of clinical practice and currently a Breast Cancer Senior Consultant at the National University Health System
- 100 peer reviewed articles and 157 publications
- Champion of Breast Cancer Awareness in Singapore and the region



Professor Feng Mengling
Founder/ Chief Data Scientist

- Assistant Professor at the Institute for Data Science and NUS
- Over 12 years of experience in research with publications in top journals like JAMA and STM as well as conferences like KDD, AAAI and AMIA



Stephen Lim
Chief Executive Officer

- Seasoned CEO with over 27 years of management experience
- Previous portfolios included startups as well as SGX Mainboard listed companies including Lion TCR, Auric Pacific Group Ltd and Ascendas Singbridge

Origin Story

US White House Digital Mammography DREAM Challenge (2017)

The FxMMG Engine was tested in the US White House DREAM Challenge with data provided by Kaiser Permanente Washington ([KPW](#)) in the USA and Karolinska Institute ([KI](#)) in Sweden. The KPW data set, which included 144,231 screening exams from 85,580 women, of whom 1.1% were cancer positive, was split for use in algorithm training (70%) and evaluation (30%). The KI data set, used only for algorithm validation, comprised 166,578 exams from 68,008 women, of whom 1.1% were cancer positive.

In the competition, our team's algorithm came up as the **top in Asia and top 5 in the world out of over 1,100 other teams** from industry, academia and research institutes

<https://www.fathomx.co/post/grow-your-blog-communityUS-White-House-DREAM-Challenge-Top-in-Asia>



Co-Founders

A/Prof Mikael Hartman (Oncologist)
Asst/Prof Feng Mengling (AI Scientist)

Support from Public Research, Innovation & Enterprise Grants

Ministry of Health, Health Service Research Grant, S\$1.04M (2018)

“An AI assistant to radiologists that reads mammograms to automatically detect breast cancers and generate diagnostic reports: a technology combines the learning of images and free text”



Innovation to Startup (I2Start) Programme (2019)

“AI Assisted Breast Cancer Diagnosis: Prototype Develop and Clinical Validation”



Phase 1: Singapore-MIT Alliance Research and Technology (SMART) Innovation grant, S\$244K



Phase 2: NHIC Innovation to Develop (I2D) grant, S\$249K



Phase 3: Enterprise Singapore Start SG Tech grant (after incorporated), capped at ~S\$750k



The co-founders found Stephen, an industry veteran with 30 years of commercial experience, including experience at running successful startups

CEO Stephen Lim

Support from National Initiatives/Platforms



SINGAPORE'S NATIONAL PLATFORM FOR DIAGNOSTICS DEVELOPMENT

DxD Hub is a one-of-a-kind organisation dedicated to leading MedTech innovation through partnerships and an undiminished passion for creating positive health outcomes. As well-recognised productisation experts, we partner with some of the most exciting companies to successfully bring their products to market.



<https://www.a-star.edu.sg/dxdhub>

“Diagnostics Development Hub

FathomX has signed an agreement with DxD Hub to help fast track and accelerate its go to market strategy by tapping onto the **regulatory expertise** to facilitate clinical trials and maximise resources by **designing trials that are effective for regulatory submission, clinical validation as well as health technology assessments.** The project is co-funded by DxD Hub and FathomX Pte Ltd.”

<https://www.fathomx.co/partners-qara>

Investments from VCs and Corporates..

Apr 2021

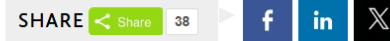
“FathomX raised SGD\$ 500,000 in a seed round in April 2021”

Sep 2022

Singaporean startup FathomX scores almost \$2M to hasten breast cancer AI development

It will use its fresh funds to complete a multi-site validation study across eight Asia-Pacific markets.

