



A Newsletter For The Research Community In Singapore • Issue 44 • Oct 2021



Special Innovation Feature

Building Research Capacity to Strengthen Research in Nursing, Pharmacy and Allied Health Professions



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LKCmedicine Hosts Joint Workshop on the Health Consequences of Air Pollution with Imperial College London



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NHG-LKCmedicine Joint Symposium (Aug 2021) - Clinical Trials



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RESEARCH NEWS

- Congratulations to Winners of the NHG Research & Innovation Awards (NRIA) 2021!



RESEARCHER'S FEATURE

- "HOPE-S" in Future Mental Healthcare



RESEARCH EDUCATION

- FY2021 Training Calendar
- Chicken Soup for the Busy Coordinator



NHG-LKCMedicine Joint Symposium (Aug 2021) - Clinical Trials

Research and clinical trials are essential to the advancement of evidence-based medicine and can lead to positive impact on healthcare and patients' lives.

On 19 Aug 2021, NHG and LKCMedicine jointly organised a research symposium focusing on clinical trials. It featured a series of talks by exemplary clinicians who shared insights on topics ranging from **clinical trials that change the global practice of medicine**, **COVID-19 trials** as well as **personal experiences in conducting clinical trials and building programmes for clinical research and translation**.

The speakers highlighted the **importance of role-modelling and establishing a culture within the healthcare and academic settings**, to inspire younger clinicians and investigators to engage in research and clinical trials.

Missed the symposium? You can now view the Zoom recording [here](#).



Congratulations to Winners of the NHG Research & Innovation Awards (NRIA) 2021!

Research and Innovation are key enablers in the transformation of Singapore's healthcare. The NRIA recognises **individuals and teams who have made outstanding contributions in improving health outcomes or delivery**, as well as promoting the spirit for continuous research and innovation.

Please click [here](#) to view the list of winners who have received the 2021 awards.

LKCMedicine Hosts Joint Workshop on the Health Consequences of Air Pollution with Imperial College London

On 22 June, LKCMedicine, in collaboration with Imperial College London (Imperial), held a joint workshop on the consequences of air pollution. Attended by 100 participants from various institutions, including National Environment Agency (NEA) and National Healthcare Group (NHG), the workshop featured multiple **experts across medicine, computing, and geography to discuss the consequences and mitigation strategies of air pollution**. Opening remarks were given by NTU Singapore's Senior Vice President for Health and Life Sciences and LKCMedicine Dean, Distinguished University Prof Joseph Sung, and Vice-Dean for International Activities and Professor of Clinical Endocrinology, Faculty of Medicine, Imperial College London Prof Desmond Johnston. Discussions focused on how



From Top Left: Prof Joseph Sung (LKCMedicine), Prof Lim Kah Leong (LKCMedicine), Assoc Prof Sanjay Chotirmall (LKCMedicine), Prof Wisia Wedzicha (Imperial College London), attendees of the workshop and Prof Desmond Johnston (Imperial College London.)

NTU and Imperial College London can **better collaborate, as well as finding strategies to address deteriorating air quality in a post-COVID-19 world**. The workshop ended with closing addresses by Prof Johnston, and Prof Lim Kah Leong, President's Chair in Translational Neuroscience and LKCMedicine

Vice-Dean for Research, with both calling for future collaborations and emphasised that support would be provided for this endeavour.

Click [here](#) to read more.



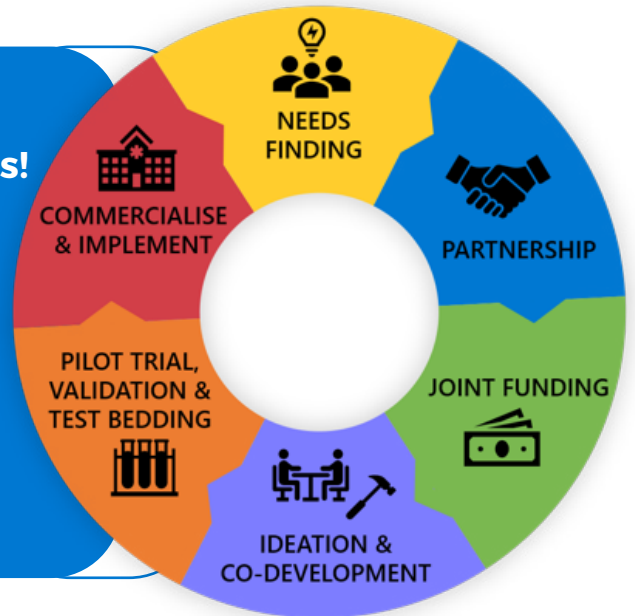


How Our Innovation Has Transformed Healthcare

Research, Innovation and Enterprise (RIE) forms the basis of Singapore's strategic plan to transform into a 'knowledge-based, innovation-driven economy and society' that can help improve the lives of our population. Each tranche of RIE comes with a 5-year strategic plan and policies to grow Singapore's research capabilities. The translation of clinical research outcomes combined with innovative science and technology is key to the development of new and improved healthcare processes, services and products that can transform our healthcare system and contribute to positive health and economic outcomes.

A Snapshot of RIE 2020 Achievements! (2016-2020)

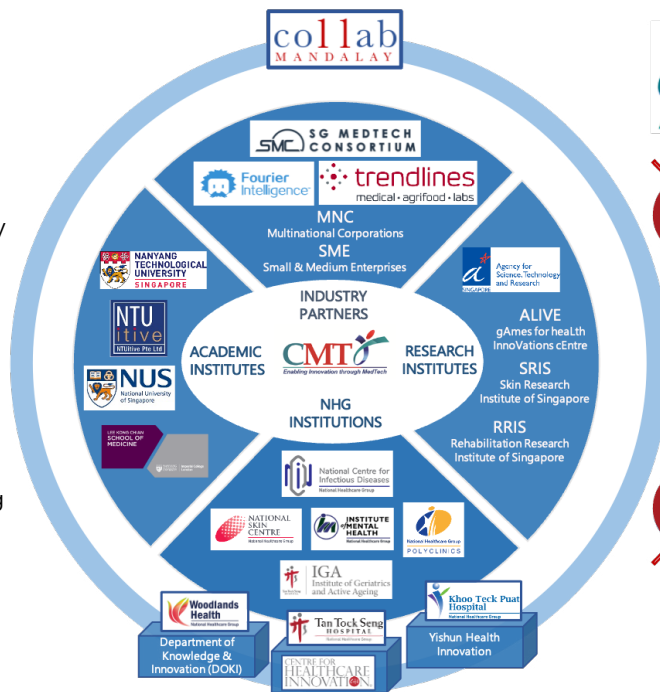
To mark the end of RIE 2020, this special edition of e-Catalyst will feature the collaborative efforts and project outcomes of our clinicians with their partners in the NHG innovation ecosystem over the past five years from 2016 to 2020. In this feature, the NHG Centre for Medical Technologies and Innovations (CMTi) will walk you through NHG's innovation journey from needs finding to successfully commercialised innovations, as we celebrate the milestones achieved and partnerships forged.



At the Forefront of MedTech Innovation

The NHG Centre for Medical Technologies and Innovations (CMTi) oversees and drives the development of MedTech and innovation activities in NHG, supporting our family of primary care polyclinics, acute care and tertiary hospitals, national specialty centres and business divisions in their innovation endeavors.

Over the past 5 years, CMTi has supported over 200 clinicians through their innovation journeys, formulating partnerships between NHG clinicians and technology partners to validate unmet clinical needs and co-develop innovative healthcare solutions that are clinically impactful. It is noteworthy that these meaningful partnerships and co-development efforts have brought about products that are available for commercial use and the creation of spin-off companies.



