Diagnostics Development Hub

FY2024 ANNUAL REPORT

Celebrating 10 years of Collaborative Excellence in Diagnostics

dxdhub

dxdhub | FY2024 Annual Report

Contents

Diagnostics for Our Future

DxD Hub, a national platform hosted by the Agency for Science, Technology and Research (A*STAR) is dedicated to transforming innovations into market-ready, clinically validated diagnostic devices. With an ISO13485-compliant productization engine, it provides end-to-end support in product design and development, regulatory strategies, and manufacturing for In Vitro Diagnostics (IVDs), Point-Of-Care Connected Devices, Digital Diagnostics and Digital Therapeutics.

Our Mission and Values

- Global medical technology leader in transforming R&D output to medical diagnostics solutions to improve lives and livelihood.
- Creating Health Impact, Economic Growth and enabling Pandemic Readiness.

Celebrating 10 Years of Collaborative Excellence in Diagnostics

Message from Our Oversight Committee Co-Chairs

Mr. John Jeans and Dr. Fidah Alsagoff

Over the past decade, DxD Hub has evolved from a productisation platform that focused on in-vitro diagnostics into a leader in diagnostics development. Today, DxD Hub drives innovation not only in in-vitro diagnostics but also in digital health solutions and integrated point-of-care systems.

As the Hub celebrates its 10th anniversary and reflects on a decade of achievements and contributions to Singapore's MedTech ecosystem, it recognises that much remains to be done. Global healthcare systems are facing the twin pressures of aging populations and rising costs, presenting growing opportunities for innovative diagnostics solutions to improve patient lives, especially in the areas of preventive and precision health.

This year's report centers around the impact of DxD Hub's partnerships with both public and private sector stakeholders. These collaborations have already led to products that have demonstrated clear clinical and economical value. Key highlights of the Hub's efforts within the report include:

- The deployment of several co-developed solutions which reflect DxD Hub's impact in advancing diagnostics. These include PREDICT, the world's first Asian-centric carrier screening panel for Asian-relevant genetic disorders, and STEADFAST, an advance diagnostic kit that enhances avian influenza surveillance and pandemic preparedness.
- New partnerships with both public organisations and industry to jointly support and develop innovative diagnostic solutions that address unmet needs in areas like precision oncology and infectious diseases.

Message from Our Oversight Committee Co-Chairs

Mr. John Jeans and Dr. Fidah Alsagoff

- Within digital health, the Digital Health Accelerator has onboarded four projects, including one that has entered the integration and implementation process with public healthcare institutions.
- Talent development remains a strategic priority for the Hub. Over the past year, DxD Hub has advanced regulatory excellence through executive certificate workshops, and training the next generation of deep tech talents through initiatives such as the NRF-funded Innovation, the Enterprise Fellowship Program, and DxD Hub's Internship Programme.

Looking ahead, DxD Hub will continue to harness its capabilities to support national healthcare and economic priorities, while addressing both local and global healthcare challenges.

On behalf of the Oversight Committee, the Hub Evaluation Committee and the Hub Evaluation Committee (Digital Health), we would like to extend our sincere thanks to the National Research Foundation, PREPARE, and all partners and collaborators for their continued trust, funding and commitment to DxD Hub's mission.

Mr. John Jeans

Dr. Fidah Alsagoff

Message from Dr. Ruifen Weng

Chief Executive Officer

Dear Friends of DxD Hub,

FY24 has been a transformative year for DxD Hub as we continue to strengthen Singapore's MedTech ecosystem. Our mission is clear—to drive productisation, commercialization, and adoption of in-vitro diagnostics and digital solutions with real-world impact. This progress is made possible by the dedication of our teams, partners, and stakeholders, whose commitment is shaping the future of healthcare.

This year also marked DxD Hub's 10th anniversary as a national platform for diagnostics productisation. We celebrated this milestone with our valued partners—reflecting on a decade of impactful collaborations, translational success stories, and growth into a trusted healthtech enabler.

Collaboration remains central to our work, and this is underscored by the few strategic partnerships we made this year. As PRECISE's diagnostics productization partner, we will play a key role in bringing Precision Health Research to market—such as with the PREDICT test, the world's first Asian-Centric Carrier Screening Diagnostics Test, co-developed with Duke-NUS, KKH, and PRECISE. Our partnerships with NHIC and NCCS will accelerate the development of digital and cancer diagnostics, while industry efforts like the Shimadzu Joint Lab and work with private MedTech companies will further enhance Singapore's diagnostic and innovation ecosystem. We remain dedicated to creating a positive patient impacts through our public-private co-development models that bring research to patient-ready diagnostics medtech solutions.

"Empowered by collaboration, we transform innovation into impact—shaping the future of diagnostics and precision health."

DxD Hub also remains committed to health resilience and pandemic preparedness. We support outbreak response efforts for mpox and H5N1, and develop surveillance tools to enhance health security. Notably, we co-developed the STEADFAST Multiplex PCR assay with BII and Japan's NIES—a rapid, accurate tool for detecting H5 highly pathogenic avian influenza viruses.

Equally important is building talent and capabilities. Through workshops, training, and industry outreach, we have trained 75 talent in FY24, and continue to nurture MedTech innovators and grow Singapore's diagnostics ecosystem.

In FY25, we aim to deepen partnerships with public healthcare institutions, accelerate commercialization through private partnership, and broaden global engagements.

As we look ahead, I extend my heartfelt thanks to our Oversight Committee, Hub Evaluation Committee, collaborators, and Hubbers. Your unwavering support powers our shared mission to advance diagnostics and precision health.

Dr. Ruifen Weng
Chief Executive Officer
Diagnostics Development Hub (DxD Hub)

Oversight Committee

The Oversight Committee provides oversight of DxD Hub's resources and activities, including project pipeline and strategy

Co-Chairs

Mr John Jeans
Chairman of the Board, Digital Health and Care Innovation Centre, Scotland

Dr Fidah Alsagoff
Vice Chairman, Healthcare & Life Sciences (Global Partnerships)

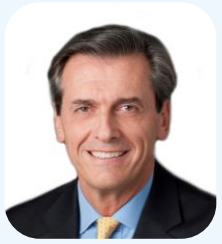
Members

Ms Amanda Ang Tian Wei
Director, Human Health & Potential, National Research Foundation

Prof Tan Say Beng
Executive Director, National Medical Research Council

Dr Clarice Chen
Director, Healthcare & Biomedical, Enterprise Singapore

Ms Irene Cheong*
Assistant Chief Executive, I&E, A*STAR



Mr Jean-Luc Butel
(ex-officio) Chair, DxD HEC

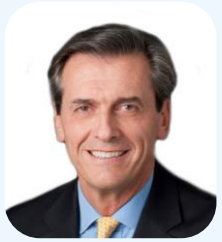
Dr Ruifen Weng**
CEO, DxD Hub

*Prof Tan Sze Wee (Assistant Chief Executive BMRC, A*STAR) served on the OC in FY24 until September 2024. As of October 2024, Ms Irene Cheong relinquished her appointment as Acting CEO, DxD Hub and remains as a DxD Hub OC member in her capacity as Assistant Chief Executive, A*STAR I&E.
** Dr Ruifen Weng, was appointed as CEO, DxD Hub and DxD Hub OC member from October 2024.

Hub Evaluation Committee

The Hub Evaluation Committee comprises members from varied backgrounds, such as the clinical community, biomedical/diagnostics and investment industries. They support the OC by providing independent review, evaluation and recommendation of major projects to be invested by DxD Hub (including licensing terms).

Members



Mr Jean-Luc Butel (HEC Chair)
President, K8 Global
Board Member: Novo A/S, Takeda Pharmaceutical, Rani Therapeutics, ICON Group

Dr Tito Bacarese-Hamilton
Chairman: Presymptom Health, Upfront Diagnostics, Prostate Cancer Research SAB

Dr Wong Chiang Yin
Member Board of Directors, National Healthcare Group
Master, Academy of Medicine, Singapore
Advisor, MOH Holdings
Senior Consultant, MOH, Primary and Continuing Care

Mr Simranjit Singh
CEO, Guardant Health AMEA

Dr Amit Kakar
Managing Partner and Head, Novo Holdings Asia

Dr Nirdesh Gupta
Managing Director, Cedars-Sinai Technology Ventures & Cedars-Sinai Accelerator
CEO, Coronet Ventures

Mr Willson Cuaca
Founding Partner, East Ventures

Hub Evaluation Committee-DH

The Hub Evaluation Committee – Digital Health (HEC-DH) is a multidisciplinary advisory group comprising representatives from public healthcare institutions, the digital health ecosystem and industry. It supports the Oversight Committee (OC) by independently reviewing and evaluating projects for inclusion in the Digital Health Accelerator (DHA). Beyond project selection, the committee also provides strategic advice and market insights to guide the direction and focus of the DHA.

Members

Prof Jackie Hunter (Chair)
Chairman, Boards of Biocortex Ltd
Brainomix and Stevenage Bioscience Catalyst
Board Member, A*STAR
CEO, OIPharma Partners Ltd

A/Prof Ngiam Kee Yuan
Head, Academic Informatics Office, National University Health System
Professor of Surgery

Ms Lee Chen Ee
Group Director, Innovation and Transformation, SingHealth

Mr Glenn Neo Boon Sen
Director, Innovation Capabilities Enablement (ICE), Synapxe

A/Prof Tan Cher Heng
Group Chief Research & Innovation Officer, National Healthcare Group

Ms Dorothea Koh
Founder and CEO, BotMD

DxD Hub Executive Leadership

Dream Team

Dr Ruifen Weng
CEO, DxD Hub

Ms Ho Yuan Lu
Head of Partnerships & Outreach (P&O), DxD Hub

Ms Chan Yang Sun
Head of Quality Assurance & Regulatory Affairs, DxD Hub

Mr Lijoy George
Head of Digital Diagnostics (DDx) and DHA, DxD Hub

Dr Ou Chung-Pei
Head of In Vitro Diagnostics (IVD) & Integrated Medtech (IMT), DxD Hub

Dr James Qu
Head of Clinlab, DxD Hub

Ms Lenny
Deputy Director, Corporate Services, DxD Hub

Mr David Vu served in the DxD Hub Leadership team in FY24 as COO DxD Hub and Co-Lead DHA with until March 2025.