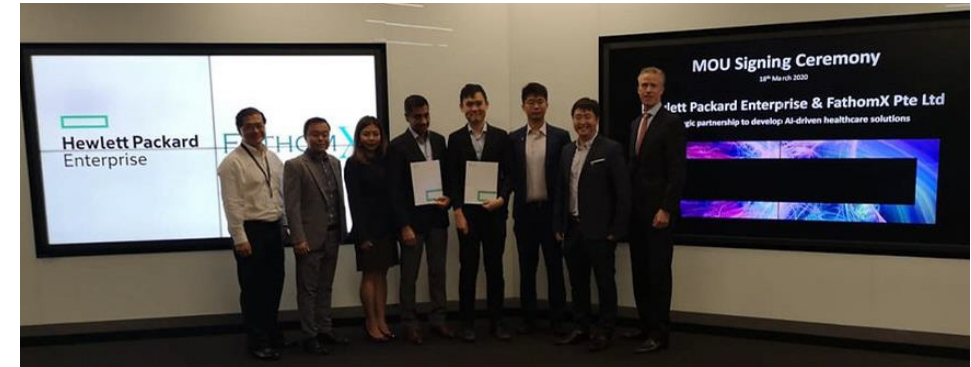
By Adam Ang | September 01, 2022 | 04:02 am



Source: <https://www.mobihealthnews.com/news/asia/singaporean-startup-fathomx-scores-almost-2m-hasten-breast-cancer-ai-development>

Mar 2020

Partnership with HP Enterprise



FATHOMX

DETECTING BREAST CANCER FASTER WITH AI

“We’re now on the brink of a tectonic shift in how healthcare is going to be delivered and how women’s health is going to be cared for.”

—MIKAEL HARTMAN
CO-FOUNDER AND
CLINICAL LEAD, FATHOMX

Singapore-based FathomX aims to improve health outcomes for women by making breast cancer diagnosis faster and easier using artificial intelligence (AI). The medical imaging startup’s target is to reduce false positives as well as false negatives for interval cancer cases in mammographic screening. It also aims to cut diagnosis times by 50%, potentially reducing women’s anxiety and breast cancer deaths, and helping clinicians provide better and faster care.

OBJECTIVES

- Make detecting breast cancer faster and more accurate
- Reduce women’s anxiety when getting mammographic screening
- Enable clinicians to provide better and faster care for women

REQUIREMENTS

- Develop an AI tool that can improve breast cancer diagnosis and deliver results faster
- Train deep learning algorithms using a secure, production-level data infrastructure

EXPECTED OUTCOMES

- Gain the ability to read and interpret mammograms in real time through edge computing
- Cut false positives as well as false negatives for interval cancer cases in mammographic screening
- Accelerate the process of reading mammograms by more than 10x, from half an hour to as little as 2 minutes
- Reduce patient anxiety and breast cancer mortality rate and improve women’s quality of life

KEY PARTNERS

- HPE Asia Pacific Innovation Center

ADDITIONAL RESOURCES

- CASE STUDY

→ EXPLORE DIGITAL GAME CHANGERS



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https://www.hpe.com/psnow/doc/a50005141enw?jumpId=in_psnow_26191261-8a0a-4b43-88b8-7a1e7c12fc54_gaiw

Validation & Adoption in Singapore... Adopting AI in Screening

THE STRAITS TIMES

Friday, October 11, 2024

\$200m boost for AI, genomics at public healthcare institutions

Singapore's public healthcare institutions will receive \$200 million of funding support from the Government to better use artificial intelligence (AI) tools and genomics data to ramp up preventive care for patients.

The Ministry of Health (MOH) will invest the sum over five years. The amount, which will be injected into the MOH Health Innovation Fund, is separate from the Government's investments in research and innovation through the Research, Innovation and Enterprise initiative, said Health Minister Ong Ye Kung, announcing the move.

"MOH will identify proven and impactful technology, or use cases, and scale them up into system-wide national projects," he said, adding that making an impact with technology requires going beyond innovations by individual institutions, and some "centralised pushes" may be necessary.

Speaking at the opening ceremony of the 22nd Singapore Health & Biomedical Congress at the Singapore Expo on Oct 10, Mr Ong said the convergence of genomics, AI and a focus on preventive care would have a profound impact on healthcare. And healthcare innovation can reach its fullest potential only when people are protected against major risks, he added.

Three healthcare tech initiatives are in the works over the next year or two.

By mid-2025, MOH will launch a national genetic testing programme for familial hypercholesterolemia (FH), a hereditary condition which affects the body's ability to process cholesterol and increases the risk of heart disease.

By the end of that year, automated record updating will also be implemented throughout the public healthcare system.

