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Continuing Education

A bridge to excellence
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EDUCATION



National
Neuroscience Institute
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ADVANCING IN NEUROTECHNOLOGY

MOU between McLaren Applied Technologies and NNI signals new possibilities in Neurological Care.

A unique collaboration between McLaren Applied Technologies – the brains behind many of Formula 1 racing’s ground-breaking technologies and the National Neuroscience Institute (NNI) is paving the way for new standards in patient monitoring. It is believed that enhanced monitoring could eventually lead to more accurate diagnoses as well as the formulation of pre-emptive treatment strategies for patients suffering from neurological conditions.

On 2 November 2016, representatives from McLaren Applied Technologies and NNI signed a Memorandum of Understanding (MOU) to explore the use of predictive analytics and data management technology to advance neurological care.

Making Sense of the Data

Mr Lim Kok-Leong, Regional Director, APAC, McLaren Applied Technologies, shared in his welcome address that McLaren, one of the oldest teams in motorsports, was today at the forefront of data management technology.

“We have over 300 sensors in our Formula 1 cars which generate millions of data points per second. We then build predictive models based on historical data. Before each race, we run in excess of 150,000 simulations to diagnose the health and performance of the cars, and scenario plan for bad weather and car crashes. We then use the data after the race to refine the performance for the next race.”

“This may sound obsessive and we don’t expect other industries to follow suit, but healthcare is a unique industry which can definitely benefit from such a technology,” he said.

Associate Professor Ng Wai Hoe, Medical Director of NNI, agrees that data is indeed critical in the healthcare setting for accurate diagnosis and treatment. He said that the way data was being used today bordered on two extremes.

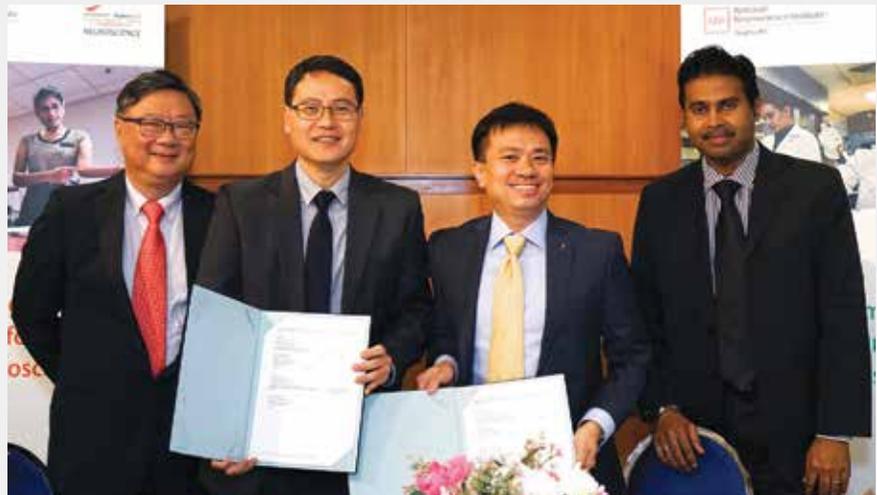
“On one hand, there is the outpatient setting where a doctor only gets to see a patient periodically. During these appointments, patients will try to recall everything that has happened over the last few months. However, this is often subject to recall bias and errors. On the other hand, we have the acute and emergency care setting, where we are doing minute

to minute collection of data such as ECG, heart rate, blood pressure, etc. The problem then is how to make sense of all that data.”

“Through this partnership with McLaren, we will be able to improve collation of data, reduce recall bias, and make use of advanced analytics to better understand the data and come up with new treatment strategies,” said A/Prof Ng.

Application of Technology

Dr Jai Rao, Consultant, Department of Neurosurgery and Lead of the Head Injury and Trauma Programme at NNI, said that he first heard about the technologies that McLaren Applied Technologies was developing some two years ago during a chance meeting.



(From left) A/Prof Seow Wan Tew, Deputy Medical Director (Academic Affairs), NNI, A/Prof Ng Wai Hoe, Medical Director, NNI, Mr Lim Kok-Leong, Regional Director, APAC, McLaren Applied Technologies, and Mr Rakesh Menon, Chief Engineer and Head of Development, APAC, McLaren Applied Technologies.

**WE HAVE OVER
300 SENSORS
IN OUR FORMULA 1 CARS
WHICH GENERATE
MILLIONS OF
DATA POINTS
PER SECOND.**

**- Mr Lim Kok-Leong, Regional Director,
APAC, McLaren Applied Technologies**



“It took a while for me to understand the technology. However, once I understood, I saw the numerous possibilities for bringing technology into patient care,” said Dr Jai.

Dr Jai, who is also Head in the Division of Neurosurgery at Changi General Hospital, shared that the current methods of diagnosis and treatment plans were often dependent on probabilities and the doctor’s experience. This, however, required a learning curve.

“We need to develop a new systems approach to the way doctors give advice. With a huge data set of per second data, are we able to predict things before

they happen? We need to move towards preventive rather than reactive,” he said. One area of improvement that will be explored through this MOU is the monitoring of patients in their home setting. While there are already many wearable devices available in the market today that can monitor heart rate and blood pressure, the advantage of this partnership is that clinicians can now communicate directly to the engineers the salient features required and the important factors that need monitoring.

Trials to Begin in 2017

Beginning from January 2017, NNI patients will be given a device to wear, which can monitor up to six different parameters at any one time.

Dr Jai said that the advantage of using such an approach was that clinicians would now be able to monitor over a longer period of time the patient’s functional decline, take away the anxiety that comes with undergoing medical tests at the hospital, and help patients to better

understand their condition using hard figures and data.

“Our device allows us to collect different data points, including heart rate, blood pressure and even gait. Currently, it’s just a lot of data and figures, and we want to look at other industries such as motorsports to see if we can benefit from a new perspective on how to interpret the data.”

“Eventually, we hope to reach a point where we can predict if a patient is going to get better or worse. We can then simplify the device using safety markers, to indicate using simple red, yellow or green signals, the patient’s condition, and if they should be coming down to the hospital for treatment,” Dr Jai said.

In closing, Dr Jai said that this partnership was in line with NNI’s vision of “We shape neuroscience care for a better tomorrow”.

“It took us two years to convince all the relevant parties to make this MOU a reality, and now we look forward towards many more years of collaboration ahead.”



Dr Jai Rao, Consultant, Department of Neurosurgery, NNI, giving his presentation on Innovative Neuroscience Care.

WORKING TOWARDS HARMONISATION IN NNI

Ever since the formation of the National Neuroscience Institute (NNI) in 1999, its mission has always been grounded in the three pillars of Clinical Care, Education and Research.

This issue, NeusLink catches up with Deputy Medical Director (Clinical) of NNI, Associate Professor Au Wing Lok, to learn more about the latest plans NNI has in store towards the harmonisation of the institute's multi-faceted services.

