



SINGHEALTH DUKE-NUS ACADEMIC MEDICAL CENTRE ANNUAL REPORT 2015

Annual  
Report  
2015



**FUTURE OF HEALTHCARE**  
SINGHEALTH DUKE-NUS ACADEMIC MEDICAL CENTRE

## Future of Healthcare

SingHealth Duke-NUS Academic Medical Centre Annual Report 2015

Singapore General Hospital (SGH)  
KK Women's and Children's Hospital (KKH)  
Sengkang Health (SKH)  
National Cancer Centre Singapore (NCCS)  
National Dental Centre Singapore (NDCS)  
National Heart Centre Singapore (NHCS)  
National Neuroscience Institute (NNI)  
Singapore National Eye Centre (SNEC)  
SingHealth Polyclinics (SHP)  
Bright Vision Hospital (BVH)  
Duke-NUS Medical School (Duke-NUS)

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Tel: (65) 6377 8051  
Fax: (65) 6377 8052  
[www.singhealth.com.sg](http://www.singhealth.com.sg)

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The steps we take today pave the way to the future of healthcare. Thank you for forging ahead in this Academic Medicine journey with us.



## READY FOR TOMORROW'S PATIENTS

**A**s Singapore's major Academic Medical Centre, we are at the forefront of serving the nation's healthcare needs. This is a responsibility we take seriously, one that requires us to anticipate the needs of Singaporeans for generations to come. With a rapidly ageing population and longer life expectancy, the increasing burden of chronic diseases will place pressure on healthcare services. We are ready to face these challenges and continue to deliver accessible and affordable, quality care.

Earlier this year, we launched the SGH Campus Master Plan – the nexus of healthcare's future. The campus renewal, which will take place over the next decade, will enable our healthcare

institutions to serve our patients' evolving needs. We are building for the future – from the physical, in terms of facilities and infrastructure, to introducing new models of care that improve our patients' experience in the healthcare system.

The new campus will better support these new models of care that are multidisciplinary and team-based. SingHealth Duke-NUS Disease Centres (SDDCs) are examples of this model, where patients are treated holistically and seamlessly by multidisciplinary care teams through evidence-based care. To date, six SDDCs bring together healthcare professionals from various disciplines to provide holistic care for patients with diabetes, head and neck, breast, lung and blood cancer, and liver transplant.

SingHealth plays multiple roles in serving the population. We play a regional role in providing community and population health while also delivering cutting edge, tertiary and quaternary care. As a well-integrated Regional Health System, we ensure that patients benefit from an interconnected healthcare ecosystem that supports and helps them achieve optimum quality of care in the comfort of the community. The upcoming Outram Community Hospital, expected to be operational in 2020 plays a pivotal

role in transiting patients who have received acute care seamlessly back to the community.

As we prepare for the future, we strive to improve everyday processes to ensure a better patient experience. We have much to improve and will continue to embark on Service Transformation projects to enhance access to care and upgrading of facilities. The completion of projects like the cluster-wide appointment management system via mobile phone application and improved call centre workflow have cut down call volume and significantly increased response time to patients. We are committed to continue this transformation journey.

Through the partnership between SingHealth and Duke-NUS, we have established new structures and forged new alliances to conduct research that matters to the local population. We have also collaborated through new National Research Institutes and Academic Clinical Programmes.

Our staff are our most important resource. It is imperative that we invest in and develop our people to achieve our Academic Medicine mission. Last year, we trained more than 11,000 nursing professionals and had close to 2,000 training places and more than 70 training

programmes for our allied health professionals. Continuing to develop a strong professional talent pool will be one of our key objectives.

As we march on in our vision to define tomorrow's Medicine, we will ensure that our healthcare institutions provide what matters most to our patients, now and into the future.

**Mr Peter Seah**  
*Chairman, SingHealth*



## BEYOND MEDICAL EDUCATION

To improve medical practice and to develop world-class programmes in our research focus areas. This is the Duke-NUS Medical School mission as we enter into our eleventh year of partnership with SingHealth. This report highlights the hallmarks of the past year, which reflect Duke-NUS' role in the Academic Medicine movement in Singapore and beyond.

Since taking the helm, Professor Thomas Coffman's first year as Dean has seen him steer Duke-NUS to greater heights. During this time, the School celebrated its 10th anniversary and marked a significant milestone with the signing of the Phase III Agreement by Duke University and the National University of Singapore (NUS).

The continued support of Duke and NUS affirms the strong confidence stakeholders and the Singapore government have in Duke-NUS. We are grateful and encouraged that the Agreement will empower the school to build on our strengths.