CMTi has established a growing strategic network of innovation partners from the industry, academia, research and government sectors that gels well with the RIE ecosystem.

Partnering with academia and research institutes
Paves the way for the translation of clinical research into implementable solutions

Collaboration with the industry
Supports the start-up landscape and facilitates the commercialisation of healthcare solutions to reach and meet the needs of end users worldwide.

Share your clinical needs, innovative ideas or questions about innovation with us here!
Or contact us at innovate@nhg.com.sg





Innovation Driven By Unmet Needs

The crucial first step in innovation is to articulate your clinical needs clearly as it can inspire different innovative ideas or open up diverse opportunities in various technological areas for solutioning.

*Keep An Open Mind.
Leave The Technology
Assessment And Solutioning
To A Later Stage!*

Craft Your Needs Statement

A way to address **The Problem** for **The Population** in order to achieve **The Outcome**

What are the pain points?

Who is the target group that is experiencing the problem?

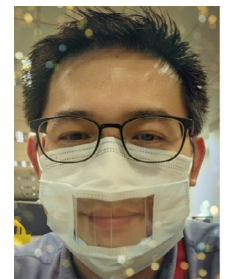
What is the expected positive change or improvement that will be experienced by the target group if the problem is solved?

*Take the time to observe the clinical situation and speak to stakeholders.
Pen down the key insights and pain points contributing to the unmet clinical need.*

A Medical-Grade Face Mask with Transparent Window To Enhance Communication

The Healthcare Context

Wearing of face masks has become a 'new normal' in many countries around the world. Singapore mandates members of public to wear face masks when they are outside their homes to reduce the transmission of respiratory droplets. The Ministry of Health recommends face masks with good filtration capabilities. However, regular face masks prevent lip-reading and reduce the level of speech transmitted from the mouth. As such, wearing a regular medical mask may impair the ability for some people to communicate with ease. The increased effort needed to listen and communicate is exacerbated in people who are communication vulnerable.



NEEDS STATEMENT

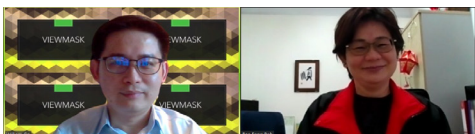
A way to enhance communication effectiveness by retaining non-verbal speech and facial cues for face mask users while maintaining the protection expected of a medical-grade face mask.

Unmet Needs Validated Through Ground Research

384 frontline healthcare workers (HCWs) and 385 patients reported a near unanimous concurrence that good communication and conveyance of emotions and feelings were greatly enhanced by facial expression and lip-reading.

1/3 of HCWs and nearly half of patients admitted to pulling down their face masks to enhance communication when necessary.

Tan Tock Seng Hospital (TTSH) is collaborating with local medical device manufacturer, [Racer Technology](#), to co-develop a disposable medical-grade mask which features a fog-resistant 'transparent' window to allow clear visualization of the wearer's mouth. The new mask will continue to meet healthcare regulatory requirements to protect wearers (American Society for Testing and Materials (ASTM)) Level 2 protection with bacterial filtration efficiency of $\geq 95\%$). The final product will be made commercially available to augment the default medical mask. A pilot study is currently underway to evaluate the new mask's effectiveness by end users. Healthcare and social service workers from participating TTSH outpatient clinics and selected community settings (community clinics, non-governmental organisations, Ministry of Education schools) are amongst the first to try out the new masks during these initial trials.



TTSH Clinical Team:
Top Row - Dr William Go (Clinical Research and Innovation Office), Ms Poh Bee Fong (Department of Infectious Diseases).
Bottom Row - Ms Florence Tang (Speech Therapy Department), Dr Ho Eu Chin (Department of Otorhinolaryngology), Dr Brenda Ang (Department of Infectious Diseases)



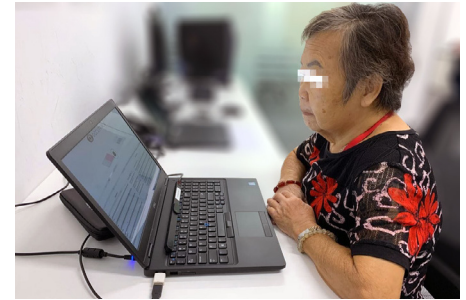
Racer Technology Team:
From Left to Right: Mr Lee Chia Ta (Chief Operations Officer), Mr Keith Ong (Senior Sales & Program Engineer, Marketing), Mr Willy Koh (Chief Executive Officer), Mr Alan Goh (Lead Product Designer)



Automated Vision Assessment and Impairment Detection Through Gaze Analysis

The Healthcare Context

Degeneration of the macula or central part of the retina occurs with age and results in blurred or distorted vision, often with a dark patch blocking the center of the visual field. In the management of age-related macular degeneration (AMD), patients are required to attend regular check-ups at the specialist eye clinic by the retinal specialists to monitor their disease. The eye examinations that patients undergo during these clinic visits may include funduscopy and optical coherence tomography which require skilled technicians and are costly. Treatment for exudative or wet AMD involves repeated intravitreal injection of an anti-vascular endothelial growth factor (anti-VEGF).



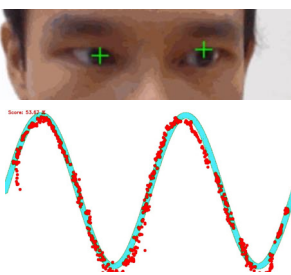
Healthy volunteer using AVIGA platform

<p>Pain Points</p>	<p>Low patient compliance for frequent monthly check-ups</p>	<p>Anti-VEGF injections are effective, but require retreatments and regular monitoring</p>
	<p>Inconsistent clinic appointments ranging from 1 to 3 months, depending on patient's disease status and clinic availability</p>	<p>Difficulty in tracking progression of disease to deliver timely therapeutic intervention</p>

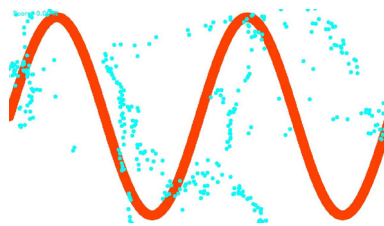
NEEDS STATEMENT

A home-based method that empowers patients with AMD to monitor their own eye condition remotely, thereby reducing the need for multiple clinic visits and allowing for timely therapeutic intervention.

Tan Tock Seng Hospital (TTSH) in collaboration with A*STAR I2R co-developed a software – **Automated Vision Assessment and Impairment Detection through Gaze Analysis (AVIGA)** and a successful proof-of-concept was presented at the end of the project. A local medical technology incubator, **Trendlines Medical Singapore**, saw the potential of this technology and licensed it from the research parties. This led to the spin-off company – **Occutrack Medical Solutions Pte Ltd** focused on the commercialisation of the AVIGA system. The AVIGA system incorporates an ocular tracking system with novel gaze tracking algorithms designed to provide a comprehensive assessment of a patient's central visual function. This intuitive, non-invasive tool can help monitor patients with AMD in real time, in the comfort of their own home. The project team is currently preparing for a clinical study at TTSH.



Visual profile & scoring of a healthy patient



Projected visual profile & scoring of an AMD patient



Occutrack AVIGA system

Project Team:
 Adj A/Prof Augustinus Laude & Prof Lim Tock Han, TTSH Department of Ophthalmology
 Mr Mark Wong, Project Manager, Occutrack Medical Solutions Pte Ltd.