Moving towards a New Phase

A/Prof Au shares that ever since his journey started with NNI in 2000, he has witnessed NNI's commitment towards Clinical Care, Education and Research bear much fruit.

"As the national centre for neuroscience, we are definitely at the forefront in clinical care. I'm proud to say that NNI is also well known on the education front; we are the training centre for neurology – all the way from undergraduate to postgraduate level. And, on the research front, we have produced a few clinician scientists as well as received a number of translational research grants," he says.

A/Prof Au, who also heads the Department of Neurology (TTSH campus) feels that the next step forward lies in the successful harmonisation of services, both physically across different hospitals and

partner institutions, as well as through the integration of Clinical Care, Education and Research services.

Harmonisation across Different Hospitals

NNI today operates across multiple sites, in its two main campuses at Tan Tock Seng Hospital (TTSH) and Singapore General Hospital (SGH), as well as in partner hospitals: KK Women's and Children's Hospital (KKH), Changi General Hospital (CGH), Khoo Teck Puat Hospital (KTPH), as well as the upcoming Sengkang General Hospital (SKGH).

A/Prof Au says that while NNI recognises that different hospitals have different cultures and practices, there is a "need for us to harmonise our work processes to ensure that our services are consistently of high-quality on a national level".

Hence, in 2015, staff from NNI attended their first strategic retreat under new medical director, A/Prof Ng Wai Hoe to brainstorm on ways in which to move the harmonisation process forward. Various workgroups were formed in this retreat including one for the Harmonisation of Clinical Services, headed by A/Prof Au.

For the past year, he has been busy getting staff from across different levels and departments to be involved in the workgroup. He says: "I have doctors,



nurses, researchers, educators and administrative staff from across both campuses involved. The team needs to have common goals, values and visions so that we can move forward effectively as a group."

"Through subsequent rounds of brainstorming, I'm glad that we have managed to come up with a few strategic programmes. Each of these programmes will have certain deliverables and its own quality indicators," says A/Prof Au.

One positive outcome that has already happened as a result of these sessions is the rotation of staff across both campuses. A/Prof Au explains: "We wanted to make the programme as seamless as possible, such that it is not just unique to a certain campus or hospital. Best practices should be consistent throughout."

Fostering Greater Interaction between Clinical Care and Research Services

A truly harmonised and integrated programme, A/Prof Au envisions, is one that is not only seamless across partner institutions, but is also multi-disciplinary in nature.

“Our programme, therefore, not only involves the neurology, neurosurgery and neuroradiology departments, it also involves allied health, nursing and researchers, to enable us to provide academic and clinical services at the highest level.”

“The first five programmes that we are rolling out in Phase One coincide with our research strategic programmes. Our plan is to link the clinical and research programmes together, involving the same members, so that we can charter the path together,” says A/Prof Au.

A/Prof Au shares that traditionally research scientists and clinical staff worked separately on basic science and clinical research respectively. “To move forward, we want to partner these two groups together to work towards translational research. Ultimately, we do research so that we can innovate our care model to benefit patients,” he says.

One of the things that the workgroup has so far come up with is increasing interactions between clinicians and researchers. “We are conscientiously getting them to meet within the programmes and having more NNI-wide meetings,” says A/Prof Au.

“The other thing we are doing is gelling up the idea of research mentorship. We hope to have more clinician scientists as well as basic scientists take up this role as mentors for the younger generation,” he says.

Working Hand in Hand to Further Education

In addition to building harmonisation between clinicians and researchers, the Clinical Services workgroup also



works closely with a separate Education workgroup to innovate new models for education and training.

While existing efforts have already resulted in the rotation of senior residents across the TTSH and SGH campuses, A/Prof Au shares that the ultimate goal is for the residency programme to evolve towards a “truly integrated programme where residents will be rotated throughout the partner hospitals and receive training from all the various faculties”.

NNI’s educational vision is not only limited to doctors. “We also hope to see trainees from nursing, allied health and even researchers come to NNI for attachments. The challenge now is to see how we can innovate and get our faculty to teach this whole group of learners in a harmonious fashion,” shares A/Prof Au.

Eyes on the Target

Even as A/Prof Au and his team are eagerly looking forward to the many exciting developments ahead, he is careful not to lose focus on the big picture. He concludes: “My hope for NNI is that we are able to function together as one, with compassion, integrity and collegiality. Ultimately, our main goal is to service the patients and their caregivers. We want to ensure that they get the consistent and high quality clinical care that we have promised them.”

FIRST PHASE

Harmonising clinical and research programmes

- 1. Stroke and Cerebrovascular Diseases**
Led by A/Prof Deidre Ann De Silva, Senior Consultant, Department of Neurology (SGH campus)
- 2. Parkinson’s Disease and Movement Disorders**
Led by A/Prof Louis Tan, Senior Consultant, Department of Neurology (TTSH campus)
- 3. Dementia and Cognitive Neuroscience**
Led by A/Prof Nagaendran Kandiah, Senior Consultant, Department of Neurology (TTSH campus)
- 4. Brain Tumour**
Led by A/Prof Ng Wai Hoe, Medical Director and Senior Consultant, Department of Neurosurgery
- 5. Head Injury and Trauma**
Led by Dr Jai Rao, Consultant, Department of Neurosurgery

SECOND PHASE

(In the next three to five years)

- 1. Motor Neuron Disease and Neuromuscular Diseases**
- 2. Epilepsy and Sleep Disorders**

THIRD PHASE (BY 2020)

- 1. Spinal Disorder**
- 2. Neuroimmunology**
- 3. Headache and Pain**
- 4. General Neuroscience**

RAISING AWARENESS OF NEUROLOGICAL CONDITIONS IN OUR COMMUNITY

The National Neuroscience Institute's (NNI) first-ever "One Heart, One Mind" Neuro-Awareness Exhibition was successfully launched at the Singapore Changi Airport, Terminal 3 on 3 September 2016, in the presence of colleagues from NNI and SingHealth, as well as supporting partners from the Changi Airport Group, Tote Board, and the Ferrari Owners' Club Singapore.

The Opening Ceremony of the Exhibition was graced by Dr Amy Khor, Senior Minister of State, Ministry of Health. She explained how neurological disorders can be devastating to patients, as well as their families and caregivers, and the importance of creating greater awareness and understanding of these conditions. "This can enable patients and their loved ones to pick up early warning signs, and seek timely intervention for better disease control and quality of life," said Dr Khor.



Dr Amy Khor and Prof Ivy Ng flag-off the Ferrari ride for stroke survivors and caregivers.

Stroke survivors and caregivers from the Singapore National Stroke Association (SNSA) were also treated to Ferrari rides, to celebrate their strength and selflessness.

The Need for Increased Awareness

The 11-day Exhibition was held from September 2 to 12 this year and reached out to guests and visitors with informative facts on the most common chronic neurological diseases in Singapore. It was also a fitting time for the public to learn more about the transformation of patient care with NNI's active clinical care programmes, support groups and neuroscience research.