And, if the use of AI in the reading of breast cancer screenings is proven effective, it will be progressively rolled out from end-2025.



(From left) Resident leader Tan Yok Hoy, National Healthcare Group (NHG) group chief executive Joe Sim, resident leader Yang Abu, Health Minister Ong Ye Kung, resident leader Lee Yok Eng, NHG chairman Tan Tee How, volunteer leader Stanley Peh and National Parks Board deputy CEO Yap Him Hoo. The group was watering plants to mark the launch of the Adding 15 Million Years of Healthy Life movement during the opening ceremony of the 22nd Singapore Health & Biomedical Congress at the Singapore Expo on Oct 10. PHOTO: LIANHE ZAOBAG

Noting that AI can help healthcare providers improve patient outcomes and deliver healthcare more efficiently, MOH said it plans to scale up the use of generative AI tools (gen AI) to automate tasks such as documentation and summarising medical records.

"We will roll out automated record updating throughout our public healthcare system before the end of 2025, so that healthcare professionals can spend more time caring for patients, and be less occupied with routine tasks," the ministry said in a statement.

It also plans to expand the use of AI for imaging across the healthcare system, enabling earlier detection and follow-up on clinically significant signs.

The ministry will work with the Health Promotion Board and the healthcare clusters to study how AI can make the workflow for reading breast cancer screening images more efficient, and give patients their screening results earlier.

"If proven effective, from end-2025, we will start progressive roll-out of screening using AI for mammography across the system with the proper workflows and care pathways in place," Mr Ong said during the congress, organised by the National Healthcare Group.

Public hospitals can access imaging AI models from different vendors via the AimSG platform, which can also monitor the AI models to ensure their accuracy and the safety of patients.

During his speech, Mr Ong noted that AI can also be used to deliver predictive preventive care, with disease prediction models including parameters such as health status, lifestyles and socio-economic status.

The addition of genetic information can make such models even more powerful, he said.

In line with this, by mid-2025, MOH will launch a national genetic testing programme for FH. Under the programme, Healthier

SG general practitioner clinics and polyclinics will identify those with abnormally high cholesterol levels and refer them for FH genetic testing at a new Genomic Assessment Centre.

Should a patient test positive for the condition, their immediate family members will be encouraged to be tested as well. They will be eligible for means-tested subsidies of up to 70 per cent under the Specialist Outpatient Clinic subsidy framework, while the remaining co-payment can be further reduced by MediSave.

Those diagnosed with FH will receive support from Healthier SG clinics to adopt healthier lifestyles and start on subsidised cholesterol-lowering therapies.

"This proactive approach aims to significantly reduce the risk of premature heart disease and avoid future cardiovascular complications," MOH said.

A genetic testing programme will help raise awareness of FH and al-

low for more people to be diagnosed earlier, said Associate Professor Tavintharan Subramaniam, an endocrinologist who leads a national screening and management initiative for the condition based at Khoo Teck Puat Hospital.

Should the programme prove successful, MOH will work on other major severe diseases, such as breast and colon cancers, diabetes, kidney failure, stroke and heart attacks, Mr Ong said, noting that this will require "sophisticated and multi-variate" AI models to be trained.

Well-established regulations in healthcare serve as "clinical gatekeeping" and ensure that the judgement of healthcare professionals remains in place even as the sector becomes enhanced by AI, he said.

"That said, we cannot swing to the other extreme, hemming ourselves in with regulations and rules, and failing to harness the opportunities of AI. We must be proactive in identifying use cases for AI in healthcare and adapt our rules and

regulations to facilitate them," he added.

Mr Ong said that in the coming years, MOH will enhance its information technology systems to drive innovation, while ensuring cyber security and data privacy, beginning with a consolidated electronic medical record system throughout the public healthcare system.

Gen AI tools will be integrated into the system to become part of its clinical and operational workflows, he added.

Meanwhile a new platform, called Health Empowerment through Advance Learning and Intelligent Exchange, will act as the AI "technology factory" for the healthcare system.

Developed by MOH and Synapxe, the cloud-based data infrastructure will enable the secure sharing of up-to-date and anonymised clinical and genomic data, among others, which will be used to train various AI and machine learning tools.