Fostering Collaborative Partnerships

Working with partners who can contribute complementary expertise to solve healthcare needs is key to the success of any co-development efforts. The basis of these partnerships is the understanding and agreement on a collaboration model that is mutually beneficial. CMTi catalyzes the formation of such collaborative partnerships by bringing together clinicians with their curated clinical needs and well-matched partners with their technology and business expertise.

PARTNERSHIP

Clinical Needs Driven

NHG Clinicians identify the unmet clinical needs and the healthcare and patient context

Clinicians from various medical specialties bring to the table their expertise knowledge vital to the co-development of solutions that can effectively address healthcare needs.

CMTi matches partners with the right expertise and interests and facilitates the discussion between the 2 parties to scope the project effectively.

Technology Push

Partners share their innovative technologies and its potential for clinical application

Technology partners contribute their technical expertise and share knowledge in the generation of viable business models for successful commercialisation of co-developed MedTech solutions.

Successful Translation of Deep Tech into Implementable Solutions

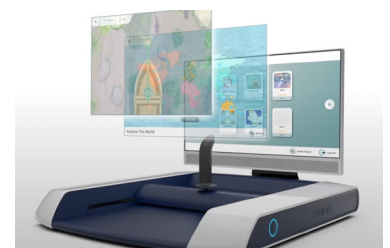
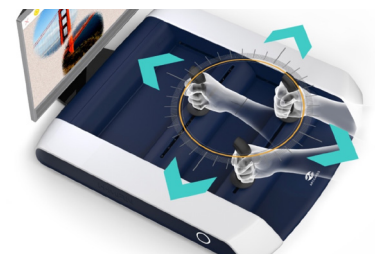
NHG has been actively collaborating with scientists and engineers from academia and research institutions. These collaborations have facilitated the research and development of early-stage deep technologies. With the clinicians' support in the co-development and validation, the clinical applicability of these technologies greatly increases. Project teams have seen the potential of its translation into real-world solutions and applications that can be commercialised to meet the needs of end users including patients and healthcare providers.

H-MAN Rehabilitation Robot

Scientists from **Nanyang Technological University, Singapore (NTU)** have collaborated with rehabilitation physicians and occupational therapists from the **Centre for Advanced Rehabilitation Therapeutics (CART) at Tan Tock Seng Hospital (TTSH)** to develop H-MAN, a portable medical robot designed to help patients undergo upper-limb rehabilitation therapy at home. The training exercises are presented in the form of serious video games (also known as 'exergames'), making rehabilitation with H-MAN an engaging and user-friendly experience. Equally important, rehabilitation plans with H-MAN can be carried out with minimal supervision from therapists and caregivers.

H-MAN has been clinically validated by a [clinical trial](#) led by PI **Dr Karen Chua** and her multidisciplinary team at TTSH-CART. Outpatients using H-MAN showed significant improvement in mobility, on par with the conventional therapy offered in hospitals. The robotic therapy also proved to be more efficient in times of manpower demands.

Upon successful completion of the clinical trials, [H-MAN technology](#) was launched as a commercial venture in 2017 by [Articares Pte Ltd](#). Articares has grown in the span of three years into an established medical technologies company with an international presence.



Since the beginning of the partnership between NTU and TTSH, NTUitive and CMTi have been firm supporters of the team through various local and international medical conferences, guiding the team in their efforts to secure competitive grants from NHIC. In support of the collaboration, CMTi proactively surfaced Articares to Enterprise Singapore on various fronts and was able to help justify the strong unmet clinical needs that Articares is seeking to address. This has given confidence to ESC to further invest in the start-up's continued research and development.

Collaboration between TTSH and Articares has produced a successful integration of clinical and engineering expertise, leading to the development of innovative solutions for rehabilitation and motor training at home and in the community

TTSH and Articares are currently developing an integrated system for robotics-assisted telerehabilitation. This innovation, empowered by artificial intelligence, has the potential to improve the intensity and quality of home-based training exercises, improve therapist productivity, and reduce direct healthcare costs. Through their

partnership, TTSH and Articares aim to contribute to the development of a robust healthcare ecosystem in Singapore, one that is well aligned with the Ministry of Health's (MOH) '3 Beyonds' strategy for future health services: beyond healthcare to health, beyond hospital to community, and beyond quality to value.





Strategic Partnerships with the Industry to Support the MedTech Start-Up Ecosystem

Enterprise Singapore first introduced Trendlines Medical, a world renowned medical incubator to CMTi in 2017. A memorandum of understanding (MOU) was established between NHG and Trendlines Medical Singapore (TMS) with the objective to jointly develop MedTech projects based on emerging clinical needs while leveraging on the technological and commercialisation expertise of Trendlines and its portfolio companies. The close partnership between NHG and TMS has resulted in the spin off of 9 start-ups between 2017 and 2020.

In November 2020, CMTi facilitated the renewal of the MOU to extend and expand the strategic partnership in co-developing innovative healthcare solutions in the following areas: Infectious Diseases, Population Health, Chronic Diseases, Ageing and Rehabilitation.

Medical technology is a cornerstone to the development of solutions that will have positive impact to human's condition.

While medical technology requires a longer time from development to commercialisation, largely due to a stringent process of clinical validation and regulatory approval, partnering physicians with strong clinical mindset and high receptivity to innovation is important towards success in such development. Our partnership with NHG's physicians bears strong testament. While not all innovation will become a successful venture, the ability to pivot or end a course of development due to market changes can be inevitable and should be encouraged in the face of innovation.

Working with the team of professionals at CMTi has helped create an effective communication platform between entrepreneurs and physicians.

Mr Eric Loh
CEO, Trendlines Medical Singapore



Top Row: A/Prof Thomas Lew (NHG), Mr Todd Dollinger (Trendlines Medical Group), Prof Benjamin Seet (NHG)
Bottom Row: Mr Eric Loh (TMS), Mr Johnny Teo (Enterprise Singapore)

PARTNERSHIP



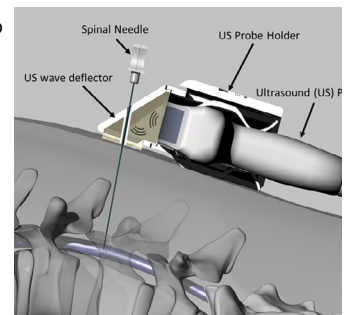
A spin off as a result of the partnership between TMS and NHG

Lumbar puncture or spinal tap could be both a diagnostic or therapeutic procedure for the extraction of cerebrospinal fluid or administration of treatments through the lower lumbar region. With knowledge of the clinical challenges and potential risks of the lumbar puncture procedure, Dr Eugene Fan submitted a clinical needs summary to the Open Innovation Challenge in 2017, that was organised by CMTi with the funding support of Enterprise Singapore.

Trendlines Medical Singapore, evaluated this clinical need and took interest in the potential clinical impact and its high commercial potential. This led to the birth of Medulla Pro Technology in 2018.

Lumbar Puncture Needle Guide

Under the clinical guidance of Dr Bin Wern Hsien and Dr Eugene Fan, Medulla Pro has developed a device that can be attached to ultrasound probes to enable real-time imaging and tracking of the needle during insertion through the deflection of ultrasound waves, which makes needle-in-plan entry possible while maintaining the clarity of ultrasound images. The device is designed to be disposable to prevent cross-contamination and is compatible with most commercially available low frequency curvy ultrasound probes.



The project team is currently preparing for the first-in-human study at Khoo Teck Puat Hospital (KTPH) for safety studies.