Said Ms Marie Lee, 19, who visited the Exhibition, "Reaching out to the public through this exhibition, with interactive games and infographics, is a good step towards a more empathetic society. With more understanding on the issues that plague our society, we can then become a more gracious and elder-friendly place."

Another visitor, Mr Sofiyan Bin Abdul Kadir, in his 30s, "I believe it is good to have a healthcare roadshow like this, especially with statistics that show how these conditions can affect people physically and psychologically. Having these creative stations are a good start to get people thinking, especially the younger generation,

as they also have close links to the older generation (their elderly family members) and will need to know proper care and management of such conditions."

The Exhibition was also visited by Madam Eny Arifin, in her late 50s, who happens to be a patient with NNI. Mdm Eny was heartened to see the introduction of this event, "As a patient myself, I am happy to see this Exhibition organised by an Institute that cares about the community. Activities like these will help people to be well updated about the conditions, and assure them that the conditions can be well managed with proper treatment and care from the clinical team."





(From left): Mr Lee Seow Hiang, Chief Executive Officer, Changi Airport Group, Prof Ivy Ng, Group Chief Executive Officer, SingHealth, Dr Amy Khor, Senior Minister of State, Ministry of Health, A/Prof Ng Wai Hoe, Medical Director, NNI and Ms Sandra Koh, Chief Operating Officer, NNI.



Mr Sofiyan Bin Abdul Kadir checking out the 3D brain hologram.



Mdm Eny Arifin trying her hands on the Electric Steadiness Game.

Empowering the Community with Education

As some diseases are known to affect any person across age, gender and ethnicity, it is important for families to learn about the causes, identify symptoms for earlier diagnosis and treatment, and recognise the need for specialised care. Said Associate Professor Ng Wai Hoe, Medical Director, NNI, “Education can empower patients, their families and communities to take personal responsibility for their health and well-being, to seek prompt medical treatment and to be compliant with the recommended treatment plan. This inaugural “One Heart, One Mind” Neuro-Awareness Exhibition is a community initiative where we can reach out and educate members of the public on the importance of having an awareness of neurological diseases.”

WITH SINGAPORE’S RAPIDLY AGEING POPULATION AND THE INCREASING NEED TO EFFECTIVELY MANAGE NEUROLOGICAL DISEASES, WE FELT THAT IT IS ESSENTIAL TO BOOST AWARENESS AMONG THE PUBLIC BY ORGANISING THIS UNIQUE EXHIBITION AT A LOCATION MOSTLY FREQUENTED BY LOCAL FAMILIES.



- Ms Sandra Koh, Organising Chairperson and Chief Operating Officer, National Neuroscience Institute



Highlights at the Exhibition

EDUCATION PANELS

Information on the prevalence of the diseases in Singapore, the signs and symptoms to look out for, as well as the risk factors, and preventive measures to observe were presented on the panels.

INTERACTIVE STATIONS

Engaging and interactive stations such as the Electric Steadiness Game, Magnetic Wall Maze and The Shoelace Challenge were set up to give visitors an idea of the challenges patients with cognitive or motor dysfunction face in their daily lives.

3D BRAIN HOLOGRAM

A 3D brain hologram installation was a highlight at the Exhibition, illustrating different parts of the human brain and the functions of each part that play vital roles in a person’s daily lifestyle.



Together with this Exhibition, NNI has produced its very first set of Surgeon Bear and Nurse Bear to raise funds. Bring home a set of these limited edition Bears with a donation of minimum \$75. Funds raised will go towards helping NNI needy patients.

To find out more, please visit <https://www.giving.sg/NNIHEF/a-beary-campaign>

RAISING OUR STANDARDS BY LEARNING FROM THE BEST

The Health Manpower Development Programme (HMDP) is a programme co-funded by SingHealth and the Ministry of Health, whereby doctors are sent overseas to further their specialist training and bring back international best practices to be adopted into a relevant local context.

NeusLink chats with two Consultants from the National Neuroscience Institute's (NNI) Department of Neurology (TTSH campus), Dr Ang Kexin and Dr Carol Tham to learn more about their HMDP fellowship and what valuable experiences they have taken away from the programme.

Developing Palliative Care for Neuroscience Patients

As part of her HMDP fellowship, Dr Ang Kexin pursued a Master's programme at the Cicely Saunders Institute of Palliative Care, Policy and Rehabilitation in London, England to learn more about palliative care within the field of neurological diseases.

For Dr Ang, it was an eye-opening experience being attached to the world's first palliative care research institute where she witnessed how clinicians and researchers worked hand in hand towards making ground-breaking discoveries for patients suffering from life-limiting illnesses.

Sharing an interesting fact about the institute, Dr Ang says that Cicely Saunders, for whom the institute was named after,

was incidentally the founder of the modern hospice movement. "In the past, taking care of people who were dying was not something that was evidenced-based. She (Cicely) recognised that we needed to deliver actual evidence-based care for the dying and hence started St Christopher's Hospice. Today, Cicely Saunder's idea has grown, and we are seeing palliative care not only in cancer patients but also in other illnesses which are life-limiting in nature," says Dr Ang.

In addition to pursuing her Master's, Dr Ang also spent time doing clinical attachments in King's College Hospital as well as other institutions within London and the United Kingdom. Through these experiences, she observed how in England, palliative care was not solely about taking care of dying patients, but also helping patients affected by life-limiting illnesses to live fulfilling lives and strive for greater independence.

"Stephen Hawkins is one good example. He has been receiving palliative care for many years, yet he continues to give lectures and write books. We want our patients to live like that, to maximise their life potential. I think that's what neuropalliative care is all about," says Dr Ang.

Having completed her overseas attachment in December 2015, Dr Ang hopes to take the many valuable lessons she's learnt during her time away towards improving palliative care at NNI.



*Dr Ang Kexin. Consultant
Department of Neurology (TTSH campus)*

"All medical professionals should be able to deliver some level of basic palliative care, so that we don't overtax the palliative care specialists. General palliative care can be done by anybody. In the UK, even the cleaners are trained in palliative care. When they see someone crying in the toilet, they must also know how to behave," she says.

Finally, on the topic of collaborative research, Dr Ang sees much potential for NNI to follow in the footsteps of the Cicely Saunders Institute. "We already have our clinicians and researchers housed in the same building and we have the right people who are interested in improving patients' lives. There have been so many support groups set up here in NNI, and all these are done out of goodwill, after office hours. I think we have the culture, and we are certainly moving in the right direction," she says.

Giving Hope to Stroke Patients

It was during the time when Dr Carol Tham was a registrar that she first developed an interest in the field of strokes. She shares, however, that in the past there was not a lot that doctors could do for stroke patients.

“Treatment was often limited to providing support and managing the symptoms. However, in recent years, there have been new therapies that can significantly improve the outcomes of strokes. For example, one of the latest developments in stroke medicine is endovascular therapy for acute ischaemic strokes,” she says.