Zaki Abdullah

"The ministry will work with **Health Promotion Board and the healthcare clusters** to study how AI can make the workflow for reading breast cancer screening images more efficient and give patients their screening results earlier. If proven effective, **from end-2025**, we will start progressive roll-out of **screening using AI for mammography** across the system"

"Public hospitals can access imaging AI models from different vendors via the **AimSG** platform, which can also monitor the AI models to ensure their accuracy and the safety of patients"



AI MEDICAL IMAGING PLATFORM FOR SINGAPORE PUBLIC HEALTHCARE (AIMSG)

- Provides an open and vendor-neutral platform
- Provides access to a marketplace of AI solutions
- Deploys and operationalises AI solutions
- Supports the development and trial of AI solutions

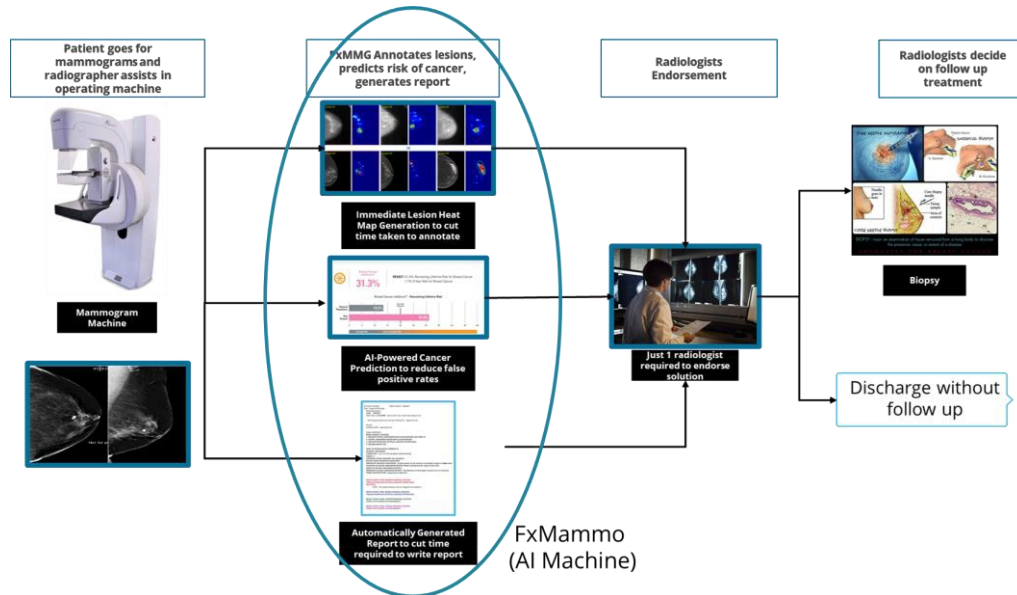
<https://www.synapxe.sg/healthtech/health-ai/ai-medical-imaging-platform>

Validation & Adoption in Singapore... Adopting AI in Screening

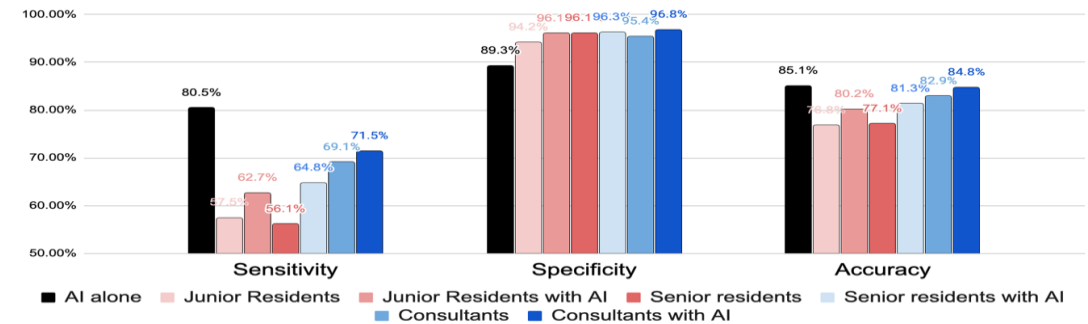
Singapore

Prospective trial on Singapore National Breast Screening

Current Medical Practice
(2 radiologist)
VS
with AI Medical workflow
(AI + 1 radiologist)