Continuing to produce a pipeline of clinician leaders, we welcomed our tenth class in July of this year. They amplify and follow the MDs, MD/PhDs and PhDs who have successfully completed their studies. The alumni from Duke-NUS' earlier classes are now well entrenched in the SingHealth system and other medical and research institutions.

Among our alumni are chief residents, technopreneurs and leaders in community healthcare. What is even more admirable is that they return regularly to inspire and mentor their juniors despite demanding commitments.

Research at Duke-NUS continues to be rigorous and ground-breaking. A Duke-NUS SingHealth team clinched the President's Science Award for their outstanding integrative and translational research in the genomics of Asian cancers. Their work promises to change the way cancer is treated, and shines light on the expertise in personalised and genomic medicine, so-called

precision medicine, being developed in the SingHealth Duke-NUS Academic Medical Centre.

Consistently at the forefront of infectious disease research, Duke-NUS continued to contribute valuable insights into the dengue virus and this year added the Zika virus to our roster. A study by our researchers provided key insight into how to destabilise the Zika virus and target it with therapeutics, giving a needed boost to healthcare workers and researchers battling the world's most pressing health concern this year.

As we celebrate our successes, I take this opportunity to thank the Duke-NUS Governing Board members who continue to serve diligently with distinction.

We look forward to a future in which Duke-NUS and SingHealth continue to contribute meaningfully. In line with the Academic Medicine Advisory Council (AMAC) review this year, we will focus our resources to address population health issues and build partnerships and structures to promote education and research that will ultimately bolster Academic Medicine not only at Duke-NUS, but across Singapore and the region as well.

Our collective mission to train future-ready clinicians, produce impactful research and innovate

the learning process is gathering momentum. In 2016, Duke-NUS will undertake a strategic planning exercise to ensure continual alignment with the healthcare landscape and the Academic Medicine movement. I am excited to see what will come next.



2 June 2016 - Signing of the Phase III Agreement by Duke University and the National University of Singapore

**Mr Kai Nargolwala**

*Chairman, Duke-NUS Medical School*



## THE FUTURE OF HEALTHCARE

**W**e saw four million patients last year. That's four million chances to make a difference, and four million lives we could improve. How did we make each of our patients feel?

At the SingHealth Duke-NUS Academic Medical Centre (AMC), we envision a reality where we provide the best for our patients through quality clinical care, research that translates into cures and education that produces dedicated professionals.

At our AMC, we aim to put patients at the heart of all we do and this prompts us to question whether we are delivering the care they need.

Many patients who come to us have multiple co-morbidities requiring complex care and treatment from more than one of our institutions. Our duty is to ask ourselves how we can

coordinate their care better and make sure they get the best outcome and experience.

One solution is the multidisciplinary SingHealth Duke-NUS Disease Centres (SDDCs), where specialists are brought together to deliver care. No longer will patients have to go through traditional clinical care pathways which may lead to multiple visits, tests and consultations at different institutions. Instead, we build care around them, and patients can be assured that they get the best results. This gives greater convenience to both patients and caregivers.

SDDCs also benefit healthcare professionals, giving them the opportunity to work in multiple teams and deepen their practice, enhance learning in an inter-professional setting and open the door to research possibilities.

As the nation's healthcare demands change, our campus will evolve over the next two decades to meet the needs of our patients. Capacity on SGH Campus will be tripled, with dedicated zones for care, research and education that will allow Academic Medicine to flourish.

Our efforts for our patient's wellbeing do not stop at our institutions. Working with healthcare and

community partners island-wide, our Regional Health System ensures that patients get the care and attention they need as they integrate back into the community and their homes.

At the same time, staff are continually pursuing research advances that will improve patient care in the future. Our research team from NCCS and Duke-NUS received the President's Science Award for their discoveries of new genes and molecular pathways for cancers such as breast, bladder and liver which present differently in the Asian population.


In Neuroscience, we have made a big leap with research on the 'mini-brain' that will help researchers develop treatment and conduct other studies into Parkinson's disease and ageing-related brain diseases. A team at Duke-NUS has improved understanding of Zika and its behaviour, enabling researchers to determine how antibodies could be used to kill the virus.

As scientists and clinicians work alongside to push boundaries in developing new treatments, faculty development and rigorous education strengthen the pipeline of future healthcare professionals. In 2015, the SingHealth Duke-NUS Surgical Skills and Simulation Centre (SSSC) was

officially opened to meet the diverse training needs of 20 specialties and subspecialties, offering a range of surgical, simulation and procedural skills courses under one roof.