“

A partnership between Healthcare (NHG) and Industry (Medulla Pro) is truly successful when the elements of mutual benefit and the value adding of patient care are conspicuously present. What sustains the team in this effort is the hope that our patients will benefit from this. CMTi has catalyzed this by engaging both medical and engineering minds to collaborate on an unmet clinical need which can be solved with real time ultrasound guidance.

”

Dr Eugene Fan
Consultant
Department of Haematology, TTSH

From Left to Right:
Dr Eugene Fan (TTSH), Mr Eric Loh (TMS), Dr Bin Wern Hsien (KTPH), Mr Desmond Soh (Medulla Pro)

“

The close collaboration with NHG has provided the company with many valuable clinical inputs from Dr Bin Wern Hsien, Dr Eugene Fan, and other clinicians from NHG. Having a strong technical team at Medulla Pro Technology working on the solution with clinical inputs has helped the company in developing a solution that tackles clinical needs and help to improve on the standard of patient care.

”

Mr Desmond Soh
Project Manager
Medulla Pro Technology Pte Ltd



Navigating The Innovation Funding Landscape

In Singapore, there are various avenues to access funding that can support the development of MedTech solutions. These funds may be in the form of grants at the institution, cluster or national level or through cash investments by industry partners who believe in the commercial viability of the solution.

Did You Know?



CMTi now offers coaching to guide you on strategies to strengthen your grant application



CMTi has knowledge of the funding landscape in Singapore and can guide you to the right funding sources for your project needs.

Reach us at innovate@nhg.com.sg

JOINT FUNDING

NHG CMTi MEDTECH GRANT

To encourage the NHG family of clinicians in their innovation endeavors, CMTi provides tangible support in the form of grants to fund the development of technological solutions that are commercially viable to resolve unmet needs in healthcare. CMTi has established a MedTech innovation grant that runs every year, as a seeding grant with aims to nurture potential projects for future extramural competitive grants that may bridge to commercialisation of the product.

NHG CMTi-NHIC JOINT MEDTECH GRANT

Since 2019, CMTi and the National Health Innovation Centre Singapore (NHIC) have partnered to launch 2 cycles of the grant with funding close to \$1 million in total; that supported 10 projects. The joint aim is to leverage on the outcomes of this seed funding to seek further competitive funding at the national level to bring the solutions to implementation.

Artificial Intelligence-incorporated Versatile Dermoscopy To Facilitate Bedside Identification Of Melanoma

A CMTi-NHIC JOINT MEDTECH GRANT FUNDED PROJECT

The incidence of melanoma, a type of skin cancer, has been rapidly increasing over the last 30 years. Melanomas are often diagnosed at a later stage where the disease is more advanced and widespread, resulting in high morbidity and mortality. Early detection and accurate diagnosis of melanoma is crucial to ensure prompt treatment, reducing mortalities and morbidities. Treatment options for advanced melanomas can be expensive and debilitating, hence it

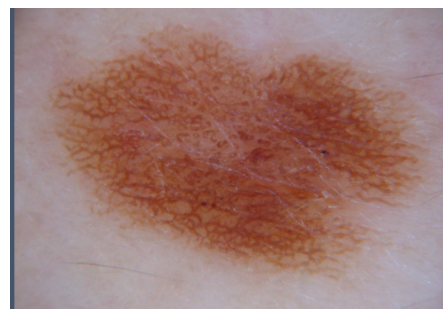
is to the patient's best interests for early diagnosis and treatment of melanomas. Dermoscopic evaluation (using a dermoscope) of melanocytic lesions (moles) to detect and exclude melanoma is the current standard-of-care in clinical practice. Current dermoscopes are costly and require specialized dermatological training for use in clinical practice. Current dermoscopic devices that are attachable to hand phones require an adapter, and are limited to a few hand phone models. This limits widespread use of hand phones to take dermoscopic images for references and analysis.

The aim of this project is two-fold, developing an AI software to identify melanocytic nevi and melanomas with high sensitivities and specificities as well as developing a prototype for a universal attachable hand phone dermoscope.

Dr Lucinda Tan and A/Prof Tey Hong Liang from the National Skin Centre collaborated with both research and industry partners to develop an AI-driven solution for bedside diagnosis of melanoma. The clinicians have partnered a research institute to develop an AI algorithm that will aid the diagnosis of Melanoma using a modified ABCD (Asymmetry, Border, Colour, Dermatoscopic structures) criteria. This AI development has been funded by the CMTi-NHIC Joint MedTech Grant 2020. The grant also funds their development of a universal attachable dermoscope that can be used for almost all models of hand phones. Dermoscopic pictures can be taken on a hand phone and these images can be directly analysed by the AI algorithm, and a risk analysis can be provided to physicians for the management of patients undergoing melanoma screening. This simple one step analysis of nevi and melanomas aims to overcome the problems and pain points that physicians encounter in clinical practice.



Clinical photo of a melanoma showing an irregular-raised plaque with variable pigmentation.



Dermoscopic photo of a benign junctional nevus demonstrating a pigment network, symmetry in color and structures in both long and short axes, a gradual fading border, and low heterogeneity in colours and structures.

Upon the successful proof-of-concept under the scope of the CMTi-NHIC Joint MedTech Grant, the clinicians put up a challenge statement under the Enterprise Singapore Healthcare Open Innovation Challenge (HOIC) to further the development of the AI algorithm and put these together for commercialisation. The team will be collaborating with Eyeris Pte Ltd, which has been awarded the HOIC funding.



Recognising The Unmet Needs Of The Global COVID-19 Pandemic

CMTi launched a one-off COVID-19 MedTech Innovation Grant Call in April 2020 to support MedTech development projects surrounding COVID-19 management.

Autonomous Mobile UV Disinfection Robot COVID-19 Protection Hood

Non-touch disinfection methods such as hydrogen peroxide vaporizer (HPV) or ultraviolet (UV) disinfection have been known to be effective against eliminating micro-organisms. As such, these devices have been adopted in TTSH as part of enhanced decontamination methods. Currently, UV disinfection is performed manually, where housekeeping staff have to move the UV disinfection device from point to point during each cycle. There are areas to improve the efficiency of performing UV disinfection using automation. Automating UV disinfection will free up manpower for housekeeping staff to perform other cleaning tasks during each UV cycle performed as the UV device is able to move to targeted high touch surfaces independently.

The fight against COVID-19 or any aerosol or droplet-driven infections hinges on containment and elimination of infectious particles. Risks of infection increase when viral loads exhaled are high (early phase of illness or transiently increased by sneezing, coughing, heavy breathing or vocalization), or spending longer periods in close proximity or in poorly ventilated spaces where particles can remain suspended in the air for long periods of time. Aerosol generating procedures and other procedures that brings persons into close proximity (e.g. polymerase chain reaction swabs for genomic sequencing, suction, nebulization, and dysphagia assessment) are necessary for diagnosis and management.



Need for an automated disinfection solution that is safe, efficient and effective to disinfect various types of surfaces in the hospital environment.



Need to limit aerosol or droplet dissemination of infectious particles during such procedures conducted in clinical environments with suboptimal ventilation called for an innovative solution.



In the early days of the COVID-19 pandemic, CMTi came to know of **PBA Systems Pte Ltd**, who was looking for a hospital partner to introduce their technology and proposal to develop and validate an Autonomous Mobile Robot (AMR) based platform integrated with a series of UV lamps. With knowledge of TTSH's unmet needs, CMTi introduced the company's engineering team to **Ms Joycelyn Sin** and **Ms Poh Bee Fong**.