Therefore, when the opportunity came up for Dr Tham to apply for her HMDP fellowship, she decided to try for the Calgary Stroke Program at the University of Calgary in Canada, which was renowned as one of the leading programs in North America for stroke treatment and research.

“Calgary was one of the large centres that was especially active in acute stroke intervention,” she says.

“It was a great learning experience to see how smooth the whole process could be. The transition from the patient coming in through A&E, getting the intervention treatment, and coming out to the ward was very efficient and is something that I would like to work on here at NNI,” adds Dr Tham.

Another important area of stroke care that Dr Tham was able to learn more about at Calgary was neuroimaging. “Through advanced neuroimaging techniques looking at the collateral blood supply of patients, the doctors at the Calgary Stroke Program were able to select the best kind of patients to undergo procedures such as endovascular treatment and tPA (two of the treatments used to treat acute strokes),” she says.

On a more personal level, Dr Tham believes that her HMDP experience went beyond just acquiring the technical know-hows. She feels that she has also been inspired by the dedication of the stroke neurologists that she had the privilege of working with.

“My mentor, Professor Andrew Demchuk, was particularly inspirational. You could really see his passion from the way he discusses his cases,” she says.

Looking back at her year in Canada, Dr Tham feels grateful for the support for continuous education that she has received from NNI. “Letting me take this year off to go on fellowship has enabled me to bring back new experiences from a world-renowned centre to help improve our processes here and ultimately help improve the care of our patients in NNI.”



*Dr Carol Tham, Consultant,
Department of Neurology (TTSH campus)*



LETTING ME TAKE THIS YEAR OFF TO GO ON FELLOWSHIP HAS ENABLED ME TO BRING BACK NEW EXPERIENCES FROM A WORLD-RENOWNED CENTRE TO HELP IMPROVE OUR PROCESSES HERE AND ULTIMATELY HELP IMPROVE THE CARE OF OUR PATIENTS IN NNI.

*- Dr Carol Tham, Consultant,
Department of Neurology
(TTSH campus)*

Rising to the Peak of

EDUCATION

Top performing faculty and residents of the National Neuroscience Institute (NNI) were recently recognised through the Residency in SingHealth Excels (RISE) awards for their commitment in raising the standards of educational excellence. NeusLink speaks to some of these award winners to find out more.



Dr Yu Wai-Yung
Dr David Low
Dr Simon Ting
Dr Tay Kay Yaw
Dr Adeline Ng
A/Prof Nagaendran Kandiah



Dr Julian Han
Dr Lester Lee
Dr Wan Kai Rui
Dr Kaavya Narasimhalu
Dr Ravindra Singh
Dr Koh Pej Xuan
Dr Jasmine Koh

DRIVEN BY A LOVE FOR RESEARCH

Dr Simon Ting, Senior Consultant in the Department of Neurology (SGH campus) at NNI, wears three hats - as a clinician, an educator and a researcher.

He shared what drew him to the research field: "There are a lot of unknowns in neurology. Being able to study and find out which part of the brain is responsible for which function is something that has always interested me."

Hence, in 2011, when Dr Ting had the opportunity to take up a fellowship at the University of California, Los Angeles (UCLA) under the Health Manpower

Development Programme (HMDP), he jumped at the opportunity to research into neurobehavioral syndromes – a topic he felt passionate about.

Today, Dr Ting is involved with several interesting research projects such as how the brain behaves differently between English-speaking and Mandarin-speaking persons, as well as whether bad bacterial in the gut might be linked to Alzheimer's disease.

While Dr Ting's entry into research was driven by passion, his foray into education came by chance, when in 2010 he was tasked to take over a colleague's role as an acting clerkship coordinator at Duke-NUS Medical School.

"This was my first formal exposure to education. I realised then that teaching was something that I really enjoyed, mainly because of the interaction that comes with it," says Dr Ting.

It was therefore a bonus for Dr Ting to receive the RISE award for doing something that he already enjoyed. He says: "I'm elated that the junior doctors find my teaching useful. I'm really encouraged by this award."

“

IT IS PART AND PARCEL OF WHAT I DO IN MY DAILY JOB.

I HAVE A DUTY TO TEACH THE NEXT GENERATION. AND HAVE ALWAYS BEEN GRATEFUL FOR THE GUIDANCE AND TEACHING I HAVE RECEIVED FROM MY SENIORS AND TEACHERS IN MY OWN TRAINING.

**- Dr Yu Wai-Yung
Senior Consultant
Department of Neuroradiology
National Neuroscience Institute**

THERE IS ALWAYS ROOM FOR IMPROVEMENT

For Associate Professor Nagaendran Kandiah, his passion for research came about because of his strong belief that there was more to neurological conditions than what was commonly being taught in schools and textbooks. He says that this drove him towards research and academic work to try and find out the answers.

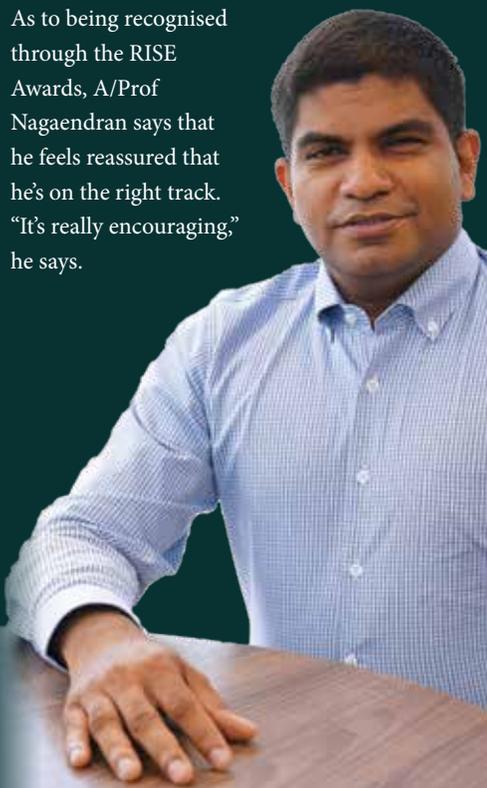
Today, A/Prof Nagaendran's main area of research focus is on how silent strokes affect dementia and how this is especially prevalent among Asian patients. He says that the interest was first sparked off during a fellowship at the University of British Columbia in 2007, where he observed that there were a lot of differences between patients in the west and the east, who were suffering from the same neurological disease.

"I realised that we therefore needed to do more work among Asian patients – to make new discoveries and find more ways to manage them," shares A/Prof Nagaendran.

Apart from research, A/Prof Nagaendran is also part of the faculty for senior residency teaching, as well as a Senior Consultant specialising in Dementia in the Department of Neurology (TTSH campus) at NNI. His secret to balancing these roles lies in his approach of treating each of these areas holistically.

"We shouldn't think that we have to do one thing, stop and do another thing. Every clinical patient should also be a platform for teaching, as well as play a contributing role towards research," he says.