DxD Hub In FY24

DxD Hub In FY24

Completion of the 2nd **Executive Certificate Workshop on Validation and Verification**

Academy of Medical Sciences and Academy of Sciences Malaysia Diagnostics and Therapeutics Workshop in Kuala Lumpur.

ASEAN Pandemic Readiness Webinar: Diagnosis and Management of Emerging Respiratory Diseases. Jointly organised by ASEAN DxI, PREPARE and APEIR.

DxD Hub 10th Year Anniversary Dinner: Celebrating a Decade of Collaborative Excellence

PRECISE Precision Health Research Singapore

SingHealth DukeNUS Academic Medical Centre — Institute of Precision Medicine (PRISM)

KK Women's and Children's Hospital SingHealth

TEMASEK FOUNDATION

Launch of **PREDICT**, World's First Asian-Centric Carrier Screening Panel

AI Application in Biomedical and Healthcare Master Class at **Switch**

SWITCH SINGAPORE WEEK OF INNOVATION & TECHNOLOGY

DxD Hub 10th Year Anniversary Hubbers Celebration: Ten Years, One Hub

Launch of **Shimadzu – DxD Hub Diagnomics Centre (SDDC)** Joint Lab

SHIMADZU Excellence in Science

APR **MAY** **JUL** **AUG** **SEP** **OCT** **NOV** **DEC** **JAN** **MAR**

Completion of the 3rd **Executive Certificate Workshop on Manufacturing and Quality Management Systems**

CareCam AIthinkTANK

3DGait Assessment device launch & Class1 FDA and HSA device registration

CAP ACCREDITED COLLEGE of AMERICAN PATHOLOGISTS

ClinLab has successfully renewed its **accreditation from the College of American Pathologists (CAP)**

Global Health and Development Summit at the **Pujiang Innovation Forum 2024**

NHIC National Health Innovation Centre

NHIC – DxD Hub Joint Partnership Enabling Productisation and Adoption of IVD & Digital Healthcare Solutions

NCCS – DxD Hub Joint Lab for Cancer Biomarker Discovery to Productization

National Cancer Centre Singapore SingHealth

Digital Health World Congress 2024 in UK

DxD Hub **ISO13485 recertification**

Launch of **DXD RAPID Plus Machine** with FORTE Biotech

FORTE BIOTECH

Launch of **STEADFAST** Highly pathogenic H5N1 Avian Influenza Virus kit.

National Institute for Environmental Studies, Japan

Bioinformatics Institute

dxdhub **Celebrating 10 Years of Collaborative Excellence in Diagnostics**

Celebrating a Decade of Collaborative Excellence in Diagnostics

In 2024, DxD Hub celebrated its 10th anniversary, marking a decade of impactful collaborations in the diagnostics ecosystem.

dxdhub | Celebrating 10 Years of Collaborative Excellence in Diagnostics

To commemorate this milestone, we hosted a dinner event attended by 150 key partners, collaborators, and stakeholders who have contributed to the organization's success and shared impact.

Professor Tan Chorh Chuan, Chairman, A*STAR, graced the event as the Guest-of-Honour and highlighted the critical role of partnerships in advancing healthcare innovation:

10th Anniversary Highlight

"It is important to recognize that none of these achievements would have been possible without the strong partnerships and collaborative spirit that define our MedTech ecosystem. The journey toward a healthier Singapore is one that we all share, and it is through these collective efforts that we can continue to make meaningful advancements in healthcare."

A key moment of the evening was the unveiling of the Commemorative Time Capsule, encapsulating ten defining milestones that illustrated DxD Hub's progress over the past decade. These milestones highlighted our journey from our founding and first co-developed product, to the rapid response during the COVID-19 pandemic, as well as advancements in digital health and precision medicine.

We also marked our 10th anniversary with a special celebration, bringing together past and present Hubbers for a day of camaraderie and reflection. Held at Sentosa, the event provided an opportunity to recognize the collective efforts that have shaped DxD Hub's journey over the past decade. As part of the celebration, Hubbers participated in a team-based Amazing Race challenge, fostering teamwork and collaboration—the very principles that have driven DxD Hub's success. The event also served as a meaningful reunion, welcoming former colleagues whose contributions have been instrumental in establishing DxD Hub as a leader in diagnostics innovation.

This milestone was a testament to the dedication and commitment of all Hubbers, past and present. Their expertise, perseverance, and collaborative spirit have been pivotal in advancing DxD Hub's mission to accelerate the development of transformative diagnostics solutions.

As DxD Hub embarks on its next decade, we remain committed to strengthening collaborations, driving healthcare innovation, and making a lasting impact on global health. We extend our sincere appreciation to all our partners, enablers, and stakeholders for their continued support in shaping the future of diagnostics.

dxdhub Celebrating 10 Years of Collaborative Excellence in Diagnostics

10th Anniversary Highlight

Ten Years, One Hub: Countless memories, lasting impact - pushing the boundaries of diagnostics, driven by the Hubber spirit!

Driving Impact Through Public, Private Partnerships

Driving Impact Through Partnerships

DxD Hub's long-standing collaborations continue to deliver real-world impact. In FY24, 3DGait—an AI-enabled gait assessment tool co-developed with CareCam—successfully received FDA and HSA registration, while Lucence UNITED™, a pan-cancer NGS assay developed with Lucence, NCCS and SGH, was further validated through regional deployment and published real-world clinical outcomes showing actionable results in nearly 80% of cases.

Building on this foundation, we continued to forge and strengthen partnerships across the ecosystem. From co-developing solutions with public sector agencies like PRECISE, NCCS, and NHIC, to translating novel biomarkers with AMILI, Nalagenetics, and through our joint lab with Shimadzu, DxD Hub remains a key driver of MedTech innovation.

We also played instrumental roles in national translational efforts such as APOLLO and IAF-ICP platforms.

Through our Digital Health Accelerator (DHA), we enable adoption of digital diagnostics in clinical settings by supporting both technology developers and healthcare providers from early-stage validation to implementation.

These partnerships remain at the heart of DxD Hub's mission—to advance diagnostic innovation, deliver patient impact, and build sustainable economic value for Singapore.

Product Updates and Progress

CareCam: 3DGait | FDA and HSA Registration of Class 1 device

Co-developed by DxD Hub and CareCam, **3DGait** is an AI-enabled software as a medical device (SaMD) that enables clinicians to assess fall risk using only simple video recordings captured via iOS mobile devices. Designed for seamless integration into routine clinical workflows, this mobile app-based system identifies individuals at higher risk of falls by quantifying 2D and 3D biomechanical measurements—such as hip and knee flexion, stride length, and walking velocity. The innovation is powered by AI and background technologies developed in partnership with A*STAR's Institute for Infocomm Research (I²R).

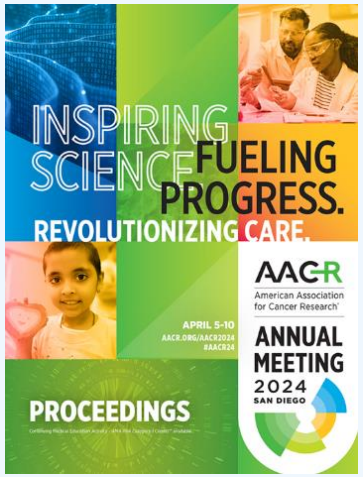
DxD Hub played a critical role in accelerating 3DGait's development, providing end-to-end support including definition of target product profile, product design, clinician dashboard and backend system development, cybersecurity assessment, regulatory strategy, ISO 13485 QMS implementation and project management.

Since our last update in the FY23 Annual Report, 3DGait has achieved significant regulatory milestones, receiving both **FDA and HSA registration as a Class 1 SaMD**. These regulatory approvals mark an important step toward broader clinical adoption, enabling better fall prevention strategies across healthcare settings.

CareCam

Driving Impact Through Partnerships

Lucence: UNITED™ | Real-world experience and clinical utility validation of UNITED™



In 2019, DxD, NCCS, SGH and Lucence co-developed **UNITED™**, an Asian-centric Pan-cancer Tumour Profiling Test, and this laboratory-developed test (LDT) was launched in September 2021. The assay covers 572 cancer-related genes and 71 RNA fusion targets. Since its commercial launch, UNITED has been deployed across Singapore, Thailand, Taiwan, the Philippines, and Hong Kong, supporting precision oncology efforts across the region.

In FY24, the **clinical utility of UNITED™ was further validated in a real-world study** published in the *American Association for Cancer Research (AACR)* journal (April 2024). The study reported that UNITED™ enabled the detection of actionable biomarkers in 79.5% of clinical cases, reinforcing its relevance in guiding standard-of-care therapeutic decisions for Asian cancer patients and maximizing survival outcomes.

LUCENCE

Reference: https://aacrjournals.org/cancerres/article/84/6_Supplement/6399/741694/Abstract-6399-Real-world-experience-of-an-Asian

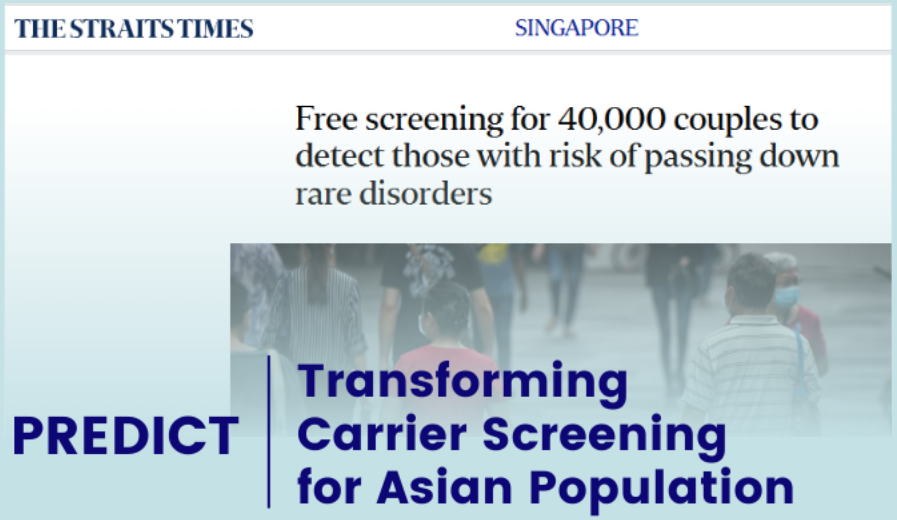
Public Sector Partnership

A core challenge in global precision medicine is the under-representation of Asian populations in genomic datasets. Precision Health Research, Singapore (PRECISE), the national body leading the National Precision Medicine (NPM) programme seeks to close this gap by building a robust, Asian-centric genomic database to inform more equitable and effective healthcare solutions.