Supported by the CMTi COVID-19 MedTech Innovation grant, KTPH's **Dr Angeline Seah** and **Sister Foo Meow Ling** partnered with a **Swab and Send Home General Practitioner (SASH GP)** from **Clifford Dispensary**, and the engineering team from **The Biofactory Pte Ltd** to co-develop a COVID protection hood.



Together in collaboration, the team responded to the CMTi COVID-19 MedTech Innovation Grant Call and was awarded funding to co-develop an enhanced version of the UV disinfection robot that can automatically travel around mapped environments to disinfect high touch surfaces using UV light.



The hood draws air from the head and neck region of a patient, passing it through a medical grade high efficiency particulate (HEPA) filter before discharging into the immediate environment. Its air filtration system produces a high air exchange rate per hour (ACH) of 5275 and experiments to validate containment were successful. The hood can be wiped down with alcohol or chlorine-based disinfectants and is also disposable. User acceptance testing has been performed with satisfactory results.

The protection hood can be further customized to adjust the location of access openings or reconfigured to fit the ergonomics of different practice settings. The project team foresees that further evaluation in real world practice is needed to assess its performance to further refine this prototype to help in containment of airborne or droplet infectious disease, to support control of current or future disease outbreaks.

Over the past 1 year, the project team has completed validation trials at TTSH/NCID. During these trials, the UV disinfection robot was programmed to navigate within the test sites at TTSH/NCID (i.e. Angiogram-suite and patients' room), stopping at key checkpoints to perform a UV cycle which involves the emission of UVC light for eight minutes continuously. Dosimeters were strategically placed at several high touch points to directly measure the amount of UVC dosage received on the surface of the dosimeter, and environmental sampling was conducted to compare colony count of potential patient flora before and after UV disinfection. The results of the trial indicated that the AMR UV robot is effective in eliminating the five micro-organisms selected for the test (i.e. *Methicillin resistant Staphylococcus aureus (MRSA)*, *Escherichia Coli (OXA 48-like)*, *Enterococcus faecalis van B (VRE)*, *Acinetobacter baumannii (NDM)*, *Pseudomonas aeruginosa (VIM)*) autonomously in the hospital environment.

The team will be expanding deployment of the validated AMR UV Robot in other hospital environments to complement the existing fleet of manual UV devices the hospital has acquired.



FEATURING 2 PROJECTS
TIMELY SUPPORTED BY THIS
INNOVATION GRANT



Our Innovators Share Their Experience Through Co-Development & The Support They Have Received

INNOVATOR SPOTLIGHT

Ms. Florence Tang, Senior Speech Therapist, TTSH, Shares Her Innovation Experience!

Being new to innovation

We started off pretty clueless about what was available in terms of grants, what companies we could approach and how to go about collaborating with others.



Thankfully, I was introduced to Amanda and Hannah from CMTi, who introduced us to the COVID-19 MedTech Innovation Grant, and linked us to potential collaborators. They had the broad view of the innovation journey and ecosystem, so they were able to advise us on what to focus on at every step.



Her motivation to innovate

To me, innovation is about making a difference. Being able to recognise a need and coming up with a potential solution is exciting. The hard work is finding out if your solution works and reconfiguring it until it does (or your resources run out). Thankful for all the mentorship and support we've received for this project.

On the partnership with Taggle

It has been great working with Taggle. There were a lot of uncertainties at times due to COVID-19 and other unforeseen changes in the IT infrastructure, but Taggle has proven themselves a committed partner, working through every challenge with us. We look forward to our continued collaboration.

An Optimised Telepractice Platform That Can Enable Speech Therapists To Provide Real-Time Intervention to Patients with Speech And Voice Disorders

In response to the COVID-19 situation, patients' access to face-to-face speech and voice therapy services have been deferred due to stay home measures and the segregation of essential and non-essential therapy services. These restrictions have necessitated an increased need to deliver therapy via tele-practice for continuity of care.

The idea of tele-practice in the TTSH Speech Therapy Department was first introduced in 2019 pre-COVID-19, as a way to enable convenient access to the Lee Silverman Voice Treatment (LSVT LOUD) programme, a global gold-standard speech and voice treatment targeted at patients with Parkinson's Disease that requires patients to attend hourly treatment sessions 4 days a week.

Presently, tele-practice services for LSVT LOUD are conducted virtually via Zoom, and requires separate voice measurement equipment, such as the decibel and pitch meter, to be placed at a fixed distance facing the webcam on the therapist's end, in the patient's view. However, current video-conferencing platforms are less than ideal as therapists experience the dampening of patient's voice quality and difficulty in obtaining absolute acoustic measurements. As a result, outcome measures collected during therapy sessions are variable, contributing to a sub-optimal reflection of patients' progress in treatment.

To address this clinical challenge in the heightened need for telepractice services, TTSH Speech Therapists have been collaborating with Taggle Pte Ltd to co-develop a fit-for-purpose digital application that incorporates audio-video conferencing capabilities and allows for the real-time collection of voice and speech parameters without the need for additional equipment. The project team is currently developing the prototype application and preparing for clinical trials.



Current LSVT tele-practice set-up



TTSH Speech Therapy team
From Left to Right: Ms Ferlin Seow, Ms Ong Yee Teng, Ms Florence Tang



INNOVATOR SPOTLIGHT

Building An Ecosystem for Customised Medical 3D Printed Solutions

In recent years, growing interest in precision medicine has driven advancements in the additive manufacturing space and revolutionised healthcare. 3D printing enables the provision of personalised medical solutions that can potentially improve patient education and healthcare outcomes.

NHG envisions a patient-centric 3D printing ecosystem for personalised medical solutions. To demonstrate a proof of concept for this vision, Dr Michael Yam from the Department of Orthopaedic Surgery and Dr Candice Leong from the Department of Diagnostic Radiology collaborated and started 3D printing in TTSH. The 2 departments represented by the pair are a propitious partnership; diagnostic radiology has the medical images required for conversion into 3D models for printing, which orthopaedic surgeons can use in their field of work. Since 2020, the team has printed more than 50 anatomical models for pre-operative planning and education, and 15 surgical jigs and guides for various intraoperative surgical interventions.

The motivation and efforts to introduce and trial 3D printed solutions in TTSH has progressively helped to convince fellow clinicians and stakeholders of its utility. This has greatly encouraged the innovative duo to advance to the next step of their plans - to setup a 3D printing facility in TTSH for clinical 3D printing activities on a larger scale, and facilitate tailoring of customised, patient-specific solutions to improve healthcare delivery. CMTi is facilitating a collaboration between the clinicians and industry partners who are well matched in their technical, regulatory and business expertise to help set up this 3D printing centre.



*Dr Michael Yam
Associate Consultant,
Department of Orthopaedic
Surgery*

*Dr Candice Leong
Consultant
Department of Diagnostic
Radiology*

*Share their Motivations &
Meaningful Partnership*

Motivations to innovate

Dr Michael: When I see a gap in an aspect of patient care, I feel compelled to try and bridge this gap. Every gap identified is an opportunity for improvement. Innovation can address these gaps by bettering work processes, improving work environments and outcomes for patients.

Dr Candice: I feel that innovation is about constantly improving and looking for ways to do things better both as an individual and an organization. From a healthcare organization's perspective, innovation is an important and necessary tool to achieve better care outcomes and adapt to an evolving healthcare system. As a healthcare professional, I have been given the opportunity to harness organizational capabilities and infrastructure to contribute to a culture and ecosystem that uses innovation to deliver value-driven and better healthcare to the community that I serve. Indeed, seeing the benefits that innovation can bring to the organization and ultimately to patients' lives gives meaning to the work that I do.