As to being recognised through the RISE Awards, A/Prof Nagaendran says that he feels reassured that he's on the right track. "It's really encouraging," he says.



THE UNASSUMING TEACHER

Dr Tay Kay Yaw, a Senior Consultant at the Department of Neurology (TTSH campus) at NNI and Head of Neurological Services in Khoo Teck Puat Hospital (KTPH), has been teaching ever since he first joined in 2005. He shares that he never really had to think twice about getting involved. To him, it was how he benefited as a junior, and felt that it was the natural thing to contribute back to the profession once he had the chance to.

“I had many mentors who inspired me. It’s just their selfless nature for wanting to see younger doctors becoming successful, with no regard for personal gain. It just caught on to us that we have to hold that tradition,” shares Dr Tay.

Today, Dr Tay juggles numerous roles. In addition to his primary role as a clinician, he is also the coordinator for Duke-NUS Medical School curriculum and Director of the NNI Community Care Partnership Programme.

What keeps him going is knowing that he does plays a part in helping junior doctors grow in their personality, knowledge, confidence, and most importantly, inspiring them to give back to the community.

“Everybody has something to offer. Even though we may not be perfect, we just have to ask ourselves each day before we go to bed, ‘Have we done the very best we can for our patient?’ If the answer is ‘yes, I think that’s most important.”



TEACHING HAS BECOME SECOND NATURE

Dr David Low manages a busy schedule as a Consultant in the Department of Neurosurgery at NNI and as the Head of Neurosurgical Services in KK Women’s and Children’s Hospital (KKH). In addition to that, he also holds other key appointments. He is an Adjunct Assistant Professor at the Duke-NUS Medical School and is the Program Director for SingHealth Neurosurgery Residency Program.

While this may seem overwhelming to many, Dr Low takes it all in his stride by sticking to the philosophy that in the field of medicine, doctors teach all the time. “You do a round, you teach; you run a clinic, you teach; and while you’re operating, you teach. We should not be looking at education as something separate,” says Dr Low.

As a programme director, Dr Low holds the responsibility of crafting the syllabus

to ensure that residents’ training and educational needs are met. This means not only motivating his students, but also ensuring that the faculty remains committed to the task. Sharing the ethos that has guided him as an educator, he tells NeusLink: “I always ask myself, ‘who’s going to look after me when I’m old?’ If I need surgery, am I going to be able to trust the resident to operate on me? I feel that it is therefore our responsibility to train up the next generation of doctors, to ensure that standards are maintained.”

On being recognised by RISE for his role as an educator, Dr Low says that the award has given him affirmation that he has done a good job. However, he is quick to add: “There can only be one winner. This doesn’t mean that the other faculty aren’t doing a good job. Ultimately, we should take our satisfaction from seeing our residents do well. That is a reward in itself.”

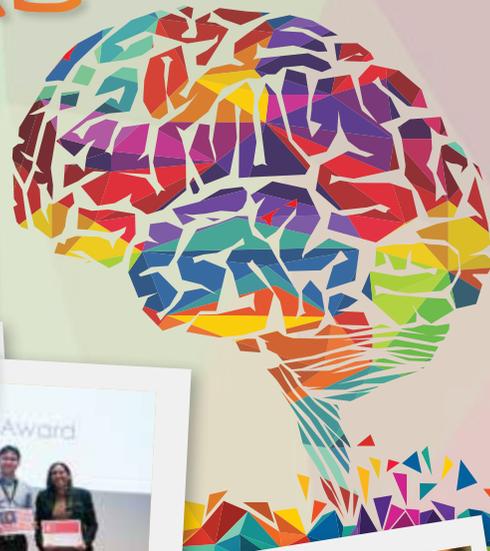


THE SCIENCE AND ART OF STROKE CARE

The Singapore Stroke Conference is held biennially by the National Neuroscience Institute (NNI) to educate healthcare professionals and researchers on the latest developments in the treatment and management of stroke. The 16th edition of the conference was held from 6 – 8 November 2016 at the Academia and chaired by Associate Professor Dr Deidre Anne De Silva, a Senior Consultant and stroke specialist from the Department of Neurology (SGH campus).

The conference was opened by Mr Chan Heng Kee, Permanent Secretary, from the Ministry of Health (MOH). Themed “The Science & Art of Stroke Care”, the conference featured presentations on the latest developments and recent discoveries in stroke as well as ideas on providing better care to patients while addressing their needs and concerns.

The conference had local, regional and international participation with nearly 300 registrants and faculty. One key feature was a travel award to one trainee from each of the ASEAN nations.



COL (Dr) Ng Yih Yng, Chief Medical Officer, Ministry of Home Affairs



(From left) ASEAN Stroke Trainee Award Winners with Professor Anthony Rudd, National Health Service, United Kingdom and A/Prof Deidre Anne De Silva, Senior Consultant, Department of Neurology (NNI-SGH campus)



Dr Darren Chua

OVERCOMING STROKE TO LIVE A LIFE OF MEANING

At the recent 16th Singapore Stroke Conference, organised by the National Neuroscience Institute, Dr Darren Chua took to the stage to share with attendees, his journey with stroke and how he overcame numerous obstacles to achieve a life with purpose.

“To me, it was just a matter of time before I could continue my houseman, finish it, and then continue my journey as a neurosurgeon. It was my persistent disbelief that I couldn’t be a doctor that kept me moving forward,” he shares.

The story behind Dr Darren Chua’s stroke, like that of many others, is a heart breaking one. He was only 24 years old at the time, and had just completed his studies at NUS Medical School. It had always been a lifelong ambition for him to become a neurosurgeon, but with a burst vessel in his brain, his bright future would soon come crashing down.

Through rehabilitation, Dr Chua managed to regain control over his movement and speech, however, the answer from the Singapore Medical Council remained negative. They felt that his condition would affect his work in dealing with acute emergency action. Finally, Dr Chua decided to move on and took on a job as a healthcare administrator.

Today, Dr Chua, does more than just run a learning centre. He is also a much sought-after motivational speaker and a national para-athlete, having represented Singapore at the 2011 ASEAN Para Games and bagging a bronze medal in the process.

He tells us that for the first three years, when he was undergoing rehab, he was consumed with getting the Singapore Medical Council to let him complete his housemanship so that he could be fully certified as a practicing doctor.

“After two years, I realised that what I really wanted to do was impact and touch people. I thought that if I couldn’t be a doctor, what I could do was run a learning centre and teach people and impact kids. So, that’s what I did.”

He shares that the key for successful stroke patients is to not see their primary identity as a stroke patient. “We are stroke patients. That is a fact. But our reality is that we are not defined by our stroke. We are so much more than that. Once this mind shift has been made, everybody can just move on and continue their purpose in life,” he says.



Participants at the Speed Data session during the Conference.

Taking the Role of Nursing to New Heights



Advance Practice Nurses (APNs) are a relatively new introduction to the nursing landscape, having only been around since 2007. This issue, Neuslink interviews APN Emily Ang and APN Esther Chua to learn more about what the role of an APN entails.