Such investments in training will continue to enable our talent to practise at the top of their licence, and deliver quality care to patients. Transforming care to meet the increasingly complex and continually evolving needs of our population; challenging ourselves to be the best – that is our focus as our AMC grows.

The Future of Healthcare is the combined effort of each and every one of our staff. From clinical care and safety improvements, to research breakthroughs and teaching highlights, every individual and project profiled in this annual report demonstrates our unified vision to provide the best to every patient.

  
**Prof Ivy Ng**

*Group Chief Executive Officer,  
SingHealth*

  
**Prof Thomas Coffman**

*Dean,  
Duke-NUS Medical School*

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### SINGHEALTH

14	Assoc Prof Tan Say Beng Koh Li Hoon Dr Edwin Low Audrey Lau
----	--

15	Assoc Prof Narayanan Gopalakrishna Iyer Gormit Kaur Isabel Yong Wong Lai Yin
----	--

### Duke-NUS

20	Prof Sandy Cook Prof Koh Woon Puay Assoc Prof John Lim
----	--

21	Vera Goh Corinna Ng Dr Viji Vijayan Dr Lim Kheng Choon
----	---

### SGH

28	Prof Tan Puay Hoon Assoc Prof Wong Kok Seng Ang Shin Yuh Mohammad Nazri Bin Johri
----	--

29	Dr Kenneth Tan Assoc Prof Tan Bien Keem Robyn Foo Norshahiman Bin Ahmad Shah
----	---

30	Dr Tan York Kiat Lim Teong Guan Dr Dixon Grant Dr Pua Yong Hao
----	---

31	Dr Prema Raj S/O C Jeyaraj Kok Pei Lai Linda Lim Kevin Low
----	---

### KKH

38	Assoc Prof Lim Sok Bee Dr Saumya Shekhar Jamuar Juwariah Binte Taib
----	---

39	Giam Poh Eng Irene Quay
----	----------------------------

### SKH

44	Dr Steven Wong Doris Lim Dr Camilla Wong Teng Jyh Lei
----	--

45	Dr Annitha Annathurai Sharon Wong Dr Pauline Leong Sebastian Low
----	---

### NCCS

52	Assoc Prof Lim Soon Thye Dr Yap Yoon Sim Dr Alethea Yee
----	---

53	Dr Fong Kam Weng Assoc Prof Melissa Teo Prof Kanaga Sabapathy
----	---

### NDCS

60	Dr Chee Hoe Kit Dr Priscilla Ang Yap Xin Ying Low Hong Fong
----	--

61	Lorraine Johnson Yew Jie Si Aisha Kalsom Bte Abdul Rahman Willie Woo
----	---

### NHCS

70	Asst Prof Tan Teing Ee Assoc Prof Carolyn Lam Zhang Xiaoxia Oh Seow Fong
----	---

71	Assoc Prof Ching Chi Keong Anuradha D/O Ramasamy Rahman Bin Omar Siti Zulaikha Zolkarnain
----	--

### NNI

78	Dr Tay Kay Yaw Dr Zeng Li Ho Thye Sin Li Wei
----	---

79	Assoc Prof Deidre De Silva Dr Vincent Ng Yew Poh Emily Ang Rohana Binte Basri
----	--

### SNEC

86	Assoc Prof Lee Shu Yen Assoc Prof Rahat Husain Assoc Prof Ho Ching Lin Loh Huey Peng
----	---

87	Asst Prof Ranjana Mathur Asst Prof Desmond Quek Aw Ai Tee Asst Prof Khor Wei Boon
----	--

### SHP

94	Dr Derek Tse Teo Lam Bee Alvis Leon Timothy Charles Adeline Tay
----	--

95	Dr Shah Mitesh Dr Jasmine Lew Jessie Neo Hanniel Lim
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### BVH

102	Magheshwari D/O RK Sabapathy Celine Yong
-----	---

103	Ratna Indra Putri Liew Lee Foong
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*We need to rethink and reframe the way we deliver care. In our planning, we have taken progressive steps to shift from institution- to person-centric care and create new models that are integrated across the continuum.”*

**PROF IVY NG**

Group Chief Executive Officer,  
SingHealth

A MASTER PLAN  
DESIGNED FOR  
**PATIENT-  
CENTRIC  
CARE**

The SGH Campus Master Plan anticipates the healthcare needs of Singaporeans and will provide an environment that supports the latest models of care that are holistic, multidisciplinary and team-based with integration across the whole spectrum of care.