On the Partnership

Dr Candice: Radiology, apart from being a key diagnostic tool in medical practice, has been crucial in pre-surgical planning. Medical imaging forms the very core of the 3D printing process. My partnership that represents the capabilities of TTSH Department of Radiology in this 3D printing initiative, oversees the initial stages of image acquisition and data transfer through our state-of-the-art imaging devices, software and trained personnel (radiographers). We ensure that image quality is optimized to support the production of anatomically accurate and precise printed products. In addition, the department's subspecialty radiologists provide clinical expertise in the post-processing stage of the 3D printing work flow, particularly for accurate anatomical delineation within various body systems. The close relationship that exists between the radiology department and our clinical colleagues enables a synergistic and multidisciplinary approach which is essential to the 3D printing process.

Envisioning the Future of Medical 3D Printing

Dr Michael: I foresee that 3D printing has vast potential to impact healthcare on many levels. It will provide useful tools for medical school education, medical training and simulation. It will aid preoperative planning, improve intraoperative precision and efficiency with surgical adjuncts and customised implantables. This will reduce operative time overall, thereby resulting in better patient outcomes. It will be useful not only in surgical and medical specialties, but also allied health specialties such as nursing and prosthetics. Different institutions will contribute by adding their domain knowledge for the application of 3D printing.



I view innovation as a part of clinical work - translating ideas into bettered processes and ultimately improved patients outcomes is part of the journey toward clinical excellence. Innovation can be incorporated into daily clinical work!

Dr Michael Yam



Abdominal aortic aneurysm printed for patient education, preoperative planning and pre-deployment of stent





Making A Difference To Patients' Lives & HealthCare

To demonstrate proof of concept or proof of value, clinical trials are typically conducted to test-bed the solution in the actual clinical environment with the appropriate target group. CMTi works closely with various institutions' clinical research and innovation units and can direct you to the right sources for advice on clinical trial planning.

- CLINICAL TRIALS IN PROGRESS - Cardiac Rehabilitation Anytime Anywhere with Heart-Track™

The Healthcare Context

Exercise training is a cornerstone of cardiac rehabilitation (CR), which is strongly recommended for patients after undergoing coronary revascularisation. Patients who attend CR have reduced cardiovascular mortality and better quality of life. Furthermore, it has been evidently shown that for every three patients who undergo CR, one patient does not get readmitted into a hospital for a repeat cardiac event. The ability to perform exercise regularly, safely and effectively is crucial in achieving these benefits. Data from 2016 to 2018 revealed a low take up rate of CR as well as a downward trend in TTSH. This increases the risk of an imminent cardiac event, potentially increasing burden to the healthcare system, amplifying the need to be future-ready.

“
Through the feasibility trial, clinicians were able to gain deeper insights into user behaviours and preferences and refine the prototypes to improve on its user friendliness. The ongoing non-inferiority clinical trial is important to prove that Heart-Track is safe and effective, comparing to the physical CR exercise class. Throughout the innovation journey, we learnt that we have to always stay agile and resilient, try different ways to overcome the challenges and barriers, and press on to reach the end goal.
Mr Ashton Neoh, Principal Physiotherapist, TTSH

Pain Points

- Inconvenience of travel
- Inflexible exercise timings
- Work commitments

Key Insights

- Survey Findings
80% patients prefer using digital solution for CR
- Patient Interviews
Patients preferred to exercise at own time, wherever they are

NEEDS STATEMENT

A way to empower patients to exercise independently at home while ensuring safety and effectiveness to reduce the risk of a repeat cardiac event

The Solution

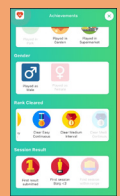
To address this unmet need, TTSH Physiotherapists and Cardiology team collaborated with Taggle Pte Ltd to co-develop Heart-Track™:



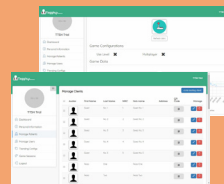
Heart-Track™



Wearable Heart Rate Sensor provides continuous monitoring for safety & effectiveness



Mobile App delivers personalised CR with inbuilt algorithms for automated exercise prescription & progression



Cloud-Based Web Portal remote monitoring



Gamification Components to make CR enjoyable to increase exercise compliance

A personalised digital cardiac rehabilitation solution that targets cardiac patients between 21 – 65 years old, who use smart devices and are physically able.

Clinical Trials

A feasibility study was conducted in August 2018 with CR support group participants to assess user friendliness and satisfaction. Prototype refinements were made based on feedback collected.

With the refined prototype, the team has progressed to the next stage, a non-inferiority randomised controlled trial that aims to compare the safety and efficacy between conventional center-based and digitalised CR.

Clinical trials are currently in progress and aim to be completed by the end of 2021.

Preliminary results revealed that patients found Heart-Track™ to be non-inferior to conventional center-based CR program in terms of clinical effectiveness and safety with no adverse events reported throughout its use. Overall, 83% of users rated satisfied or very satisfied with Heart-Track™ and they would recommend it to others.

Healthcare Outcomes



Mr CHAI T. S., age 65

“I feel comfortable exercising with Heart-Track as it guides me to exercise within the appropriate heart rate.”

“The audio messages provided real-time feedback and encouragement to remind me to keep to the target heart rate zone set and to encourage user to continue exercising.”

TTSH Project Team

Physiotherapy Department

Ms Jaclyn Chow
Mr Ashton Neoh
Mr Rethinam Ganesan

Department of Cardiology

Dr Violet Hoon
Dr David Foo

Moving forward, Heart-Track™ has been chosen for the first launch of actualisation and implementation for patient's use under the upcoming NHG HealthApps platform and digital applications factory. Being the pioneer application for the digital prescription track in NHG HealthApps, Heart-Track's conceptual framework will be subsequently used for other medical conditions and for clinicians to come onboard to the HealthApps platform without the need to reinvent the wheel.



Making A Difference To Patients' Lives & HealthCare

- PILOT STUDY COMPLETED - Maggot Debridement Therapy In TTSH

Maggot debridement therapy (MDT) using sterilised medical grade maggots has been described since 1832. It is useful as a means of biological debridement of tissue in infected ulcers and diabetic ulcers and indicated for chronic wounds that have moist slough where surgical debridement is not required or persistent wounds that fail chemical debridement and has emerging evidence for use in multiple drug resistant wounds (Naik & Harding, 2017). The mechanisms of action of medical maggots include debridement by mechanical and proteolytic enzymes, disinfection, stimulation of healing and biofilm inhibition.

While MDT has been reported extensively in Europe and America, it has not been available in Singapore in recent years. Prior limitations included the fact that the nearest production facility is 8 hours away by plane in Australia. A local company [Cuprina Pte Ltd](#) was engaged with CMTi and this culminated in locally sourced medical grade MDT being re-introduced into the Singapore market.

In conjunction with Cuprina, the Vascular Surgery Service performed a pilot study evaluating the use of sterile larvae of *Lucilia cuprina* (tropical blowfly maggot) for the treatment of diabetic foot ulcers. The study's aim was to demonstrate the safety of single-use MEDIFLI medical grade maggots and to demonstrate its efficacy by reduction in slough on the wound bed.

Eleven patients were recruited, who underwent at least one week of inpatient MDT with at least two cycles of MEDIFLI maggot therapies. Results were very promising with minimal side effects besides mild discomfort with a mean visual analogue pain score of 3.3. Average slough reduction following MDT was 15% after one cycle and 45% after two cycles.