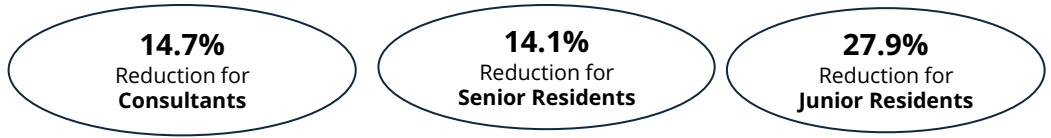
INNOVATIONS ADOPTED AT SPEED, AT SCALE



Reader group	ROC-AUC [95% CI]	Accuracy [95% CI]
Consultant	0.90 [0.89, 0.92]	0.82 [0.80, 0.84]
Resident	0.85 [0.84, 0.86]	0.78 [0.77, 0.79]
AI system	0.93 [0.90, 0.95]	0.85 [0.82, 0.88]

Reader group	Recall sensitivity (%) [95% CI]	Recall specificity (%) [95% CI]
Consultant	91.6 [89.6, 93.5]	63.4 [60.2, 66.7]
Resident	87.0 [85.8, 88.3]	65.5 [63.7, 67.1]
AI system	Same as consultant	73.7 [68.6, 78.7]
	Same as resident	79.6 [75.0, 84.3]

Time Savings



Proposed Breast Screen Reading Workflow with AI + 1 radiologist

Overseas Expansion

Collaboration with Japan National Cancer Centre Hospital East



Home > Collaboration with a medical AI software start-up FathomX from Singapore

Collaboration with a medical AI software start-up FathomX from Singapore

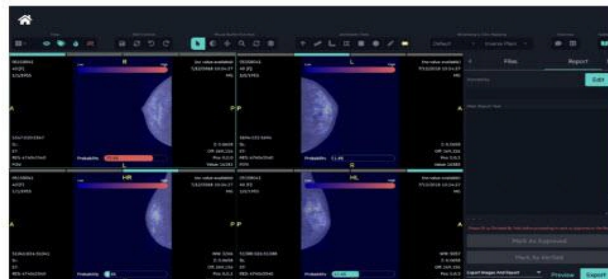
Sep,28, 2022

The National Cancer Center Hospital East (NCCHE) has started the joint research project with FathomX Pte Ltd from Singapore to investigate the performance inconsistency of deep learning models for mammogram classification in different populations: an international, multi-center study

Background and Motivations

Recently, deep learning has demonstrated revolutionary potential in imaging recognition and has been rapidly applied in medical image research. However, the superhuman or near expert performance of these models may not be achieved on unseen external data sets. In previous multi-site retrospective trials, the generalization problem was addressed by fine-tuning models with a large amount of data from external datasets or using cohorts from same geometric locations to test. However, obtaining a large number of labeled mammograms requires considerable amount of time and expertise's effort. In most clinical image datasets, there are very few manually labeled images.

FathomX's flagship product, FxMammo, is an AI Assistant that significantly improves the screening procedure for mammograms by reducing both the false positive and interval cancer rates. The solution also enhances the clinical workflow by reducing the time taken to assess a screen.



NCCHE's Tatsuya Onishi, MD, PhD, will undertake overall management of the research and evaluation of results while FathomX's Dr. Meng Ling Feng will undertake the design, implementation and reporting of research projects and manage and supervise all partnerships. The team in FathomX will also oversee the data management of medical information and images, as well as the development, training, and evaluation of the AI Model.

https://www.ncc.go.jp/en/ncce/clinic/breast_surgery/news/20220927/index.html

Regulatory Approvals

Approved by the following countries and organizations:



Key Lessons from a Singapore Success Story



ASSEMBLE A
WINNING TEAM
(COMMERCIAL +
TECH + CLINICAL
FOUNDERS)



TAP ON
GRANTS/FUNDING
– NON-DILUTIVE



DISRUPTING CLINICAL
PRACTICE IS A LONG
PROCESS, START WITH
SOLUTIONS THAT
INTEGRATE INTO
CURRENT
WORKFLOWS



GO BIG – NATIONAL
SCREENING
PROGRAMS!
REIMBURSED
MARKETS!