As PRECISE's diagnostics productization partner, DxD Hub plays a key role in translating these genomic insights into clinically validated diagnostic tools that better address the needs of Asian populations. This partnership bridges research and clinical application, advancing Singapore's leadership in precision medicine and ensuring that genomic innovation leads to real-world health impact.

PRECISE
Precision Health Research Singapore

Photo Credit: The Straits Times


THE STRAITS TIMES SINGAPORE

Free screening for 40,000 couples to detect those with risk of passing down rare disorders

PREDICT | **Transforming Carrier Screening for Asian Population**

An impactful example of DxD Hub and PRECISE's partnership is PREDICT (PaREnthood Genetic Disease Carrier Test) — the world's first Asian-centric carrier screening panel.

Launched in February 2023, the co-development project with KK Women's and Children's Hospital (KKH) and the SingHealth Duke-NUS Institute of Precision Medicine (PRISM) harnesses genomic insights from the PRECISE SG10K dataset, to address the lack of Asian-representative data in commercial carrier screening diagnostics tests.

In September 2024, the team officially launched PREDICT as a lab-developed test (LDT) out of KKH's clinical diagnostics lab.

dxdhub | Celebrating 10 Years of Collaborative Excellence in Diagnostics

PREDICT screens for 112 genes associated with severe, pediatric-onset, and debilitating recessive disorders, including 20 genes highly relevant to Singapore's multi-ethnic population that are not covered by commercial tests.

Each year, 3 in 100 babies in Singapore are born with a rare disorder or birth defect. The National Thalassemia Registry was established in 1992 to provide genetic counselling for individuals with thalassemia and to offer government-subsidized thalassemia screening to all their immediate family members. PREDICT expands this initiative to include screening and genetic counselling for over 80 common severe recessive genetic diseases and empowers couples to make informed reproductive choices by providing:

- Informed decision-making: Couples can understand their genetic risks and access expert counselling.
- Timely intervention: At-risk pregnancies can benefit from options including pre-implantation genetic diagnosis and prenatal diagnosis.
- Better health outcomes: Early detection will provide opportunities to reduce the incidence of severe genetic diseases in children reduced long-term costs to the healthcare system.

The development was supported by philanthropic funding from Temasek Foundation, which enabled both the launch of a voluntary pilot screening programme and the set-up of an automation of lab workflows. Up to 40,000 eligible couples will receive free screening at KKH until 2027, potentially identifying up to 160 high-risk couples and providing opportunities to reduce the incidence of severe genetic diseases in their children. Plans are underway to scale this programme across other public hospitals.

Public Sector Partnership

Prevalence of Rare Disorders

3/100 Babies born in Singapore per year

Gap in Testing

Asian Specific recessive **genetic disorders not sufficiently covered** in commercial testing panels

PRECISE Precision Health Research Singapore

SingHealth DukeNUS ACADEMIC MEDICAL CENTRE

Institute of Precision Medicine (PRISM)

KK Women's and Children's Hospital SingHealth

TEMASEK FOUNDATION

Public Sector Partnership

NHIC
National Health Innovation Centre

NHIC – DxD Hub Joint Partnership:

Enabling the Productization and Adoption of Diagnostic and Digital Healthcare Solutions

The National Health Innovation Centre (NHIC) and DxD Hub, with its Digital Health Accelerator (DHA), formed a powerful alliance driving Singapore's Medtech innovation ecosystem in 2024.

NHIC plays a pivotal role in catalysing early-stage innovation through funding and strategic guidance as a national grantor. DxD Hub complements this by offering downstream expertise in diagnostic development and productization. With the support of DxD Hub, this partnership has enabled the fast-tracked translation of IVD, NGS, and digital health solutions into clinical use. Notable outcomes include the joint support of TIIM Healthcare in developing, productising and implementing their cardiac risk stratification solution, along with successful commercialisation efforts with other homegrown start-ups such as MiRXES and FathomX.

On 28 August 2024, the longstanding partnership was formalized with a Memorandum of Understanding (MOU) signing, celebrating past collaborations and reinforcing a shared vision to enhance healthcare outcomes by streamlining the development and adoption of innovative diagnostics in Singapore's public healthcare system.

The collaboration focuses on identifying promising technologies early, leveraging NHIC's funding schemes, and providing structured support from concept to commercialization. Together, NHIC and DxD Hub enable clinicians, scientists and entrepreneurs to drive innovation, whose resilience and dedication continue to shape the future of healthcare.

dxdhub Celebrating 10 Years of Collaborative Excellence in Diagnostics

Enabling Local Innovation | How NHIC and DxD Hub Supported TIIM Healthcare's Journey

Public Sector Partnership

NHIC's funding and clinical expertise, combined with DxD Hub's technical and regulatory support have helped startups turn research into real-world solutions. One notable success story is TIIM Healthcare, a local company that spun off from Singapore General Hospital (SGH) to commercialize a heart rate variability-based risk prediction tool for emergency department patients.

Technology Development

DukeNUS Medical School

Singapore General Hospital SingHealth

SGH and Duke-NUS developed a heart rate variability risk prediction score to risk stratify patients in the emergency department

Startup and Pilot Trial

TIIM Healthcare registered to spinoff the technology from SGH. NHIC provided early-stage funding and clinical expertise to advance the tool from research to prototype, supporting signal acquisition, feature extraction, and clinical validation.

NHIC National Health Innovation Centre

TIIM Healthcare

Productise and Regulatory

dxdhub DIAGNOSTICS DEVELOPMENT HUB

TIIM Healthcare

DxD partnered with TIIM to develop and clinically validate 1st-gen product aiTriage, offering technical, workflow, and regulatory support culminating in **HSA clearance.**

Clinical Trials and Beyond

Larger randomized controlled trial (RCT) at SGH and NUH to validate aiTriage's operational impact, ensuring that its implementation would lead to meaningful improvements in patient care.

aiTriage showcased at **Singapore Innovation Week at Cedars-Sinai**, providing exposure to international healthcare stakeholders and potential future collaborators to drive large-scale clinical deployment.

NHIC National Health Innovation Centre

dxdhub DIAGNOSTICS DEVELOPMENT HUB

TIIM Healthcare

Implement

NHIC National Health Innovation Centre

DIGITAL HEALTH ACCELERATOR

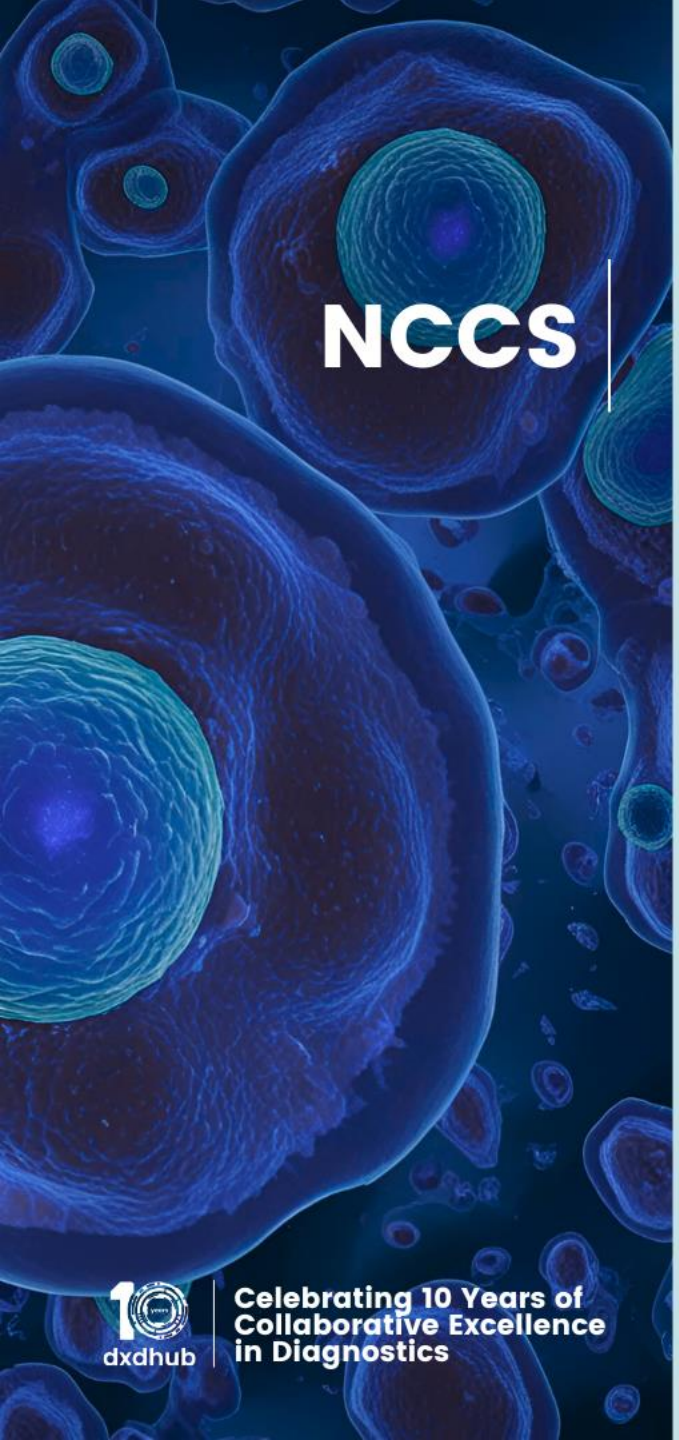
TIIM Healthcare

Singapore General Hospital SingHealth

DxD Hub's **DHA** is driving the clinical integration and deployment of an EMR-ready aiTriage at **SGH**, ensuring seamless adoption into the hospital's digital infrastructure.

dxdhub | Celebrating 10 Years of Collaborative Excellence in Diagnostics

This is an example of a project we jointly supported with NHIC and the MOU allowed us to formalised our longstanding collaboration with NHIC. By reinforcing a shared commitment to expand joint efforts, we hope to advance more diagnostics innovations moving forward.