Dr Yong Enming
Consultant, Vascular Surgery Service, General Surgery, TTSH



1 Baseline wound pre-treatment



3 Wound post 2 cycles of MDT



2 Maggots on wound during MDT



4 Wound closed 5 months post MDT

MDT using locally produced sterile maggots is a safe and a useful adjunct in the treatment of diabetic foot wounds.

To Illustrate the Various Routes Leading To Commercialisation Take a Look at These Success Stories of Innovation!

Follow NHC CMTi on LinkedIn to learn more about NHC Group Research's latest research & innovation highlights!



1 Co-development of a solution with a company, with jointly owned foreground IP and eventual licensing of institution's share of IP to the company for commercialisation rights

GentleFoods - 3D Moulded Pureed Meals

Pureed meals require extra effort and skill to prepare and are not commonly available in our local community. It is often not visually appealing and the addition of food thickeners to improve thickness and cohesiveness can result in deviation from the original flavour of the dish. As a result of altered taste, texture, appearance, and the inconvenience in food preparation, patients may choose not to consume their recommended pureed meals, leading to risks of aspiration, choking due to obstruction of the airway, and malnutrition as a result of poor oral intake. In addition, clinicians often receive feedback from caregivers about the significant time and effort required to prepare pureed meals. Despite their best intentions, caregivers may still be unable to prepare the correct food texture leading to frustration as they see their loved ones coughing and choking when eating their meals.



To ease the preparation of pureed meals and increase the accessibility of such ready-to-eat meals to patients in the community, **Speech Therapists and Dietitians from TTSH collaborated with SilverConnect Pte Ltd** to develop a range of 3D moulded pureed bento meals that are visually appealing, locally flavoured, and balanced in nutrition. Bento flavours include Curry Chicken, Rendang, Sweet and Sour Fish and Hainanese Chicken Rice.

These have been trialed with TTSH patients and findings revealed that the 3D moulded appearance positively influenced patient meal satisfaction, while bento flavour options with more acceptable taste to patients had comparable influence on oral consumption as hospital pureed meals.

GentleFoods has commercialised these ready to eat meals since mid 2020 and are available online at the company's [website](#) and their new retail café.



Sweet & Sour Fish With Broccoli And Carrots



Hainanese Chicken Rice



Bedside Alarm Recognition (BAR)

Most hospital devices such as medication infusion pumps or ventilators are fitted with an audible alarm for the purpose of alerting nursing staff for timely intervention. However, in an isolation ward where room doors are closed, the sound level from these alarms are inadvertently lowered or inaudible to nurses outside the room. When nurses are unable to hear the alarm, this could drastically impede the intervention that is critical to prevent a potential adverse event. A system that can continuously pick up all types of sounds, such as a baby monitor, is not suitable as it may capture private conversations in the ward and intrude on the privacy of patients.

To address these issues, **TTSH Nursing and CoNEX Healthcare Pte Ltd** embarked on a collaboration in 2020 to co-develop **BAR®**, a bedside alarm recognition system.

The system is trained to recognize and pick up alarm sounds given off by medical equipment in single or isolation rooms to alert nurses for timely intervention.



BAR Device Unit by bedside detects and recognizes medical device alarms



External Alarm Unit placed outside the isolation ward is triggered to alert nurses

2 NHG institution collaborates with a research institute or academia, and subsequently a company spins off with the co-developed licensed technology

Smart Medical Solution for Early intervention of Congestive Heart Failure

The project started off with a collaboration between **Dr David Foo, Senior Consultant Cardiologist from TTSH and A/Prof Ser Wee from NTU's School of Electrical and Electronic Engineering**. The team worked together to develop an acoustic-based AI driven technology that can record and differentiate breath sounds to help detect fluid accumulation in the lungs in patients with congestive heart failure.

The NTU team licensed the technology from NTU and TTSH and spun-off a company - **SPACE (MedTech)** to bring the technology to commercialisation.

The eventual product is a Smart Medical Solution for Early intervention of Congestive Heart Failure, which consists of a digital stethoscope, a mobile application and a patented algorithm.



3 NHG institution develops IP in-house or as joint IP in collaboration with a research institute and the IP is then licensed to a company for commercialisation

Fortitude COVID-19 RT-PCR Test Kit

In response to the COVID-19 pandemic, **Tan Tock Seng Hospital and The Agency for Science, Technology and Research (A*STAR)** developed a diagnostic test which can detect the presence of the SARS-CoV-2 virus (COVID-19) quickly and with high accuracy. Fortitude is the first "ready-made" hospital lab diagnostic kit that has received Singapore Health Sciences Authority's provisional authorisation for clinical use. It was licensed to **MIRXES Pte Ltd**, a Singapore-headquartered diagnostics company, for mass production and sales worldwide. Since February 2020, Fortitude has commercialised globally in more than 45 countries, with more than 7 million tests deployed.



3D Printed Spectacle Face Shield

Due to the COVID-19 pandemic, there has been an increased interest in the design of personal protective equipment (PPE). As patient-facing healthcare workers are now expected to don PPE for long hours while carrying out their daily clinical work, the conventional designs of several types of PPE – such as face masks and face shields – have been challenged, in terms of comfort, usability, as well as how it affects interactions with end-users and the environment.

The **Centre for Healthcare Innovation Living Lab (CHILL)** at TTSH has redesigned and developed a reusable face shield that incorporates a 3D-printed spectacle frame. This innovative spectacle face shield has been trialled and validated by healthcare workers. The commercial value of this development caught the attention of **Siemens Advance Manufacturing Transformation Centre (AMTC)** who took interest and licensed the design from TTSH. To enhance the face shield's design, Siemens AMTC applied their proprietary anti-bacterial and post-processing method to strengthen the frame. The product has since been commercialised and implemented in TTSH.





“HOPE-S” in Future Mental Healthcare

Schizophrenia is a mental disorder with a fluctuating illness course. Individuals can suffer from symptom exacerbations and relapses which places a high burden on patients, their caregivers and the healthcare system. Relapse prevention, with a concomitant reduction in hospitalisation, is an important treatment goal. Close and continuous monitoring of patients has the potential to detect early warning signs preceding relapse and so enable early interventions to prevent an adverse clinical outcome. **Digital phenotyping**¹, defined as moment-by-moment quantification of the individual-level human phenotype in situ using data from personal digital devices such as smartphones, **is a promising approach in predicting relapse in patients with schizophrenia.**

Launched in November 2019, the **Health Outcomes via Positive Engagement in Schizophrenia (HOPE-S) study** is a collaborative effort between the Institute of Mental Health (IMH) and the MOH Office for Healthcare Transformation (MOHT). In this 6-month observational study, **digital phenotyping devices, i.e., smartphones and commercially available Fitbit wrist wearable devices, are employed to collect digital data relevant to sleep, heart rate, locational variance and entropy, smartphone usage, ambient light, and physical activity** on 100 recently-discharged participants with schizophrenia spectrum disorder. Participants' clinical, cognitive, functioning and health utilization outcomes are collected at 6-weekly intervals. **Various state-of-the-art machine learning techniques are being applied to build an artificial intelligence model, which uses these digital phenotyping features to predict relapse in patients with schizophrenia and to monitor their mental health status**².

The study examines how digital phenotypes are associated with clinical and health utilization outcomes, develops a model for patient monitoring and relapse prevention, and evaluates the feasibility and acceptability of wearable devices and smartphones in patients with schizophrenia³. The next phase of HOPE-S will be an interventional study to evaluate the effectiveness of such a digital platform augmented with various triggered interventions to prevent adverse clinical outcomes and improve mental health and wellbeing of persons with schizophrenia.