Ms Emily Ang

Nurse Clinician, Department of Neurosurgery,
National Neuroscience Institute

APN Emily Ang's introduction to healthcare first happened when she was just 12 years old – when she would accompany her grandmother to Tan Tock Seng Hospital (TTSH) for her regular check-ups. It was during these visits that she first imagined what it would be like to work in a hospital. As fate would have it, Emily eventually became a nurse, and coincidentally at TTSH.

Today, Emily is part of an elite group of nurses who provide doctors with valuable nursing input on patients' conditions. "Doctors often have to see many patients and may not have the luxury of time to look at a patient in fuller detail. APNs play a valuable role in the team because they spend more time with patients and are better able to observe changes and developments," she says.

Even though training to become an APN was tough, Emily is grateful for the opportunity. "I would say this was a period when my values, personality and character were really put to the test and shaped," shares Emily.

As an APN in the Department of Neurosurgery, Emily has her work cut out for her. She spends much of her time juggling between the management of neurosurgical patients and supporting doctors in clinical work. Despite this heavy workload, Emily shares her secret to staying motivated. "It makes me happy just to see patients getting well under my care. That's what keeps me going."



Ms Esther Chua

Nurse Clinician, Department of Neurology
National Neuroscience Institute

APN Esther Chua had been a nurse for close to 14 years when the opportunity arose for her to embark on a training programme to become an APN. It was a tough decision at the time for her to leave her routine and return to the classroom for the two-year full-time Master's programme.

"I hadn't been in school for over a decade and I was apprehensive if I could adjust," Esther shares.

Ultimately, she decided to take the plunge as she felt that being a certified APN would enable her to deliver better care to her patients. In addition, she felt that advancing through the clinical route as opposed to pursuing a more administrative-oriented role in management better suited her.

2016 marks Esther's second year as an APN specialising in providing care to dementia patients. "To date, there are not many nurses specialising in dementia care, but we are seeing an increase in the number of patients mainly due to the ageing population and greater awareness through public education. Many members of the public are coming forward for early assessment and treatment. I hope with this higher level of clinical training, I can better enhance the care that they receive," says Esther.

As to the challenges that she faces, she says: "I draw strength and focus from the patients and families that I meet. I am thankful for the many lessons and opportunities each of them bring, that helps me be a better person and nurse by allowing me to be a part of their care. They are my strength and driving force."

Enhancing Community Care for Homebound Parkinson's Patients

The National Neuroscience Institute (NNI) recently announced the launch of the NNI Parkinson Home Care Training and Support Programme which seeks to bridge the gap between hospital and community services for people with Parkinson's Disease (PD).

Associate Professor Louis Tan, Senior Consultant in the Department of Neurology (TTSH campus) at NNI, and the Director of the Programme, shares that of the approximately 3,000 PD patients that NNI sees each year, many are frail and elderly, and are either home alone or with just a domestic helper during the day.

"This programme enables us to assess how these patients are coping at home, pre-empt complications, and bring to them the available community resources to support them," A/Prof Tan says.

Training Up Home Care Nurses

As part of the new programme, nurses from community care organisations receive specialised training in PD in the form of three clinical attachments at NNI and six home care visits with the NNI Home Care Nurse held over a one-year period.

During these clinical attachments and home visits, trainees are attached to NNI nurses, and get to learn more about PD and how to manage patients suffering from the condition.

Ms Noor Haryani, Senior Staff Nurse at St Luke's ElderCare and programme trainee, shares that coincidentally, around the time of her clinical attachment, she had a patient

who had jerky movements and tremors. "Through this programme, I was able to learn from the nurses at NNI if these were genuine PD symptoms," she says.

Ms Yvonne Chew, a Senior Staff Nurse from NNI specialising in home care, adds that while many of the nurses from the community care organisations are already experienced home care nurses, they lack medical knowledge that is specific to the PD condition.

Such knowledge, A/Prof Tan explains, includes understanding medication in relation to movement. "As the disease progresses, medication effects to reduce tremors could get shorter and shorter. Home care nurses need to know when is the best time to visit them in relation to the medication effects on their function and activity."

Apart from medication, Ms Nancy Tan, Palliative Care Staff Nurse at Tzu Chi Foundation and programme trainee, found in her own experience that learning about patients and their caregivers' psychosocial needs was also helpful.

"Caregivers often face stress from both the patients as well as the family. We need to provide them with support and help them to achieve a positive mindset."

How PD Patients and their Caregivers benefit?

Mdm Woon Aye Kiow is one of the patients currently benefitting from the NNI Parkinson Home Care Training and Support Programme.

According to her son, Mr John Lim, Mdm Woon's advanced stage of PD has made visits to the hospital increasingly difficult. "She is unable to sit for long periods of time. During these visits to the hospitals, she would have to sit in a wheelchair for up to four hours. But, after just a couple of minutes, she will start to feel back pain," he says.

It was therefore a relief for Mr Lim and his family when they were told that as part of the programme, nurses would now be making regular home care visits. This would not only save him the time needed to travel to the hospital and wait for medical appointments, but also gave him peace of mind to know that nurses could ensure that the best care was given within the home environment.



Photo caption: NNI's Senior Staff Nurse Ms Yvonne Chew training and guiding fellow nurses from the community care organisations.

STUDYING DEEPER INTO NEUROPSYCHIATRIC DISORDERS



Scientists from Duke-NUS Medical School, the National Neuroscience Institute (NNI) and the Genome Institute of Singapore (GIS) have come up with a new protocol that streamlines the process of using human stem cells to mass produce high quality, functional GABAergic neurons (GNs) in the laboratory. This will provide scientists with a robust source of GNs to study many psychiatric and neurological disorders such as autism, schizophrenia, and epilepsy, which are thought to develop at least in part due to GN dysfunction. It will also facilitate the screening of drug effects on specific populations of neurons.

Scientists worldwide have been hard at work trying to generate a consistent supply of GNs in the laboratory, but have been faced with many challenges. These include: protocols involving multiple complex stages, poor yields and the lengthy time required to generate mature and functional GNs. Many of these limitations have now been overcome by the development of a rapid and robust protocol to generate GNs from human pluripotent stem cells (hPSCs) in a single step.

With the addition of a specific combination of factors, hPSCs turn into mature and functional GNs in a mere six – eight weeks. This is about two – three times faster than the 10 – 30 weeks required for previous protocols. In addition, this new protocol is highly efficient, with GNs making up more than 80 per cent of the final neuron population.

unprecedented access to the quantities of neurons necessary for studying the role of GNs in disease mechanisms. Drugs and small molecules may now be screened at an unparalleled rate to discover the next blockbuster treatment for the neuropsychiatric disorders.