National Cancer Centre Singapore
SingHealth

Public Sector Partnership

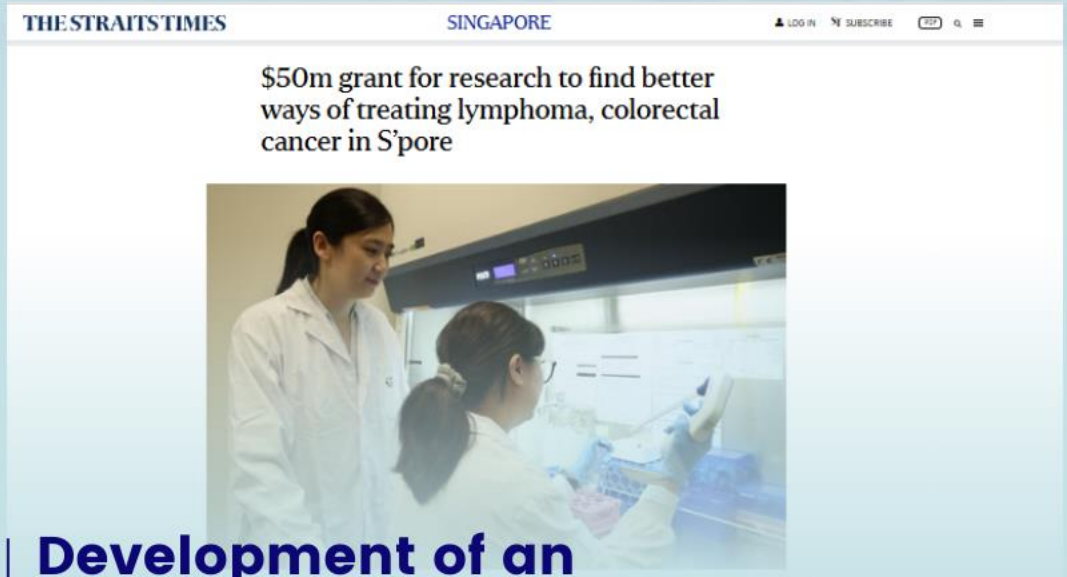
NCCS - DxD Hub Partnership:
Advancing Cancer Diagnostics and Innovation

The National Cancer Centre Singapore (NCCS) and DxD Hub have formed a strategic partnership to fast-track cancer biomarker discoveries into clinically viable diagnostics. This collaboration was formalized through the signing of a MOU between NCCS and DxD Hub, solidifying their joint commitment to advancing Asian-centric laboratory-developed tests (LDTs) and IVDs.

Under the MOU, a Cancer Diagnostics Joint Lab between NCCS and DxD Hub was set up in the NCCS building, synergizing cancer biomarker discovery and clinical management led by NCCS and diagnostics productization efforts by DxD Hub.

This partnership aligns with DxD Hub's strategic focus on precision medicine in oncology and molecular diagnostics, ensuring that innovations in cancer diagnostics translate effectively into clinical practice.

Photo Credit: The Straits Times



THE STRAITS TIMES SINGAPORE

$50m grant for research to find better ways of treating lymphoma, colorectal cancer in S'pore

Development of an NGS-based Test for Subtyping of Asian Prevalent Lymphomas

NMRC National Medical Research Council Singapore

Singapore General Hospital SingHealth

dxdhub Celebrating 10 Years of Collaborative Excellence in Diagnostics

One flagship initiative under this collaboration is a joint project to develop a clinical test for accurate subtyping of Asian-prevalent lymphomas. This effort builds on the foundational work of the Singapore Lymphoma Translational Study (SYMPHONY), a NMRC-funded Large Collaborative Grant, and is now being translated under the SYMPHONY 2.0 programme—part of a $50 million grant recently featured in the news for its potential to transform lymphoma and colorectal cancer care in Singapore.

The test, to be deployed as a laboratory-developed test (LDT) at Singapore General Hospital (SGH), aims to support precise diagnosis and personalized treatment planning. As the first tissue-based, Asian-focused NGS diagnostic tool for lymphoma, it addresses a critical regional gap in lymphoma subtyping. This project exemplifies how sustained investments in large-scale clinical research can translate into high-impact clinical applications, with potential for regional scalability and broader healthcare value.

Accelerating Diagnostic Innovation with Shimadzu Corporation

Private sector partnerships are instrumental in driving healthcare innovation, combining industry expertise with translational research and productization capabilities.

On 6th March 2025, DxD Hub and Shimadzu Corporation, a leader in precision instrumentation, officially launched the Shimadzu – DxD Hub Diagnomics Centre (SDDC) at Biopolis, Singapore. This strategic partnership integrates Shimadzu's advanced analytical technologies with DxD Hub's expertise in diagnostics development, ensuring that high-potential innovations progress efficiently from research to real-world applications.

Through this collaboration, SDDC aims to accelerate the development of high-quality, cost-effective diagnostic solutions. This includes the productisation of advanced multiplexed polymerase chain reaction (PCR) kits for faster and more accurate disease detection, as well as the use of Shimadzu's cutting-edge MALDI and FTIR platforms. These technologies support high-precision diagnostics, enabling rapid identification of bacteria and fungi in clinical samples, as well as biomarker detection, tissue analysis, and quality control of diagnostic products. Together, these efforts aim to improve the speed, accuracy, and affordability of diagnostics to better meet healthcare needs.

SDDC will focus on advancing diagnostics in three key healthcare areas:

- **Infectious diseases** – Developing solutions for early detection of pathogens with pandemic potential
- **Cancer** – Driving early screening and precision medicine
- **Metabolic disorders** – Enhancing diagnostic accuracy to support disease management

dxdhub Celebrating 10 Years of Collaborative Excellence in Diagnostics

SHIMADZU Excellence in Science

Microbiome DNA Biomarker Panel with AMILI and NUH for early detection of Colorectal Cancer

Colorectal cancer (CRC) remains one of Singapore's most common and deadly cancers, with seven new cases diagnosed daily and a lifetime risk of 3–4.4% by age 75. While early detection can lower mortality by 32% and reduce risk by up to 70%, current tools face limitations. The Faecal Immunochemical Test (FIT) lacks sensitivity for early-stage CR. Colonoscopy, though effective, is invasive and costly, therefore difficult to scale.

To bridge this gap, DxD Hub, NUH, and AMILI are co-developing a non-invasive, PCR-based stool assay leveraging microbial DNA biomarkers and a predictive classification model. This novel diagnostic solution builds on emerging links between gut microbiome imbalances and colorectal neoplasia, enabling more accurate and accessible early-stage screening.

The test will contribute to Singapore's National Health Screening Program and reflects the global move toward precision oncology. AMILI's proprietary Asian-centric microbiome biobank ensures regional relevance and efficacy. Commercialization efforts are underway, with AMILI leading go-to-market planning and early health technology assessments.

This collaboration highlights DxD Hub's role in driving system-level innovation through industry-clinic-academic partnerships. Beyond CRC, the project paves the way for future microbiome-based diagnostics in preventive health, reinforcing Singapore's MedTech leadership.

Private Sector Partnership

Lucence Urine-Based Multi-Cancer Test

Genitourinary cancers (Prostate, Bladder, and Kidney) remain difficult to diagnose early due to a lack of screening guidelines. Existing tools like the PSA test have low specificity, leading to unnecessary biopsies and overtreatment. In 2021, these cancers contributed to 2.2 million new global cases, underscoring the urgent need for accessible diagnostics.

To address this, DxD Hub is collaborating with Lucence and Singapore General Hospital (SGH) to develop a urine-based multi-cancer early detection (MCED) test. Powered by Lucence's proprietary AmpliMark™ technology, the test uses advanced amplicon-based enrichment to deliver accurate, non-invasive, and cost-effective screening.

This innovation supports Singapore's push in precision medicine, strengthening its position as a regional MedTech hub. A 2023 study projects that MCED adoption could save up to $260 billion annually in global cancer care by reducing reliance on invasive diagnostics. With the global MCED market expected to reach $15.3 billion and the APAC market demonstrates the fastest growth rate, this partnership is well-positioned for regional impact through Lucence's distribution networks in Singapore, Hong Kong, and Southeast Asia.

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LUCENCE

Singapore General Hospital
SingHealth

Value Capture from Upstream Research

Enabling Value Capture from Upstream Research through Industry–Public Sector Collaborations

DxD Hub plays a pivotal role in translating upstream public research into impactful healthcare solutions, in line with Singapore's RIE2025 strategy and the DxD 2.0 framework.

Through active participation in project collaborations that utilise and further develop intellectual property and research outcomes from the Industry Alignment Fund – Pre-Positioning (IAF-PP), DxD Hub bridges research excellence with clinical adoption and commercialisation. A prime example is the APOLLO Project, which builds on background IP developed by the Bioinformatics Institute (BII), the Institute for Infocomm Research (I²R), Tan Tock Seng Hospital (TTSH), and the National Heart Centre Singapore (NHCS) under the A*STAR–NHCS IAF-PP initiative.

DxD Hub plays a key role in translating APOLLO into a clinically deployable solution by supporting QMS implementation, clinical validation, and HSA regulatory submission, with commercial partner and local medtech company Theia Health to productize the platform for real-world use.

DxD Hub also actively participates in large-scale industry–public sector collaborations like the Industry Alignment Fund – Industry Collaboration Projects (IAF-ICP), which promote strategic R&D partnerships between Public Research Performers (PRPs) and industry. These collaborations aim to drive translational research with tangible clinical and economic outcomes.

In FY24, DxD Hub participated in two major IAF-ICP collaborations:

- With MiRXES, on the Joint Asian Genomics Lab, to advance innovation in human genomics and its clinical translation via a novel next-generation sequencing (NGS) platform.
- With Nalagenetics, to co-develop long-read sequencing tools for risk prediction of cardiometabolic, cancer, and neurodegenerative diseases.

These initiatives reflect DxD Hub's ongoing commitment to value capture from upstream research, deepen industry engagement, and accelerate innovation in precision medicine, genomics, and next-generation MedTech. Through these efforts, DxD Hub continues to serve as a vital bridge between Singapore's public research and healthcare innovation ecosystems.

THEIA HEALTH
Innovating Insights for Health

National Heart Centre Singapore
SingHealth

Project APOLLO | Advancing AI-Driven CT Coronary Angiography Diagnostics

A standout example of DxD Hub's translational efforts is Project APOLLO – an AI-driven software platform designed to automate Computed Tomography Coronary Angiography (CTCA) for more accurate and efficient coronary artery disease (CAD) diagnosis.