¹Torous, J., Kiang, M. V., Lorme, J., & Onnela, J. P. (2016). *New Tools for New Research in Psychiatry: A Scalable and Customizable Platform to Empower Data Driven Smartphone Research*. *JMIR mental health*, 3(2), e16. <https://doi.org/10.2196/mental.5165>

²Wang, X., Vouk, N., Heaukulani, C., Buddhika, T., Martanto, W., Lee, J. C. K. & Morris, R. J. T. (2021). *HOPES: an integrative digital phenotyping platform for data collection, monitoring, and machine learning*. *Journal of Medical Internet Research*, 23(3), e23984-. <https://dx.doi.org/10.2196/23984>

³Martanto W, Koh YY, Yang Z, Heaukulani C, Wang X, Abdul Rashid NA, Sim A, Zheng S, Tang C, Verma S, Morris RJT, Lee J. *Association between wrist wearable digital markers and clinical status in Schizophrenia*. *Gen Hosp Psychiatry*. 2021 May-Jun;70:134-136. doi: 10.1016/j.genhosppsy.2021.01.003.



Photo taken during one of the study team meetings

From Left to Right:
Dr Soon Chun Siong, A/Prof Ang Seng Bin, Dr Gerard Wong, Dr Jimmy Lee, and Prof Robert Morris

Building Research Capacity to Strengthen Research in Nursing, Pharmacy and Allied Health Professions

Talent development is a key thrust of NHC's research strategy and we recognize the pivotal role that Clinician Scientists (CSs) play in conducting research and translating newfound knowledge into improved health outcomes.

As nurses, pharmacists and allied health professionals (AHPs) make up the majority of the healthcare workforce, developing them as CSs and building research capacity for these family groups are important to drive incessant improvement in healthcare and public care. With complementary research skills, they are able to strengthen their existing clinical expertise and to utilize critical thinking skills and evidence-based practice to development of new therapies and diagnostics, enhance patient care, and improve care outcomes.

NHG and its primary academic partner, NTU Lee Kong Chian School of Medicine (LKCMed) jointly offer a **comprehensive research talent development roadmap** comprising programmes listed below which are tailored to support clinicians in pursuing careers as CSs and to nurture them to be competitive at the national level.

- ♦ **CS Preparatory Programme (CSPP)** aims to integrate research into the early phase of one's career by equipping them with the basic skills and knowledge for research conduct
- ♦ **CS Fellowship (CSF)** equips our CSs with a formal research training through a PhD

- ♦ **CS Career Scheme (CSCS)** provides post-doctoral support through project funding and salary support to prepare our CSs to be competitive for national awards such as the NMRC Transition Award, the Clinician Scientist Award and subsequently the Singapore Translational Research Investigator award.

From FY2020, these programmes have been extended to nurses, pharmacists and AHPs in NHG. Here are what some of our recent programme awardees have to say about the programmes, and their motivation and aspirations for research:

“
It is an immense privilege to be awarded the CSPP as an AHP. The journey so far has been challenging but extremely rewarding. I want to thank the CSPP faculty and my mentors who have been instrumental in helping me to start on this research adventure, thank you so much!



Mr Ng Chuan Guan
TTSH
Senior Podiatrist
FY2020 CSPP
Awardee



RESEARCHER'S FEATURE

“

Research may seem to be an exclusive field, even a little bit intimidating but it is a part of the lifelong learning in Pharmacy profession. It sparks off when one starts to wonder how a process, a workflow or a treatment plan can be improved. Don't stop at wondering; talk to your colleagues and friends, leap forward to test your ideas, and be inspired to find out what may unfold before your eyes.

”



Ms Winnie Choo
NSC
Senior Pharmacist
FY2020 CSPP Awardee

“

It's a golden opportunity to embark on research for clinicians. Clinicians have lots of good ideas and don't have research knowledge to conduct research on their ideas. The CSPP is a great program to support and guide clinicians to start their research journey. This will allow clinicians to carry out research ideas while still practicing as a clinician.

”



Mr Jayachandran Balachandran
WHC
Principal Physiotherapist
FY2020 CSPP Awardee

“

I strongly believe that promoting evidence-based practice is essential in improving clinical patient care. As a nurse clinician being passionate about wound care research, it has been very rewarding to generate, adopt and incorporate local evidence into my teaching and patient care. Being awarded the NHG-LKCMed CSF has provided me an exciting opportunity to further hone my research skills. I hope to further establish evidence-based nurse-led wound care services in primary healthcare to better serve our population.

”



Ms Julia Zhu Xiaoli
NHG Polyclinics
Nurse Clinician
FY2021 CSF Awardee

“

I have always aspired to bring about excellence in pharmacy practice through clinical care and research. However, finding time to plan and conduct research has always been a challenge while juggling clinical and administrative duties. Therefore, I am very grateful to be awarded the CSCS as this will provide me with protected time for research while fulfilling my clinical duties. This would also not be possible without the support from Ms Lim Hong Yee, Director of Pharmacy and my research mentor, A/Prof David Lye and also the CRIO and NHG CSD colleagues!

”



Dr Ng Tat Ming
TTSH
Principal Pharmacist (Specialist)
FY2021 CSCS Awardee

To find out more about the programmes, please click [HERE](#).
Contributed by: Clinician Scientist Development Office, NHG Group Research



Training Calendar

Date	Training Courses	Course Provider
Monthly	Good Clinical Practice (Online)	NHG Group Research
	(PCR100) Study Start-Up: Budgeting, Case Report Form Design and Database Design*	
	(PCR200) Study Conduct I: Subject Recruitment and Informed Consent*	
	(PCR300) Study Conduct II: Documentation, Safety Reporting and Investigational Products*	
	(PCR400) Monitoring, Audits and Inspections*	
5 Nov 2021	Basic SPSS Workshop	TTSH CRIO
8 Nov 2021	Prognostic Model	NHG Group Research
17 – 19 Nov 2021	Biostatistics	NHG Group Research
30 Nov 2021	Intellectual Property (IP) Seminar – For NHG staff only	NHG Group Research
8 Feb 2022	Evidence in Healthcare	NHG Group Research
25 Feb 2022	Introduction to Pharmacogenetics	TTSH CRIO
4 Mar 2022	Basic SPSS Workshop	TTSH CRIO
10 Mar 2022	Manuscript Writing and Poster Design	TTSH CRIO
11 Mar 2022	Basic SPSS Workshop	TTSH CRIO

*Blended learning courses involving Online Lectures coupled with a Classroom Workshop on a stipulated date.

Dates are subject to changes without prior notice.

For registration and full details on courses by:

NHG Group Research

please visit www.research.nhg.com.sg
(Training & Education → Register for Courses and Other Events)

TTSH CRIO

please contact Ms Siti Aisha Binte Jaffar
Siti_Aisha_JAFFAR@ttsh.com.sg

Chicken Soup for the Busy Coordinator

Education to facilitate high standards of research conduct

May 2021:
How to Prepare for a Study Review or Audit?



Jun 2021:
Pre-screening / Screening Process: Documentation and the Use of Subject's Identifiers



July 2021:
Minimum Training Requirements for PI and Study Team Conducting Human Biomedical Research (HBR)



Aug 2021:
Impartial Witness & Witness In Informed Consent-Taking For HBR Studies



Sep 2021:
How to conduct and document E-SIV



Click on the respective issues to find out more!