The SGH Campus of the future will be Singapore’s largest medical campus when completed. It will provide patients with healthcare that is easily accessible, integrated and seamlessly connected to cutting-edge research and education, translating to better health outcomes for patients.

Designed to deliver a seamless continuum of care, the resulting vibrant healthcare ecosystem will also drive a world-class Academic Medical Centre that will define healthcare for Singapore.



**A SEAMLESS CONTINUUM OF CARE**

Leveraging on the synergy from the co-location of the three pillars of healthcare – clinical care, research and education – in one campus, SingHealth is able to deliver greater accessibility to new models of care for Singaporeans.

**AN INTERCONNECTED  
HEALTHCARE ECOSYSTEM**



Healthcare connectivity



Improved access for all



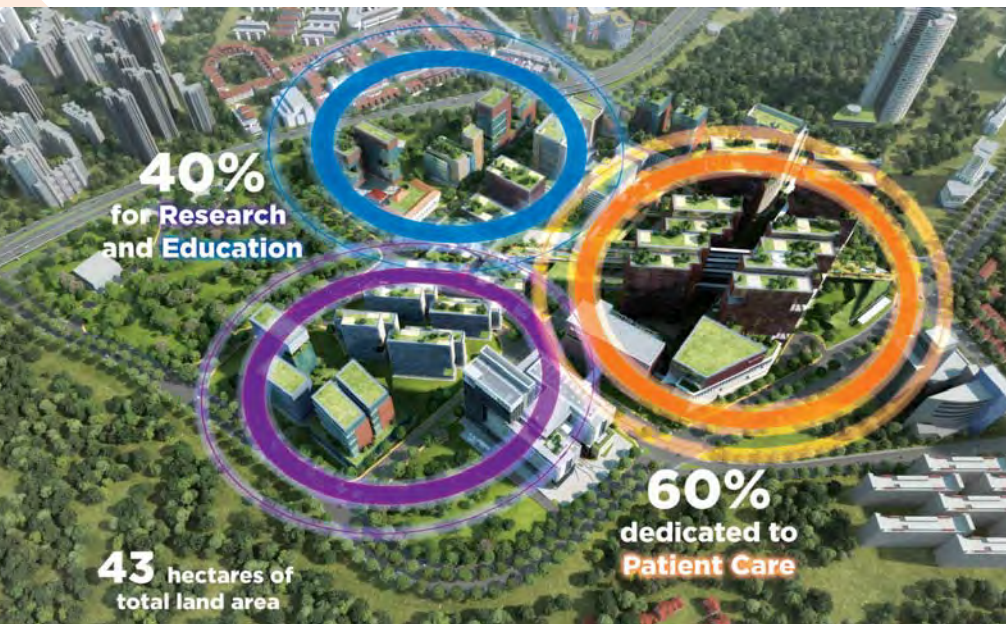
Pedestrian-friendly navigation

**A PHASED APPROACH**

Completed	Phase 1	Phase 2
DukeNUS Medical School	Outram Community Hospital SingHealth	Singapore General Hospital SingHealth (PHASE 2)
Academia	National Cancer Centre Singapore SingHealth	Specialist services from National Neuroscience Institute SingHealth
National Heart Centre Singapore SingHealth	Singapore General Hospital SingHealth (PHASE 1)	KK Women's and Children's Hospital SingHealth
	National Dental Centre Singapore SingHealth	

**AN EXCITING FUTURE**

To ensure the uninterrupted flow of operations, a strategic space planning timeline has been developed to facilitate the phased development of new infrastructure and migration of facilities from their existing buildings to their new locations within the campus.



**T**oday, the SGH Campus handles more than one-third of Singapore's public healthcare needs. In 2015 alone, the campus cared for more than 90,000 inpatients and handled 1.3 million specialist outpatient clinic attendances. With an ageing population, especially in the Southern region which the campus primarily caters to, capacity needs to be expanded.

According to Prof Ivy Ng, addressing demand for healthcare services is not just about adding capacity. "We need to rethink and reframe the way we deliver care. In our planning, we have taken progressive steps to shift from institution- to person-centric care and create new models that are integrated across the continuum."

Enter the SGH Campus Master Plan, which marks the redevelopment of the Outram site over the next 20 years and has been designed to facilitate care across institutional boundaries.

For example, the new Outram Community Hospital will allow patients to move seamlessly between acute and community

care. This is in line with the SingHealth Regional Health System's (see page 22) efforts to improve care transition for patients at every stage of their healthcare journey.