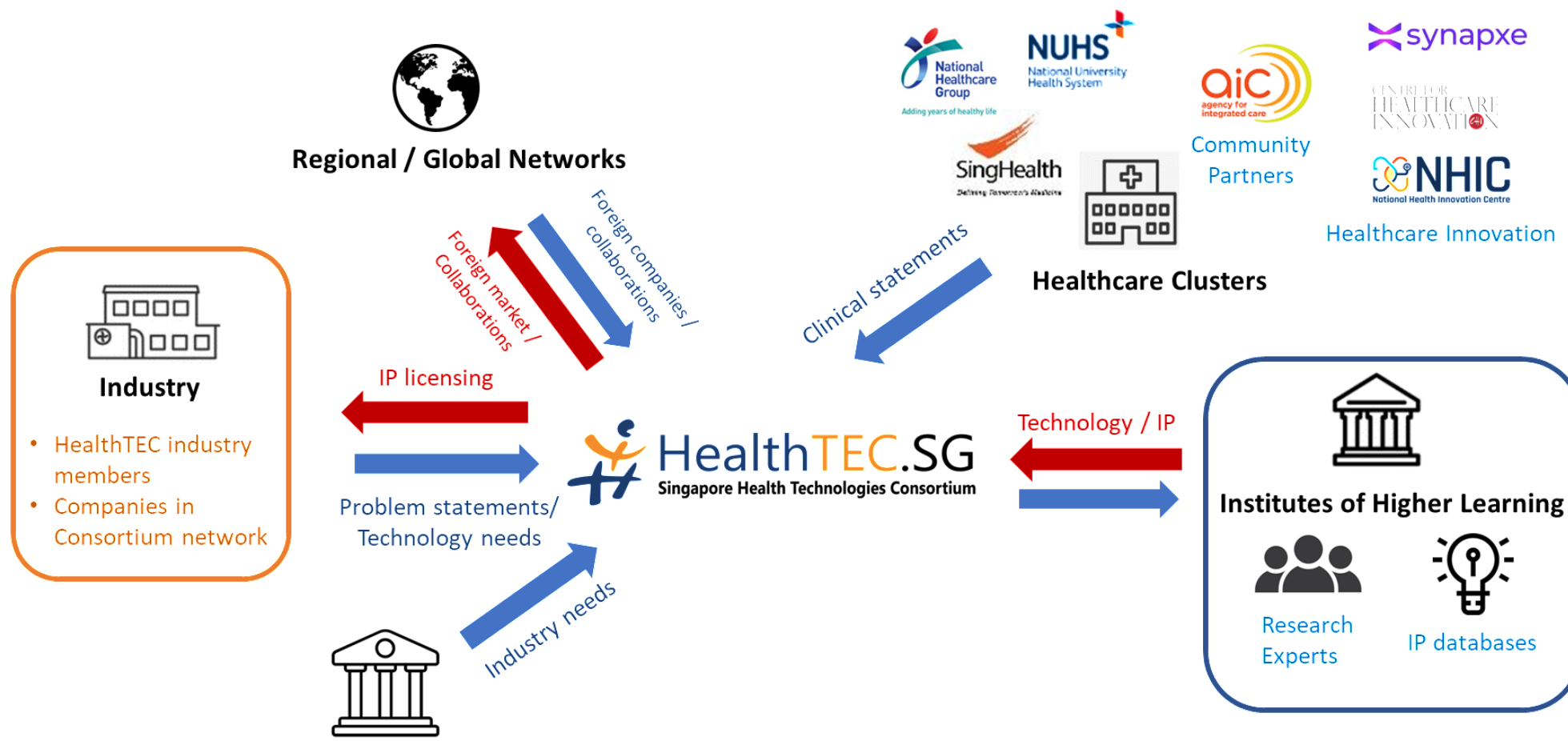


LOOK AT STRATEGIC
PARTNERS ABROAD



**Platform for Accelerating
Healthcare Innovations through
Partnerships**

Platform for interactions and collaborations



Other Innovation Partners



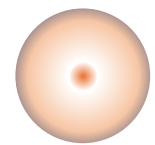
Accelerators/Venture Builders



Incubators



Training / Consulting



'One-stop shop' for innovation in Health & Medical technologies

Startup Members

Remote Care

Rehabilitation



Wound / Ulcer Management



Remote Patient Monitoring



Therapeutic Devices

Wound Healing



Interventional devices



Muscle Therapy



Neurostimulation

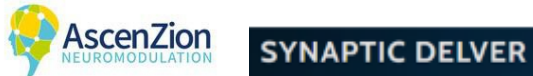


Image-based Diagnostics / Analytics

Fall Prevention Screening./ Diagnostics



Surgical guidance



Gait Analysis



Biomarker Diagnostics