CAD is a leading cause of death in Singapore, responsible for nearly 20% of all fatalities in 2021. Regionally, it remains a major health burden with a prevalence rate of over 1,400 cases per 100,000 people. While CTCA is effective in diagnosing CAD, its widespread use is limited by time-consuming manual workflows—often requiring up to four hours of specialist time per case.

To address this gap, DxD Hub collaborated with National Heart Centre Singapore (NHCS) and Theia Health.

A local MedTech SME, to develop APOLLO—a PACS integration-ready, AI-powered Software as a Medical Device (SaMD). Built on intellectual property from NHCS, NUHS, TTSH, BII, I²R, and DxD Hub, APOLLO automates key diagnostic steps including: Calcium scoring (Agatston); Epicardial adipose tissue (EAT) measurement; Plaque and stenosis analysis; Coroflow estimation; Automated clinical report generation.

DxD Hub plays a pivotal role in transitioning APOLLO from research to real-world application by:

- Enabling licensing and productization through Theia Health
- Supporting QMS implementation
- Driving clinical validation and HSA regulatory submission

Value Capture from Upstream Research

The impact of APOLLO is substantial. It is projected to reduce false positives in CTCA by up to 10%, potentially avoiding 780 unnecessary hospital investigations annually, while significantly easing clinical workloads. Beyond clinical benefits, APOLLO demonstrates how upstream research can be translated into scalable, exportable innovations—strengthening Singapore's medtech industry and delivering meaningful healthcare outcomes.

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IAF-ICP with NalaGenetics | Advancing Long-Read Sequencing for Risk Prediction

DxD Hub is partnering with Nalagenetics, LKCMed, GIS, NCCS, National University of Singapore (NUS), National Neuroscience Institute (NNI), Tan Tock Seng Hospital (TTSH) and National Healthcare Group Polyclinics (NHGP) to advance long-read whole-genome sequencing (LR-WGS) for risk prediction of cancer, cardiovascular, and neurodegenerative conditions.

The Collaboration aims to facilitate the integration of clinical, hereditary, and polygenic risk models with LR-WGS to enhance the accuracy of personalized screening for conditions including breast, prostate, and colorectal cancer, cardiovascular disease, and Parkinson's disease.

DxD Hub leads the validation and regulatory approval of the LR-WGS service, including developing and validating biomarker assays, facilitating MOH certification as a Laboratory-Developed Test (LDT), and ensuring seamless clinical integration. A pilot clinical trial was conducted to assess real-world utility of the service, and supporting system readiness for eventual clinical deployment.

NalaGenetics · Lee Kong Chian School of Medicine Students' Medical Society · Genome Institute of Singapore A*STAR GIS · National Cancer Centre Singapore SingHealth · NUS National University of Singapore · National Neuroscience Institute SingHealth · Tan Tock Seng Hospital National Healthcare Group

Digital Health Accelerator

DIGITAL HEALTH ACCELERATOR

DHA in FY24

Establishing Strong Foundations and Driving Action:

Building Processes, Capabilities, and Pipeline While Advancing Digital Health Adoption Through Active Project Execution

Digital Health Accelerator

In FY24, the Digital Health Accelerator (DHA) focused on strengthening its foundational capabilities while actively advancing digital health adoption through structured project execution and ecosystem engagement. The team made significant progress across three key areas:

- Engaged across local healthcare ecosystem to gather needs and gap areas.
- Established partnerships with healthcare clusters to jointly develop projects both in the productization and adoption space.
- Developed robust pipeline of 113 projects, with >20 pre-consultation to help fine-tune project proposals and shortlisted 10 high potentials for DHA project endorsement.

Build DHA Project Pipeline

- Secured endorsement for 4 projects across healthcare clusters, covering across areas of imaging diagnostics in radiology and pathology, as well as SAMD for CDSS.
- Established governance processes and implementation synergies with DH ecosystem players (e.g. NHIC, Synapxe, ESG, Healthtech.SG, EDB) to streamline efforts and expedite adoption
- Enhanced assessment for multi-disciplinary evaluation committee with rigorous evaluation

On-Boarding DHA Projects

- Built credibility in high-value project assessment: pre-consultations + process re-engineering + workflow benefits simulation + strategic market assessment
- Showcased value through DHA implementation experience and effectively bridging clinical and IT stakeholders
- 80% of team activation with seasoned implementors w/ Industry and/or PHI experience

Activate and Train New Capabilities

Through these achievements, DHA laid strong foundations and drove meaningful action to support the digital health innovation landscape in Singapore.

Qritive | QAi Prostate

Prostate cancer is one of the most prevalent cancers in men, and its accurate diagnosis relies heavily on the expertise of pathologists in interpreting H&E-stained biopsy images. However, traditional pathology workflows face several challenges, including inter-reader variability, workload pressures, and the increasing demand for precision in cancer detection. At the same time, the adoption of AI-driven digital pathology solutions remains slow due to integration complexities, validation requirements, and clinical adoption barriers. There is a need for a validated AI-powered tool that can assist pathologists in identifying prostate cancer with high accuracy, improve diagnostic confidence, and enhance hospital operational efficiency.

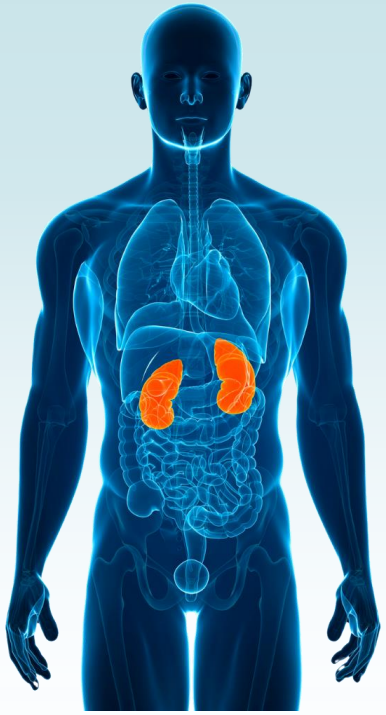
QAi Prostate by Qritive addresses these challenges by providing a clinically validated AI-powered diagnostic support tool, integrating seamlessly with digital pathology systems to aid pathologists in detecting and grading prostate cancer more accurately and efficiently. DxD Hub's Digital Health Accelerator (DHA) is collaborating with Qritive to validate and deploy QAi Prostate for Singapore General Hospital (SGH) Pathology. The partnership is focused on achieving these outcomes:

- Evaluating QAi Prostate performance by assessing key metrics such as AUC, sensitivity, and specificity.
- Integrating QAi Prostate with the Philips Digital Pathology system at SGH, enabling AI-driven analysis of H&E-stained prostate biopsy images to support pathologists, allowing them to use AI insights as a second reader.
- Conduct comprehensive training sessions and user support to facilitate a seamless transition for hospital teams and strengthened their confidence in utilizing AI-assisted pathology tools.
- Carry out an impact assessment to quantify the benefits of the solution, such as improvements in diagnostic precision, workflow efficiency, and patient outcomes, to support durable adoption.

The implementation of QAi Prostate has the potential to significantly enhance early and accurate cancer detection, leading to more treatment options and potentially less invasive interventions, ultimately improving patient outcomes. As a decision-support tool, it aids pathologists in diagnosing and grading prostate carcinoma while alerting them to potential discrepancies, thereby enhancing diagnostic confidence and consistency.

Mesh Bio | HealthVector Diabetes

Chronic Kidney Disease (CKD) is a significant complication in patients with Type 2 Diabetes Mellitus (T2DM), often progressing undetected until later stages when intervention options are limited. Early detection and timely intervention are crucial in preventing or delaying disease progression, yet current clinical workflows may not consistently identify at-risk patients in time.



To address these challenges, Mesh Bio partners with DHA, to integrate HealthVector Diabetes (HVD)—a predictive analytics solution based on digital twin technology developed by Mesh Bio—to support polyclinics and hospitals in identifying T2DM patients at risk of developing CKD. By seamlessly integrating into clinical workflows, HVD provides actionable insights that enable early intervention, optimize care pathways, and improve patient outcomes.

The collaboration focuses on implementing HVD within polyclinic and hospital settings to assess its clinical and operational impact:

- System Integration: Deploying and integrating HVD into hospital infrastructure to enable risk stratification of CKD in T2DM patients.
- User Training & Support: Providing training sessions and ongoing support to healthcare providers to facilitate successful adoption and optimal utilization of the system.
- Workflow Optimization & Impact Assessment: Re-engineering clinical workflows to enhance efficiency while conducting a quantitative assessment of HVD's impact on workflow performance, clinical decision-making, and patient outcomes.

Digital Health Accelerator

By enabling early detection and intervention, HVD has the potential to delay or prevent the onset of CKD Stage 3A in T2DM patients, thereby reducing complications and improving long-term patient health. This digital twin predictive approach allows healthcare providers to proactively manage at-risk patients, optimizing treatment strategies and reducing the burden on healthcare resources.

This initiative aligns with Singapore's healthcare priorities by advancing digital solutions that address critical clinical needs in chronic disease management. HVD, developed by a local startup, has already achieved HSA Class B registration (August 2023), reinforcing its credibility as a market-ready solution. By supporting the introduction of local SMEs into national health clusters, this initiative accelerates the adoption of innovation within Singapore's healthcare ecosystem while positioning the solution for global scalability.

mesh bio

Pandemic Preparedness

The ongoing threat of Highly Pathogenic Avian Influenza (HPAI), particularly the H5N1 strain, remains a significant global concern, with recent outbreaks underscoring the need for enhanced surveillance and response mechanisms. As of 2024, human cases of H5N1 have been reported across various countries in Asia, including Cambodia, China, Japan, and South Korea. The World Health Organization (WHO) has highlighted the urgent need for rapid intervention, especially following a fatal human case in Cambodia in April 2024. In China, a fatal case was reported in 2022, and ongoing outbreaks in poultry across Asia continue to raise alarms.

Singapore, too, remains vigilant, as the threat of H5N1 reaching its shores persists, given the high volume of migratory birds passing through the region and the proximity of affected countries. The detection of H5N1 in wild birds and poultry across Asia emphasizes the risks of interspecies transmission and potential human infection.