In conceptualising the Master Plan, careful consideration has been given to make sure the campus is age-friendly. "We took the lead to develop and publish the Singapore Healthcare Age-Friendly Infrastructure Design Guide last year," said Prof Ng. "These design guidelines will continue to be applied to create an environment that is warm, welcoming and safe for our older patients."

The Master Plan will also create dedicated and interconnected zones for patient care, education and research, reflecting the evolvement of the SingHealth Duke-NUS Academic Medical Centre partnership. "We have an opportunity here to co-locate cutting edge clinical services with strong research teams to work towards new treatments and cures for our patients," Prof Ng elaborates. "We also want the campus to remain a fertile training ground for generations of doctors, clinician scientists, nurses, allied health professionals and healthcare administrators."

As much as the Master Plan is progressive and transformative, Prof Ng emphasises that the fundamentals remain. "We stay true to our calling to care for all Singaporeans and ensure that they have access to leading-edge medicine that is appropriate and built around their needs."



### PROF ANG CHONG LYE

*Deputy Group Chief Executive Officer,  
(Clinical Services and Informatics), SingHealth  
Chief Executive Officer,  
SGH*

Singapore General Hospital (SGH) continues its legacy as the cradle of medicine in Singapore, with new models of care that are holistic, integrated and always patient-centred. With the transformation of the SGH Campus, we remain at the forefront of healthcare and stay true to our rich tradition as the heart of healthcare for Singapore.



### PROF FONG KOK YONG

*Deputy Group Chief Executive Officer,  
(Regional Health & Medical), SingHealth  
Chairman, Medical Board, SGH*

As a well-integrated Regional Health System, SingHealth will develop new models of care so that patients can benefit from an interconnected healthcare ecosystem that spans the spectrum from primary to tertiary care, together with our community partners. The new SGH Campus will enable us to continue to lead the development and delivery of new treatments and technologies to ensure holistic care for Singaporeans.

### PROF SOO KHEE CHEE

*Deputy Group Chief Executive Officer,  
(Research and Education), SingHealth  
Director,  
NCCS  
Senior Vice Dean,  
Clinical, Academic & Faculty Affairs, Duke-NUS*

The new SGH Campus will provide the ideal environment for the rich integration of clinical care, research and education. This seamless interconnectivity will yield a robust academic culture to catalyse new discoveries and innovative care, which will benefit patients and underpin our position as a leading Academic Medical Centre.







**ASSOC PROF TAN SAY BENG**

*Group Director, Research  
Senior Associate Dean,  
Clinical Sciences, Duke-NUS*

There is now a common strategy and much better coordination of research within SingHealth than in the past. There is also greater appreciation that research can lead to improvements in clinical care. With research funding increasingly focused on areas that reflect national needs, we need to adapt accordingly and prioritise our areas of research. At the same time, we need to ensure that individuals and groups who are not in the priority areas remain sufficiently engaged and supported.

**DR EDWIN LOW**

*Chief Operating Officer,  
Regional Health System*

In setting up the Regional Health System for SingHealth, we need to reach out to our community partners to identify healthcare needs, and then co-create programmes to address these needs. Internally, we need a paradigm shift to help all our staff be more person-centric and think about how they can provide seamless care to the community. One of the key initiatives is the Esther Network movement which we hope will help clinicians focus on providing holistic person care.



**KOH LI HOON**

*Deputy Director,  
Strategic Human Resources*

I'm currently on the Career Advancement Taskforce, which develops career and competency framework pathways for our administrators. It's interesting and challenging at the same time, harmonising the career paths across SingHealth cluster. I strongly believe that this is an important part of the people process, to map out the possible opportunities and to have structured progression tracks for staff. Being involved in this project gives me great satisfaction, knowing that I have direct impact on administrators' development in SingHealth.



**AUDREY LAU**

*Deputy Group Director,  
Group Communications  
Director, Corporate Development, KKH*

When I partner clinicians to successfully garner philanthropic support in research, education and clinical care initiatives, I am gratified that I, too, play a part in improving our patients' lives. For donors, our causes are opportunities to partner clinicians and researchers in unveiling new discoveries, grooming tomorrow's medical experts and providing compassionate care. When we communicate the opportunities for philanthropic partnerships, we enable powerful synergies that transform patients' lives and advance the way Medicine is practised for better health.