Disease / Health Monitoring



Air Monitoring



Microbiome biomarkers



Sleep biomarkers



IVD / Molecular Assays



Telehealth / mHealth



Robotics/ IoT



Health Services



Distribution/Regulatory Services



Fitness training/ Rehab



Health Data Management / Analytics



Analytics platform APIs for devices



Clinical Workflow Automation



AR/ VR



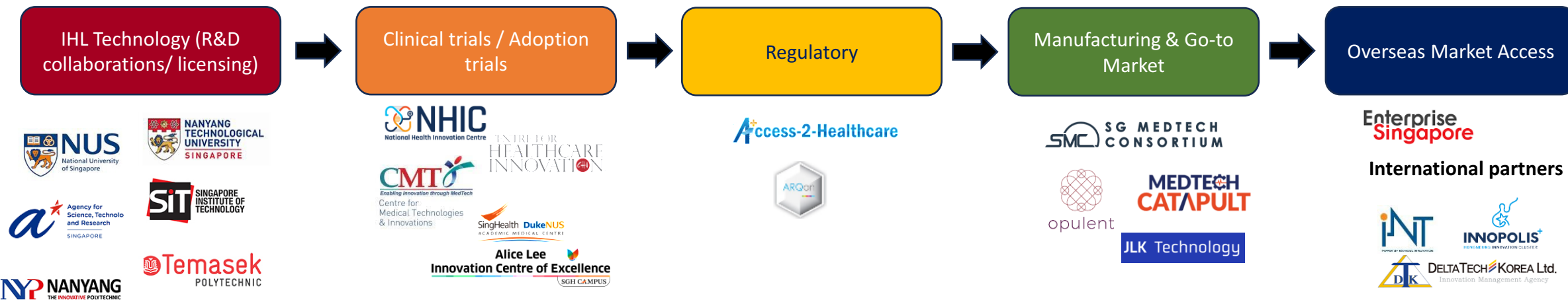
Precision Medicine



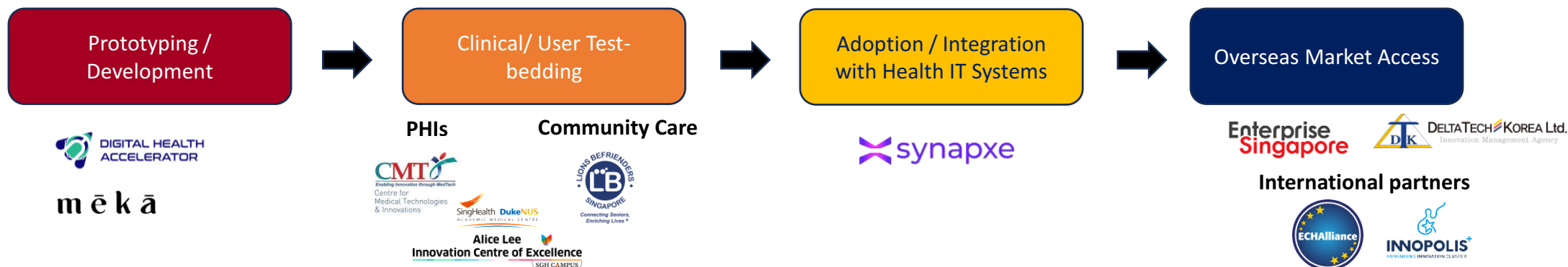
How we support

Our support for industry along the medical device and digital health/SaMD value chain(s) with the members and partners we work with.

Medical Devices



Digital Health / Software-as a-Medical Device (SaMD)



Thank you

For more information, visit our website <https://www.healthtec.sg/>



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