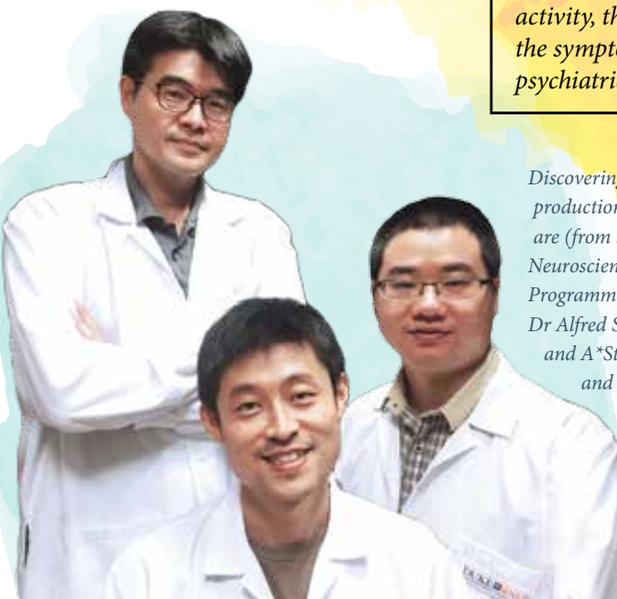
“Our quick, efficient and easy way to mass produce GNs for lab use is a game changer for neuroscience and drug discovery. With increased recognition of the essential role of GNs in almost all neurological and psychiatric diseases, we envisage our new method to be widely used to advance research and drug screening,” said Dr Shawn Je, Assistant Professor in the Neuroscience and Behavioural Disorders Programme at Duke-NUS, and senior author of the study.

*Published on 4 August 2016 in Cell Reports, this research is supported by the Singapore National Research Foundation under its Cooperative Basic Research Grant, administered by the Ministry of Health’s (MOH) National Medical Research Council (NMRC), the Ministry of Education (MOE), A*STAR Biomedical Research Council, and a Duke-NUS Signature Research Programme Block Grant.*

What are GABAergic Neurons (GNs)?

GNs are inhibitory neurons that reduce neuronal activation, and make up roughly 20 per cent of the human brain. They work alongside excitatory neurons (ENs) to ensure balanced neural activity for normal brain function. The coordinated interplay between GNs and ENs orchestrate specific activation patterns in the brain, which are responsible for our behaviour, emotions, and higher reasoning. Functional impairment of GNs results in imbalanced neural activity, thereby contributing to the symptoms observed in many psychiatric disorders.

*Discovering the new protocol for the mass production of high quality, functional GNs are (from left) Asst Prof Shawn Je from the Neuroscience and Behavioural Disorders Programme at Duke-NUS Medical School, Dr Alfred Sun, Research Fellow at NNI and A*Star’s Genome Institute of Singapore, and Mr Yuan Qiang, NUS Graduate School PhD student.*



New Protocol a Game Changer for Neuroscience

The speed and efficiency of generating GNs with this new protocol provides researchers

WORKING TOGETHER TO STUDY THE GROUP B STREPTOCOCCAL BACTERIA

In 2015, about 360 people in Singapore were made ill by an outbreak of the Group B Streptococcal (GBS) infection that was linked to the consumption of infected raw freshwater fish. To understand more, a group of researchers from the Singapore Neurologic Infections Programme (SNIP) studied how GBS affected the brains and central nervous systems (CNS) of those infected.

Preliminary findings identified patterns in the Magnetic Resonance Imaging (MRI) brain scans, shedding important clues that could improve the detection and diagnosis of GBS infections. This was achieved through a multi-centre, multi-disciplinary collaboration of clinicians and scientists.

Singapore Neurologic Infections Programme (SNIP)

SNIP is a nationwide surveillance programme that studies infectious neurological disease patterns in Singapore, with the aim of identifying and rendering the relevant expertise during potential infectious outbreaks. It is made up of a multidisciplinary group of experts including clinicians and scientists from various public healthcare institutions such as the National Neuroscience Institute (NNI) and Singapore General Hospital (SGH).

Led by Associate Professor Kevin Tan, Senior Consultant, Department of Neurology (TTSH campus), NNI,

the SNIP team found that GBS patients with brain infections had abnormalities in the brain and its fluid spaces (see Figure 1). These abnormalities, which include small lesions and unusual findings in certain regions of the brain, were highlighted using an advanced MRI technique called Diffusion-weighted Imaging (DWI).

The findings demonstrate that such patterns of MRI features can alert clinicians and radiologists to such bacterial outbreaks in the future, and that DWI could be used to detect and diagnose cases of GBS infection.

The study's senior author and radiologist, Prof Tchoyoson Lim, Senior Consultant, Department of Neuroradiology, NNI, said, "Incorporating DWI into routine practice will enable doctors to detect abnormalities that might not otherwise be seen using other conventional methods. Our research shows that DWI can accentuate abnormalities caused by the GBS infection and help doctors and radiologists make a more accurate diagnosis."

Further study is needed to determine the virulence factors of the GBS bacteria, which may explain the severity and relative incidence of complications seen in patients.

Importance of Collaboration

The study also demonstrates that a collaborative national surveillance system such as SNIP is vital for the detection of unusual outbreaks like the GBS infection. In SNIP's case, A/Prof Tan from NNI worked with the study's co-author, Dr Limin Wijaya, Senior Consultant, Department of Infectious Diseases, SGH, and clinicians from other participating hospitals.

"It is important that we work as a multidisciplinary team, because each of our expertise adds value to the study to create synergy for better results," said A/Prof Tan.

The study was published in the international Journal of Magnetic Resonance Imaging. More details can be read on [http://onlinelibrary.wiley.com/journal/10.1002/\(ISSN\)1522-2586](http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1522-2586).

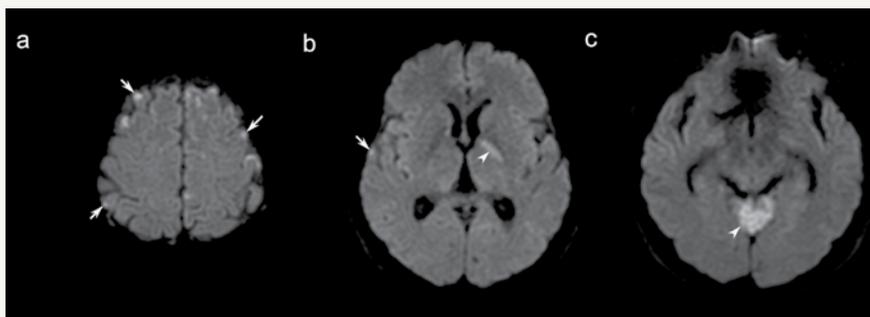


Figure 1. Image credits to Journal of Magnetic Resonance Imaging

MAKING WAVES WITH MINI MIDBRAIN ORGANOIDS

Scientists in Singapore have made a big leap on research on the 'mini-brain'. These advanced mini human midbrain organoids will help researchers conduct other studies into Parkinson's Disease (PD) and ageing-related brain diseases, and develop specific treatments to control the conditions.