**ASSOC PROF NARAYANAN GOPALAKRISHNA IYER**

*Head,  
SingHealth Duke-NUS Head & Neck Centre  
Senior Consultant,  
Division of Surgical Oncology, NCCS*

I'm working on precision oncology in head and neck cancer. We're streamlining our protocols, tightening up our quality measures and doing many hours of research which can be painstaking and "fruitless" at times, for the potential to better the medical practice. Instead of focusing on the glamorous output of papers, patents and industry money, the less glamorous output of changing actual patient outcomes has to come into play.



**ISABEL YONG**

*Director,  
Group Service Quality*

Having worked in healthcare for 12 years, I can see how ageing has become a real issue that will confront every one of us. I see more wheelchairs along the corridors and have offered more wheelchairs to limping elderly daily. We need to press on to make our infrastructure more age-friendly and resolve some of the care issues faced by them after discharge, especially those who are alone and without family support.



**GORMIT KAUR**

*Deputy Director Nursing,  
Nursing Division*

I am a trained Paediatric and Neonatal Nurse, but my area of focus now is on clinical and management. I'm seeing more nurses taking on roles that were traditionally held by doctors and this is the way to go. As nurses, we bring an important voice and point of view to management and policy discussions. To help lead the changes in healthcare that the population needs, nurses have to assume enhanced and reconceptualised roles in health coaching, chronic disease management, transitional care, prevention activities and quality improvement.



**WONG LAI YIN**

*Director,  
Strategic Development & Operations,  
Group Procurement Office*

The integration of procurement as a shared service has broken down silos and encouraged us to come together as a group. Through consolidation of the team and rigour in sourcing strategies, we have strengthened supplier management practices. Our aim for consistency in governance and practices is coming to fruition with the implementation of a cluster-based eProcurement system, supported by a standardised group procurement policy. We need to continually evolve so that we can create an integrated supply chain that is responsive, agile and efficient.





*Antibodies usually prevent a person from being re-infected but that's not what we saw with the dengue virus."*

### PROF OOI ENG EONG

Deputy Director,  
Emerging Infectious Diseases Programme,  
Duke-NUS Medical School

## EMERGING INFECTIOUS DISEASES PROGRAMME

Research and knowledge is what lies between shielding a country from emerging infectious diseases and allowing an epidemic to occur spontaneously. Prof Ooi Eng Eong's research in Dengue is part of the larger Emerging Infectious Diseases Programme at Duke-NUS Medical School.

The purpose of the Emerging Infectious Diseases Programme at Duke-NUS is to pioneer the development and discovery of new and more effective methods for the treatment, prevention and control of new and emerging pathogens. The key outcome of the research will be the early identification of new pathogens, out of which new diagnostic tests, treatments and control strategies will also be developed.



#### RESEARCH FOCUS

- Dengue
- Zoonotic Viral Diseases
- Influenza
- Viral Hepatitis



#### NUMBER OF PUBLICATIONS

491



#### NUMBER OF FACULTY

20

Programme Director: Prof Wang Linfa  
Programme Deputy Director:  
Prof Ooi Eng Eong



#### AWARDS

- SingHealth Duke-NUS Research Team Award
- National Research Foundation (NRF) Investigatorship
- NRF Fellowship
- National Day Public Service Medal 2015 (Friends of Singapore)
- Emeritus Professorship
- Singapore Translational Research (STaR) Investigator Award
- Clinician-Scientist Award
- Eureka Prize for Infectious Diseases Research
- National Institutes of Health (NIH) Career Development Award



#### NUMBER OF PATENTS

18



#### NUMBER OF GRANTS AWARDED

123 AMOUNTING TO  
\$68  
MILLION



#### NUMBER OF SPIN-OFF COMPANIES

- 3
- SABio
  - Lion TCR Pte Ltd
  - Tychan Pte Ltd



*“A disease is like a 3D puzzle. With our individual expertise, we only have 2D views. But when we each bring our different expertise and perspectives together in a collaboration, we’re better able to see the problem holistically and come up with new solutions.”*

— Prof Ooi Eng Eong

When Duke-NUS Medical School's Emerging Infectious Diseases (EID) Programme was set up in 2007, the natural inclination was to focus on emerging but neglected diseases in the region. Dengue, a prevalent disease in this part of the world, was on top of the list and that was how Prof Ooi Eng Eong, one of the first members of the programme, switched from public health to basic dengue research in academia.

His research is focused on the interface between antibodies and dengue virus. “Antibodies usually prevent a person from being re-infected but that’s not what appears with the dengue virus,” explained Prof Ooi. “A person previously infected with one type of dengue could be re-infected with the other three types of dengue. Moreover, the risk of severe dengue increases with the second infection and the prevailing hypothetical explanation at that time was that antibodies that developed following the first infection enhanced the second infection. However, how antibodies enhance dengue infection is not completely clear. We thus set out to tease out the molecular details of antibody-enhanced dengue.”