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Pandemic Preparedness

In response to the growing threat of infectious diseases, DxD Hub is actively strengthening surveillance systems with the ecosystem to monitor and mitigate the impact of high-risk diseases such as HPAI. Through our work in diagnostics, we enable early detection and rapid response, improving the monitoring of disease transmission and supporting timely interventions. This proactive approach supports ongoing efforts to contain infectious diseases before they escalate, helping to mitigate potential economic, social, and health-related impacts on a global scale.

Wild bird

Partnered with Japan's National Institute for Environmental Studies (NIES) and A*STAR Bioinformatics Institute (A*STAR BII) to develop Steadfast - to test the performance of a 2+1 qPCR kit designed to detect and differentiate between HPAI and Low Pathogenic Avian Influenza (LPAI) strains.

Wastewater

Working with National Environment Agency (NEA) to advance efforts to include wastewater and environmental sample screening for avian influenza. This initiative will evaluate Steadfast H5 (HPAI) Kit and Flu A Subtyping PCR Kit for Screening in wastewater and environmental samples.

Wastewater surveillance, adopted in Singapore since February 2020 for COVID-19, has proven effective as a non-intrusive strategy for monitoring viral spread. By analyzing viral material in wastewater, public health authorities can gauge the level of transmission within communities and trigger appropriate response actions, such as individual testing and isolation.

Human Clinical - qPCR

Collaboration between BII and DxD Hub to embark on the clinical validation of a multiplex H5Nx qPCR assay to assist in clinical management of patients at TTSH.

Human Clinical - ART

Development of a H5N1 rapid antigen test (ART) kit (PREPARE).

Photo Credit: CNA

Steadfast | Global Research Team Develops Advanced H5N1 Detection Kit to Tackle Avian Flu

DxD Hub, in partnership with Japan's National Institute for Environmental Studies (NIES) and A*STAR Bioinformatics Institute (A*STAR BII), has developed Steadfast, an advanced diagnostic kit that enhances avian influenza surveillance and pandemic preparedness.

Unlike conventional sequencing methods that require two to three days, Steadfast detects highly pathogenic avian influenza (HPAI) H5 strains—including H5N1, H5N5, and H5N6—in as little as three hours.

It also differentiates between HPAI and low pathogenic avian influenza (LPAI) strains, a critical distinction that enables more effective disease control strategies. By enabling faster and more accurate strain identification, Steadfast supports evidence-based interventions that help mitigate transmission risks and prevent potentially devastating epidemics.

Avian influenza spreads rapidly through direct contact, contaminated surfaces, and infected droppings, with migratory birds acting as long-distance carriers. HPAI strains are highly lethal, spreading systemically in poultry and requiring immediate culling to prevent severe outbreaks while LPAI strains cause milder symptoms, can often be managed through enhanced monitoring and targeted biosecurity measures.

DxD Hub played a key role in the development of the multiplex assay prototype test kits, including the design and development of avian clinical testing protocols, data analysis, and assay optimization. The kit was validated by NIES, using avian influenza samples collected between 2022 and 2024, confirming its accuracy in classifying virus pathogenicity. A*STAR BII provided bioinformatics expertise in virus sequence, structure, and evolution analysis, supporting the integration of PCR diagnostics as a timely, cost-effective complement to genomic surveillance. This enabled more efficient detection and tracking of ongoing H5N1 outbreaks.

This collaboration underscores the success of international partnership in developing a robust, field-ready solution that strengthens global avian influenza monitoring, enhances biosecurity, and reinforces pandemic preparedness.

Pandemic Preparedness

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National Institute for Environmental Studies, Japan

Bioinformatics Institute A*STAR BII

The global concern surrounding mpox continues, with increasing cases reported in several countries. In 2024, mpox outbreaks have been observed in regions including Europe, Africa, and North America, prompting renewed attention from health authorities. The World Health Organization (WHO) has urged countries to strengthen surveillance and containment efforts, particularly following the surge in cases in 2022 and 2023, where the virus spread to non-endemic areas. While many cases are mild, mpox poses a significant public health risk due to its potential for transmission through close contact and its ability to affect vulnerable populations, including immunocompromised individuals. In Southeast Asia, including Singapore, vigilance remains crucial as the region continues to monitor trends and risks associated with the virus.

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https://www.cdc.gov/poxvirus/monkeypox/
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https://www.moh.gov.sg

Multiplex Mpox qPCR Assay

On 15 August 2024, World Health Organisation declared mpox as a public health emergency. The new variant Clade Ib is more transmissible and causes more serious disease and higher fatality rates in adults and children. The rapid spread within and beyond Africa is of major public health concern. Singapore has stepped up surveillance in preparation for possible transmission locally.

In response to the evolving mpox virus landscape, the DxD Hub swiftly adapted the multiplex qPCR detection assay originally developed during the 2022 outbreak. Incorporating the latest viral sequence data, the updated assay is designed to detect both the more pathogenic clade Ib and clade II variants. Preliminary testing has been completed in collaboration with PREPARE, and the team is now working with NEA to optimise and validate the assay for use in environmental surveillance..

Evaluation of Mpox ART Kits in Collaboration with NEA

The collaboration with NEA focuses on the implementation of a standardized protocol and analytical panel to evaluate commercially available mpox Antigen Rapid Test (ART) kits. This structured approach ensures rapid, consistent assessments, empowering health authorities to make informed, evidence-based decisions.This partnership significantly enhances our capacity to assess and validate commercial ready diagnostic solutions during infectious disease outbreaks—an essential component of effective public health response. Additionally, it fosters the development of expertise and infrastructure for diagnostics product evaluation, which remains an asset for addressing both current and future emerging health threats.

Development of Mpox Serology Tool with NUS

Through the PREPARE Commission Project, we partnered with NUS to co-develop laboratory-based and point-of-care serology tests for mpox. This initiative reinforces our foundational diagnostics capacity and pandemic preparedness. The adaptable technologies enable rapid repurposing for emerging variants, reflecting our strategic investment in scalable, innovative diagnostics.

NUS National University of Singapore

Infectious Diseases Labs A*STAR IDL


Global
Health

Pujiang Innovation Forum 2024 | **DxD Hub's Role in Advancing Global Health Through Regional Collaboration**

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At the *Pujiang Innovation Forum 2024*, DxD Hub contributed to shaping the global health agenda, with CEO Dr. Weng Ruifen highlighting DxD Hub's role as Singapore's national platform for diagnostics development and commercialisation. Dr. Weng presented Singapore's coordinated approach to enabling rapid diagnostics deployment, grounded in strong public-private partnerships and regulatory alignment.

Beyond showcasing its portfolio, DxD emphasized its deeper commitment to advancing diagnostic equity in underserved regions. Notably, DxD has played a role in engaging the Bill & Melinda Gates Foundation to explore a strategic presence in Singapore, positioning it as a regional collaborative hub for accelerating access to health technologies.

This participation reinforced the importance of regional innovation ecosystems working in concert to tackle global health challenges through practical, scalable diagnostics solutions.

Antimicrobial Resistance

Global Health: One Health

Antimicrobial resistance (AMR) is a major global health threat, contributing to approximately 9% of deaths worldwide. Recognizing its cross-sectoral nature, the World Health Assembly launched a Global Action Plan in 2015, calling for a "One Health" approach — a coordinated effort across human and animal health, agriculture, the environment, and consumers.

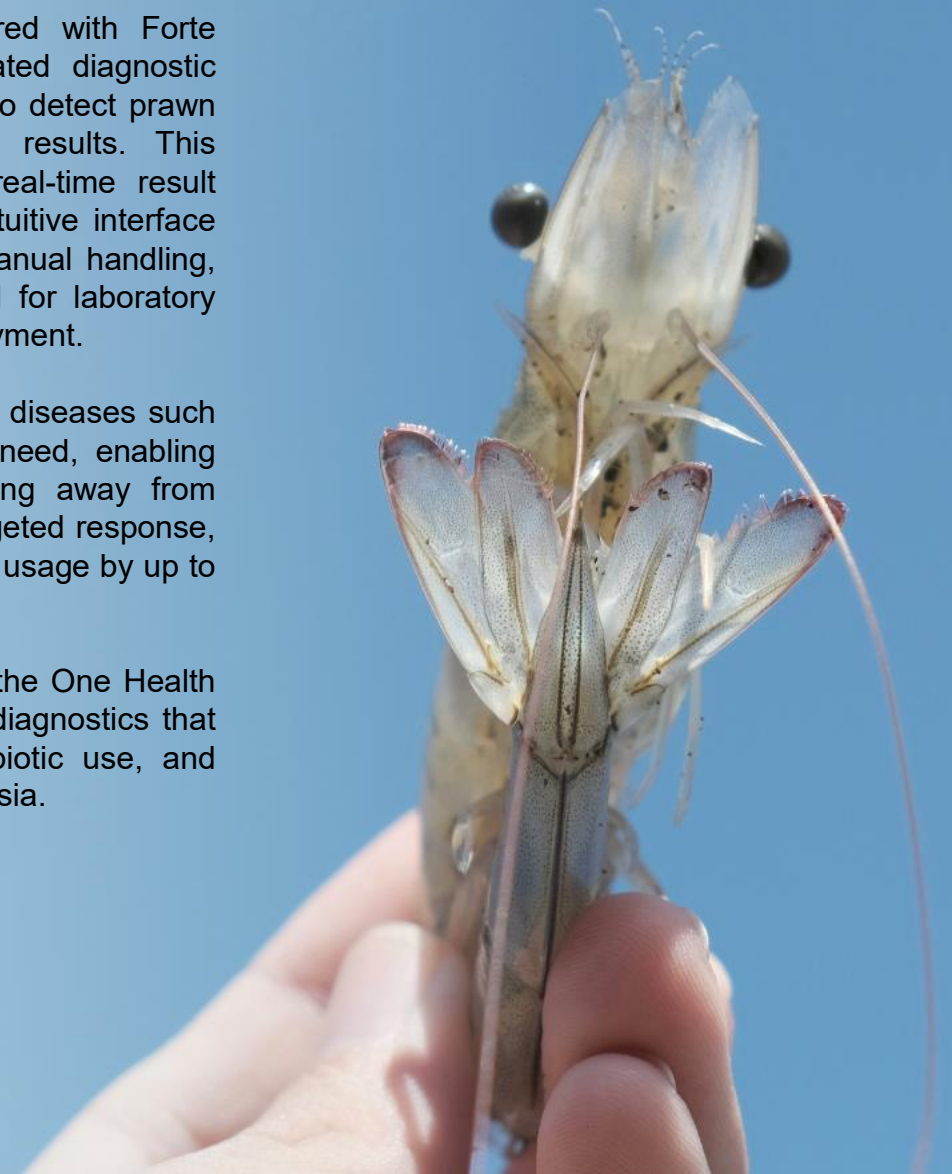
A key driver of AMR is the misuse of antibiotics in food production, including aquaculture. In the shrimp farming industry alone, disease outbreaks contribute to an estimated USD 4.5 billion in global losses each year. In countries like Vietnam, farmers often resorting to antibiotics in the absence of timely diagnostic tools. This leads to an over-reliance on antibiotics, compromising both farm productivity and long-term sustainability while further exacerbating AMR.