What Exactly Are 'Mini Midbrain' Organoids?

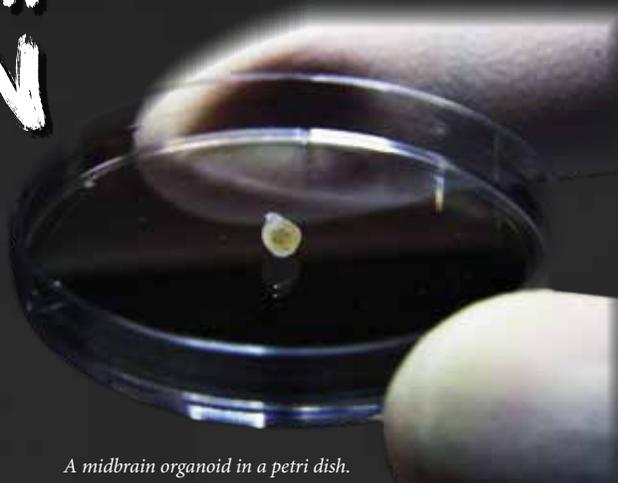
These mini midbrain organoids are three-dimensional miniature tissues that are grown in the laboratory and they have certain properties of specific parts of the human brains. This is the first time that the black pigment neuromelanin has been detected in an organoid model. The study also revealed functionally active dopaminergic neurons.

The human midbrain, which is the information superhighway, controls auditory, eye movements, vision and body movements. It contains special dopaminergic neurons that produce dopamine – which carries out significant roles in executive functions, motor control, motivation, reinforcement, and reward. High levels of dopamine elevate motor activity and impulsive behaviour, whereas low levels of dopamine lead to slowed reactions and disorders like PD, which is characterised by stiffness and difficulties in initiating movements.

How Parkinson's Disease Takes Place

Also causing PD is the dramatic reduction in neuromelanin production, leading to the degenerative condition of patients, which includes tremors and impaired motor skills. This creation is a key breakthrough for studies in PD, which affects an estimated 7 to 10 million people worldwide.

Researchers now have access to the material that is affected by the disease itself, and different types of studies can be conducted in the laboratory instead of through simulations or on animals.



A midbrain organoid in a petri dish. The black pigment is neuromelanin, a hallmark of the human midbrain.

Jointly led by Prof Ng Huck Hui from A*STAR's Genome Institute of Singapore (GIS), Prof Tan Eng King from the National Neuroscience Institute (NNI), and Assistant Prof Shawn Je from Duke-NUS Medical School, this collaborative research is funded by the National Medical Research Council's Translational Clinical Research (TCR) Programme in Parkinson's disease (PD) and A*STAR. Other collaborators are from the Lieber Institute for Brain Development, the Johns Hopkins University School of Medicine, and the Nanyang Technological University.

This research is supported by the National Research Foundation Singapore under its Translational and Clinical Research (TCR) Flagship Programme and administered by the Singapore Ministry of Health's National Medical Research Council.

“ THIS ACHIEVEMENT BY OUR SINGAPORE TEAM REPRESENTS AN INITIAL BUT MOMENTOUS SCIENTIFIC LANDMARK AS WE CONTINUE TO STRIVE FOR BETTER THERAPIES FOR OUR PATIENTS.

**- Prof Tan Eng King
Research Director, NNI and
Lead PI of the Translational
and Clinical Research (TCR)
Flagship Programme in PD**



NURTURING CLINICIANS WITH A STRONG PASSION FOR RESEARCH

The Nurturing Clinician Scientist Award was initiated from the NNI Centre Grant to recognise potential or young promising clinicians and encourage them to become Clinician Scientists.

NeusLink speaks to Dr Nicole Keong and Dr Tan Yee-Leng, both recipients of the Nurturing Clinician Scientist Award, to find out more about their research interests.





Dr Nicole Keong

Consultant, Department of Neurosurgery, NNI

For neurosurgeon Dr Nicole Keong, her passion for research started when she was still a registrar at Cambridge. She shares that it all began with an interest in normal pressure hydrocephalus (NPH), a condition in which water in the brain causes patients to have walking problems, dementia and urinary incontinence.

She adds: “It is a rather strange, complex clinical conundrum. While surgery can help, the response to surgery is imperfect and because the condition itself is a bit of an enigma, we don’t really understand much about why it happens.”

Fast forward a couple of years, Dr Keong met up with NNI’s Medical Director, Associate Professor Ng Wai Hoe, who encouraged her to apply for the National Medical Research Council’s (NMRC) Clinician Scientist Award and further her research at NNI.

Thanks to the award, Dr Keong is today able to explore new lines of research. These include studying more about Asian subtypes as well as doing research on patients with irreversible conditions.

“NPH is a pervasive condition worldwide, however, much of what has been published has so far been very European in sub-type. As for research into patients which fall into the irreversible sub-group, that’s something very challenging to ask funding for. Generally, you need to show a little bit more of a change. But, if you only look at reversible, you can’t understand what is irreversible,” says Dr Keong. The Nurturing Clinician Scientist Award gives her an opportunity to explore this difficult topic.

Dr Keong’s work is a reminder that research is many times, a long and tedious process. She therefore has this piece of advice to aspiring clinician scientists: “You definitely have to be persistent. That really is the key to everything.”



Dr Tan Yee-Leng

Consultant, Department of Neurology (TTSH campus), NNI

Dr Tan Yee-Leng has always enjoyed research as an outlet towards satisfying her curiosity and for finding solutions to problems.

Hence, as a neurologist, with a subspecialty in epilepsy, Dr Tan says it was only natural that when she started to do research work, her area of specialisation soon gravitated towards epilepsy, neurophysiology and brain imaging.

In particular, her interest lies specifically in the use of computer-aided diagnostics and machine learning algorithms to learn more about neuroimaging and neurophysiological correlates in seizures and epileptic disorders.

Dr Tan shares that in the course of her research work, the area that she found most challenging was getting members from across different specialty niches to communicate effectively. “I spend considerable time and effort on the research design, methodological and analytical processes, and setting up meetings with my collaborators and team members to go through each step thoroughly,” she says.

The NMRC Clinician Scientist Award therefore provided a much-needed boost, as it enabled her to build a platform for local and international collaboration with computer scientists, biomedical engineers and fellow clinicians in the research and epilepsy community. “The funds allow the building of data repositories, with the ultimate aim of advancing healthcare via big data analysis,” she says.

Having experienced various ups and downs over the course of her research work, Dr Tan says that the biggest lesson she has learnt through this journey is that: “Resources are not handed to us on a platter. It is how resourceful we are at seeking out opportunities and collaborations that will help us to push our way through to explore the frontiers of medicine.”

AWARD WINNERS

- 🌱 Dr Tan Yee-Leng
- 🌱 Dr Nicole Keong
- 🌱 Dr Simon Ting
- 🌱 Dr Adeline Ng



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