Over the years, Prof Ooi's laboratory has produced several key findings that pinpointed the molecular machinery that operated during the second dengue infection. A clinical trial was started in 2013 to prove the findings in humans. Prof Ooi recalled

the reaction of Dr Jenny Low, Senior Consultant of the Department of Infectious Diseases at SGH and collaborator of the study, when he first suggested the hypothesis to her. “She thought I was crazy and that I wanted to make people sick!” he chuckled. “But we went where the research led us and substituted dengue virus with a vaccine to test our idea. The results of the clinical trial showed that antibodies under specific conditions did, in fact, enhance viral infection in humans.”

The findings open new perspectives on the way we battle the disease and could lead to the design of more effective dengue vaccines.

Although his laboratory has already published in several prestigious journals worldwide, Prof Ooi was quick to emphasise the long, painstaking process of research. “There are more ‘failures’ than successes in research. It can be discouraging but failures are lessons that sometimes lead us to the right answers, more so than successes.”

“I was fortunate to have two things in my favour: a great mentor and an outstanding collaborative team at Duke-NUS and SingHealth. The importance of collaboration cannot be overstated. A disease is like a 3D puzzle. With our individual expertise, we only have 2D views. But when we each bring our different expertise and perspectives together in a collaboration, we’re better able to see the problem holistically and come up with new solutions.”



### DR JENNY LOW

Senior Consultant,  
Dept of Infectious Diseases, SGH

The exciting new breakthroughs in our work are possible because we have an extraordinary team of collaborators. We have encountered many failures and disappointments in the past but the team has always held on to our beliefs. Research is not for everyone and anyone. It is a lot of hard work and sweat, and often with no achievement to show. But without clinical research, there would be no new advancement for mankind. I will tell young doctors — don't be afraid to explore the new and the unknown, otherwise you will never know.



### DR EUGENIA ONG

Research Fellow,  
Emerging Infectious Diseases Programme,  
Duke-NUS

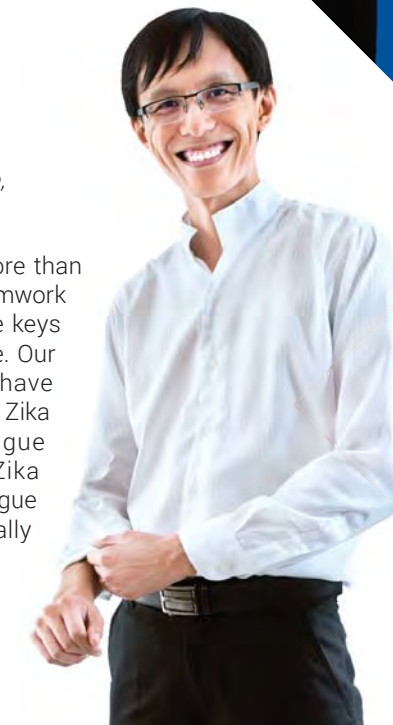
My work this past year involved looking at the antiviral activity of a therapeutic antibody for dengue virus in both cell culture and animal models, so as to prepare for a Phase I clinical trial in humans. Very often, we have to design experiments that test our scientific hypotheses and also ensure their reproducibility. I certainly would not have been able to achieve as much without advice from the “pros” — researchers who are familiar with what I am about to work on.