RAPIDPlus

To address this challenge, DxD Hub partnered with Forte Biotech to co-develop RAPIDPlus, an integrated diagnostic device launched in FY24 that enables farmers to detect prawn diseases on-site with real-time, quantitative results. This innovation combines DNA amplification and real-time result readout into a single, compact unit. With an intuitive interface and simplified operation, the device reduces manual handling, increases affordability and eliminates the need for laboratory equipment, making it highly suited for field deployment.

RAPIDPlus empowers farmers to swiftly identify diseases such as WSSV, AHPND, and EHP at the point of need, enabling faster, more informed decisions-making. Shifting away from reactive antibiotic use to early detection and targeted response, the solution has been shown to reduce antibiotic usage by up to 80%, while improving yields and biosecurity.

This project exemplifies DxD Hub's support for the One Health approach by advancing accessible, field-ready diagnostics that improve biosecurity, promote responsible antibiotic use, and strengthen food system resilience in Southeast Asia.




ASEAN Dx

Webinar Series

ASEAN Pandemic Readiness Webinar

Diagnosis and Management of Emerging Respiratory Diseases

On 1 July 2024, the webinar **Pandemic Readiness – Diagnosis and Management of Emerging Respiratory Diseases** brought together 260 participants from Singapore and across the region to examine the rising threats posed by respiratory pathogens. With past pandemics such as SARS, H1N1, and COVID-19 highlighting the critical need for preparedness, the session convened infectious disease experts to share insights on diagnosis, clinical management, surveillance strategies, and public health interventions.

Key takeaways included:

- Heightened awareness and preparedness for emerging infectious diseases beyond COVID-19
- Strengthened regional knowledge-sharing on respiratory infections and pandemic threats
- Facilitated discussions on surveillance strategies and public health interventions in ASEAN

This webinar is part of an ongoing series that serves as a platform to foster regional collaboration in addressing public health challenges, while aiming to expand and strengthen the ASEAN regional network. DxD Hub has organised five webinar since 2021, attended by more than 2000 participants.

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Strengthening ASEAN's Infectious Disease Preparedness Through Sero-Surveillance

To enhance regional readiness against future pandemics, DxD Hub has been actively supporting large-scale sero-surveillance efforts across six ASEAN countries—Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam—since October 2021. This multi-country initiative, aimed at assessing population-level immunity, forms a critical foundation for evidence-based public health decision-making and pandemic preparedness in the region.

A total of 9,773 samples were collected and analysed using Roche and Genscript assays to detect:

- **Nucleocapsid-binding antibodies**
- **Spike-binding antibodies**
- **Neutralizing antibodies**

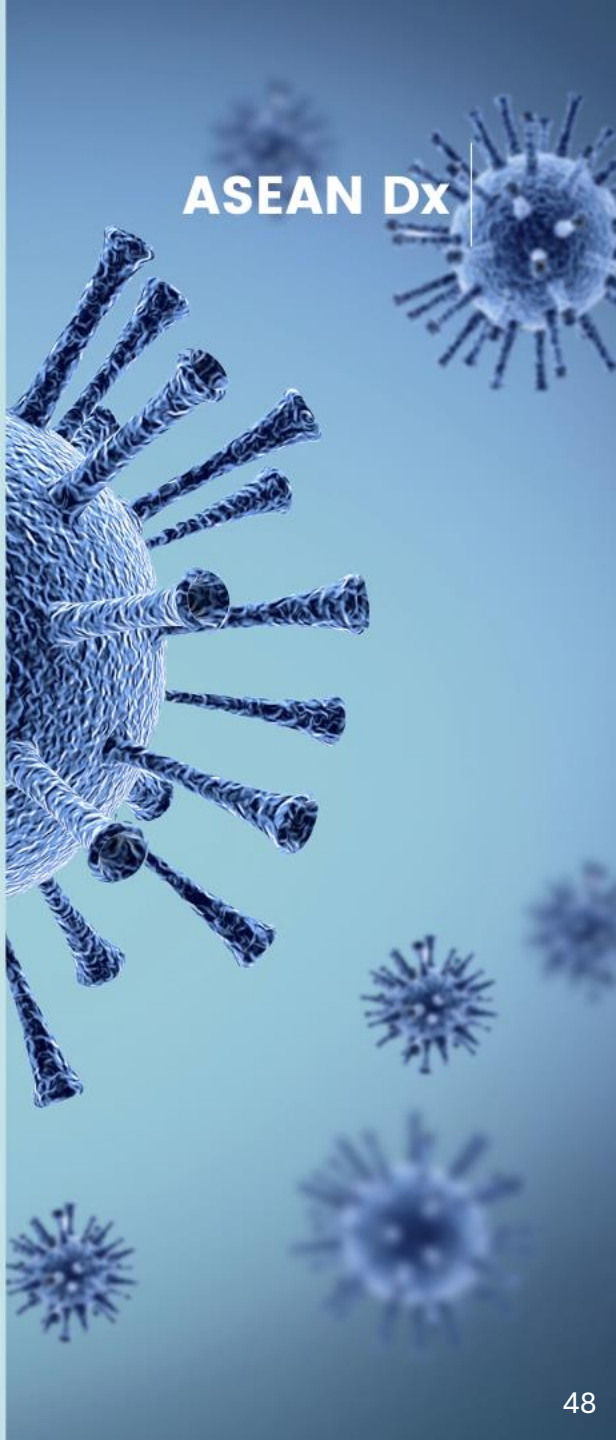
Longitudinal analysis was conducted to evaluate the durability of vaccine-induced immunity and the risk of breakthrough infections. The study has delivered:

- Key insights into how immunity evolves over time post-vaccination
- Scientific evidence to guide booster vaccination policies
- Identification of potential immunity gaps in various populations
- A robust baseline for ongoing and future sero-surveillance efforts

To further strengthen regional capabilities, federated sero-biobanks have been established across participating countries. These curated biobanks enable further research and product development to bolster preparedness against future infectious disease crises.

Insights from the study and the 4 resulting peer-reviewed publications have illuminated on-the-ground challenges during vaccine rollouts in Southeast Asia[1], informed practical considerations for deploying alternative vaccines like Abdala in low-resource settings[2], and deepened our understanding of immune responses in vulnerable populations such as cancer patients and those with B cell malignancies[3,4].

Collectively, these findings strengthen ASEAN's ability to design data-driven vaccination strategies and respond more effectively to future infectious disease threats.



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[1] https://doi.org/10.7189/jogh.14.03016
[2] https://doi.org/10.1016/j.ijid.2024.107173
[3] https://doi.org/10.47102/annals-acadmedsg.2022302
[4] https://doi.org/10.1038/s41541-025-01141-w

Outreach and Talent Development

Tech Brews | Health Technology Translation and Commercialization

In 2025, Tech Brews and DxD Hub launched a quarterly Wednesday workshop series in Singapore, aimed at strengthening collaboration within the health technology ecosystem. These sessions provide a dynamic platform for industry leaders, experts, and enablers to exchange insights, explore partnerships, and accelerate the translation and commercialization of health technologies.

The first workshop, held on 19 February 2025, featured speakers from the National Health Innovation Centre (NHIC), highlighting key funding opportunities and real-world case studies. They talk provided an overview of NHIC's funding schemes supporting clinical innovation and insights on collaborative projects jointly supported by DxD Hub and NHIC.

Aligned with Tech Brews' informal and collaborative spirit, the session sparked conversations around MedTech, diagnostics, and digital health commercialization. The session also identified potential areas for future growth, particularly in integrated MedTech, AI/ML, and Software as a Medical Device (SaMD), with an emphasis on developing market-ready solutions within a QMS 13485-certified environment.

Beyond tech translation, the series also highlights the importance of talent development and community-building in Singapore's health innovation ecosystem.

Advancing Regulatory Excellence

Executive Certificate Workshops on Health Technology Compliance

In collaboration with the Centre of Regulatory Excellence (CoRE), DxD Hub conducted two Executive Certificate Workshops focused on key regulatory and quality management processes for In Vitro Diagnostics (IVD) and Software as a Medical Device (SaMD). These workshops provided participants with essential knowledge and practical insights to navigate complex regulatory landscapes, ensuring that health technologies meet compliance requirements and are market-ready for commercialization.

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The **Executive Certificate Workshop on Validation and Verification (V&V)** equipped participants with a comprehensive understanding of the V&V process, covering critical topics such as the regulatory landscape, risk management strategies, and the Essential Principles exercise. Attendees explored key aspects of pilot manufacturing, design verification, analytical validation, performance evaluation for IVD, and clinical validation for SaMD. Sessions also addressed structuring design and development files and managing design and manufacturing transfers to support product commercialization. A key takeaway was the crucial role of V&V in ensuring product functionality and regulatory readiness, with a deeper understanding of the Essential Principles template to streamline regulatory submissions.

Building on these foundational regulatory insights, the **Executive Certificate Workshop on Manufacturing and Quality Management Systems** provided in-depth knowledge on dossier preparation, product registration, labelling and packaging requirements, and document and record control. Participants examined the application of Quality Management Systems (QMS) within medical device organizations, process validation for scale-up manufacturing, and customer-related processes for IVD and SaMD.

Outreach and Talent Development

The workshop emphasized the shared responsibility of quality assurance among product developers, manufacturers, industry stakeholders, and regulatory bodies. It reinforced the necessity of compliance with regulatory requirements, highlighting conformity assessment methods and effective QMS practices as key to ensuring product integrity and market success.

Both workshops fostered an engaging learning environment, bringing together returning and new participants to encourage cross-disciplinary collaboration and industry knowledge sharing.

>30 **Participants from MNCs, SMEs, Start-up founders and QARA**

From Classroom to Lab | SST Immersion Programme at DxD Hub

As part of DxD Hub's commitment to inspire the next generation of scientific innovators, we hosted a Two-day Immersion Programme for students from the School of Science and Technology, Singapore (SST) in 2024.

This initiative provided students with a first-hand experience of the exciting world of diagnostics, equipping them with essential laboratory skills and insights into the translational process of turning scientific discoveries into real-world healthcare solutions.

During the programme, students engaged in hands-on activities, including:

- Tear-down of Antigen Rapid Test (ART) kits to understand the underlying mechanisms of diagnostic technology.
- Lab safety and pipette training, preparing them for practical laboratory work.
- Polymerase Chain Reaction (PCR) experiments, allowing them to observe diagnostic science in action.

Beyond technical skills, the students gained a deeper appreciation of DxD Hub's role in productization.

This interactive learning experience was made possible through the collaboration between SST and the dedicated team at DxD Hub, who continue to play a key role in shaping the future of healthcare innovation. We look forward to welcoming more young talents in the years ahead.

Building Deep-Tech Talent for Singapore's MedTech Future | DxD Hub Innovation Fellowship Programme

The DxD Hub Innovation Fellowship Programme (IFP) is a talent development initiative funded by the National Research Foundation (NRF) to train and expand Singapore's deep-tech talent pool in diagnostics and medical device translation, productisation, and commercialization.

This structured programme combines theoretical learning with hands-on training, providing fellows with direct exposure to DxD Hub's product development and productisation processes. The curriculum aligns closely with ISO 13485 requirements and the FDA's Total Product Life Cycle (TPLC) framework, ensuring industry-relevant expertise.

Upon completion, fellows will be equipped with the specialized skills and experience needed to pursue careers at DxD Hub, A*STAR, or the private sector, strengthening Singapore's MedTech innovation ecosystem.

dxdhub | Celebrating 10 Years of Collaborative Excellence in Diagnostics

During my Innovation Fellowship Program (IFP), I had the opportunity to work across multiple domains, gaining exposure to hands-on research, cross-functional collaboration, and real-world applications of academic knowledge. Notably, I led key projects, where I engineered a heating system without a stepper motor, and I designed a gravity-based filling mechanism, both requiring innovative thinking and a first principles approach. These projects not only sharpened my technical and design thinking skills but also deepened my understanding of how to align engineering solutions with commercial goals. The IFP experience effectively bridged scientific, technical, and commercial thinking, enabling me to view challenges through a multidisciplinary lens. Moving forward, I plan to apply these learnings in the biomedical industry, leveraging my strengthened problem-solving capabilities, teamwork experience, and market-oriented mindset to deliver impactful and sustainable solutions.

- Mohamed Daniel, Junior Mechanical Engineer

I worked in digital health product development as a Systems Engineer, collaborating closely with QA/RA, technical teams, project managers, and external stakeholders to bridge user needs and technical functions across the design, development, and verification stages. This cross-functional exposure deepened my understanding of balancing competing priorities and streamlining project workflows. I also led the documentation process for a Software as a Medical Device (SaMD), where I gained insights into the importance of thorough yet adaptable documentation in a regulated environment. The programme showed me how engineering and regulatory decisions influence business strategy and product viability. Now, as I take on a Project Manager role, I continue to build on this foundation by managing scope, schedule, and stakeholder expectations. Looking ahead, I plan to apply these skills to advance innovation in Singapore's MedTech industry, especially in AI-integrated medical devices ensuring they meet rigorous safety, efficacy, and regulatory standards while addressing real-world healthcare needs.

- Divya Jose Ellickamuriyil, Systems Engineer

Building Deep-Tech Talent for Singapore's MedTech Future | DxD Hub Innovation Fellowship Programme

As part of the IMT team, I was exposed to a broad range of areas including microfluidics, rapid prototyping, user-centric design, and medical product development, which deepened my understanding of how to translate clinical needs into practical engineering solutions. A key responsibility I took on was designing a microfluidic device, where I had to integrate fluid dynamics with user-friendliness and manufacturability. The programme gave me firsthand exposure to the MedTech innovation pipeline, from ideation to commercialization, and showed me how to align scientific rigor, technical feasibility, and business considerations in decision-making. These experiences helped me develop a holistic perspective on product development. Moving forward, I plan to apply these insights to design scalable, user-focused healthcare solutions that meet both clinical and market needs.

- Tan Yon Gin, Mechanical Engineer

I had the opportunity to work across various areas within MedTech, including mobile development (iOS/Flutter), AR integration, full-stack web development, and backend testing. I gained hands-on experience with technologies such as CoreML, Vision, AWS cloud services, and automation tools like Playwright and SonarQube, which allowed me to bridge cutting-edge tech with real-world medical applications. A key project I led was the UI development using Flutter. Despite limited prior experience, I quickly upskilled, built scalable components, and integrated features like face detection and authentication. This strengthened my abilities in rapid learning, modular design, and cross-functional collaboration. The fellowship also taught me to balance ML-based segmentation with end-user performance needs, guided by regular stakeholder feedback. Looking ahead, I plan to deepen my full-stack skills while eventually leading larger-scale projects, exploring applied machine learning, and contributing to team growth through mentorship and knowledge-sharing.

- Pawandeep Singh Sekhon, Software Engineer

I was involved in the development of medical devices across various stages of the product lifecycle, including prototype development, hardware testing, and iterative design based on clinical and engineering feedback. Working closely with engineers, scientists, and project managers gave me valuable insight into the complexities of creating effective and commercially viable medical products. A key responsibility I undertook was supporting the development of a nerve testing device, where I gathered clinician feedback, addressed design and testing challenges, and worked with suppliers to resolve issues, an experience that taught me the importance of adaptability and structured problem-solving in real-world engineering. The fellowship also deepened my understanding, helping me consider user needs and business factors in design decisions. Moving forward, I plan to apply these skills to future roles in MedTech development, while continuing to grow as a problem-solver and communicator on increasingly complex projects.

- Tan Yan-Ming Alexander, Electronics Engineer

Nurturing Future Innovators | DxD Hub Internship Programme

At DxD Hub, we believe in fostering the next generation of talent in healthcare innovation. Through our Internship Programme 2024, we provided students and young professionals with hands-on experience in diagnostics development, exposing them to real-world projects that bridge science and industry.

This year, we collaborated with 8 Institutes of Higher Learning (IHLs) to attract a diverse pool of candidates. Our interns worked alongside subject experts contributing fresh perspectives while gaining invaluable industry insights by providing mentorship and exposure to the end-to-end innovation process, DxD Hub continues to strengthen the talent pipeline, inspiring the next wave of healthcare innovators.

During my summer internship at DxD Hub, I explored precision health and medicine through landscape studies and reviews of regulatory standards. This experience offered valuable insights into diagnostics and market dynamics, enriching my technical knowledge with a strong business perspective. Analyzing regulatory advancements and proactive approaches to adopting technologies such as next-generation sequencing (NGS) for genetic testing deepened my appreciation of the regulatory landscape in ensuring safety and efficacy. Overall, this internship reaffirmed my passion for precision health and medicine and solidified my decision to pursue a postgraduate degree in this field.

- Elizabeth Ng, QARA Intern

I gained hands-on experience in machine learning by developing a federated learning system using the NVFlare framework. I explored practical applications of AI, collaborating with skilled professionals to build and fine-tune models. This internship deepened my understanding of AI's impact across industries, especially in the MedTech sector where early diagnosis is critical. Leveraging advanced AI techniques for predictive analysis in this field was both challenging and exciting. I look forward to continuing this journey by contributing to innovative AI projects in the future.

- Lim Wei Jun, DDx Intern

I conducted a comprehensive landscaping study on diagnostics productization services, identifying key competitive areas and trends. I also explored the regulatory and reimbursement landscapes in Indonesia and Singapore, deepening my understanding of market access challenges in the region. This hands-on experience in competitor analysis and market research provided valuable exposure to the biotechnology sector. Additionally, engaging with industry professionals enriched my learning through their insights and mentorship.

- Sarah Wong, Corp Planning Intern

Nurturing Future Innovators | DxD Hub Internship Programme

"At DxD Hub, we are committed to nurture the next generation of healthcare innovators by providing hands-on, real-world experience that bridges science and industry."

My internship with DxD Hub as an Outreach and Training Intern was an eye-opening experience that equipped me with valuable skills and insights into the MedTech industry. I conducted a market landscape analysis to identify opportunities and challenges in introducing precision health and medicine into Indonesia's medical technology market. I also supported the planning and execution of the webinar series on ASEAN pandemic readiness, featuring distinguished speakers from across the region. These experiences broadened my perspective on global public health strategies and challenges, and have prepared me well for a future career.

- Low Leng Ee, O&T Intern

I gained hands-on experience in executing experiments, liaising with vendors, analysing data, and supporting my team's research efforts. I had the opportunity to independently perform ELISA assays, master data analysis using various software tools, and sharpen my skills in communication, networking, and inventory management. This internship not only strengthened my technical expertise but also enhanced key soft skills such as professional communication and teamwork. It has been a transformative experience that has prepared me well for future studies and a meaningful career in the future

- Elfie Tan, IVD Intern

During my internship with the Digital Diagnostics (DDx) team, I worked on implementing dynamic animations, improving state management, and enhancing user experiences using the Flutter framework. This hands-on experience strengthened my technical skills in cross-platform development and deepened my passion for diagnostics and digital health innovation. It was an enriching journey that allowed me to tackle real-world challenges, sharpen my problem-solving abilities, and gain valuable insights into the transformative potential of healthcare technology.

- Manishansh Shaswat, DDx Team

As an Electrical Engineering Intern, I had the opportunity to conceptualize the design of a PCR-grade Point-of-Care Testing device, with a focus on sample handling, liquid flow control, heating systems, PCR chambers, and fluorescence optics. I also contributed to enhancing user interface code, analyzing system data, and troubleshooting electronic components. This experience sharpened both my technical and communication skills, providing practical knowledge that extended beyond the classroom. It was a pivotal step in preparing me for the workforce and further education as a well-rounded engineering professional.

- Foo Yong kang, IMT Intern

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