### DR SHIRIN KALIMUDDIN

Consultant,  
Dept of Infectious Diseases, SGH

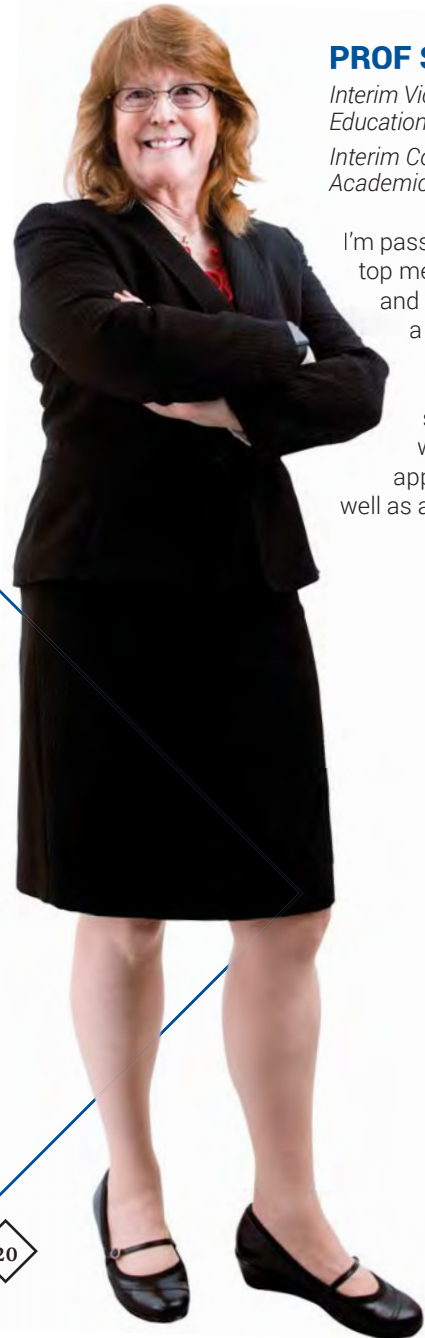
The Department of Infectious Diseases in SGH and the EID programme at Duke-NUS have had a close working relationship for several years. Translating research from the bench to the bedside is not without its challenges. For example, we had to find ways to minimise the radiation exposure to our study participants with dengue fever who would be undergoing Position Emission Tomography (PET) imaging. However, we're not afraid to push the boundaries and come up with novel approaches to solve research questions. Most importantly, we have a common goal which is for our research to ultimately benefit patients in the long run.



### DR CHAN KUAN RONG

Research Fellow,  
Emerging Infectious Diseases Programme,  
Duke-NUS

I've been working with Prof Ooi for more than eight years, and I believe that good teamwork and a network of collaborators are the keys to consistency and doing great science. Our findings from the dengue research have direct relevance to the development of Zika virus vaccines as the Zika and dengue viruses are closely related. Future Zika vaccines will need to consider how dengue cross-reactive antibodies can potentially affect vaccine efficacy.



**PROF SANDY COOK**

*Interim Vice Dean,  
Education  
Interim Co-Director,  
Academic Medicine Education Institute*

I'm passionate about helping Duke-NUS become a top medical school – with outstanding students and faculty. Since 2006, we have grown from a small school to one that is part of a dynamic Academic Medical Centre with a commitment to medical education, scholarship and clinical care. In education, we are looking for ways to further enhance appropriate technology-focused learning as well as accrediting self-directed learning efforts.



**ASSOC PROF JOHN LIM**

*Executive Director,  
Centre of Regulatory Excellence*

I'm really excited by the opportunities offered by the Duke-NUS Centre of Regulatory Excellence (CoRE) to develop capabilities for better and "smart" regulation of medicines and medical devices in Asia-Pacific, particularly in Singapore and Southeast Asia. With the positive support we have been receiving, CoRE promotes innovation in regulatory policies to streamline national regulatory systems so that patients can have timely access to safe and effective therapies. The main challenges will be addressing new therapeutic products and modalities arising from major ongoing advances in biomedical research and development.

**PROF KOH WOON PUAY**

*Office of Clinical Sciences  
Lead, Talent Development,  
Academic Medicine Research Institute*

As the Lead of the Talent Development Core in the Academic Medicine Research Institute (AMRI), I run programmes to nurture budding clinician-researchers in our Academic Medical Centre. In this work, I have had the privilege and pleasure to meet young clinicians and allied health professionals, and help each of them work out a comprehensive and personalised plan to achieve his or her goals in research. We have a hardworking, passionate and talented pool of young people in our midst and with institutional support in resources and time, the sky's their limit in what they can achieve in their research endeavours.



**VERA GOH**

*Final year MD/PhD student*

Many more clinicians are engaging in clinical research. However, there is still a gap between clinical and laboratory research that needs to be filled and I hope to bridge this gap. There is already increased focus on training clinicians with solid background in laboratory research, and in allocating protected time for laboratory research. Having insight into both worlds can hopefully help me make more meaningful contributions to patient care and medical research in the future.

**DR VIJI VIJAYAN**

*Assistant Dean,  
Safety, Health and Emergency Management, and  
Central Procurement Departments*

*Director,  
Research Operations Department*

Safety science is an evolving field of study that has been successfully adopted in industries like aviation and nuclear plants. I foresee that biomedical laboratories and healthcare will benefit from it as well. My challenge is to empower staff to take control of the safety in their work.



**DR LIM KHENG CHOON**

*Chief Resident,  
Dept of Diagnostic Radiology, SGH  
Alumnus (Class of 2011)*

Residency is a significant change to the postgraduate medical training of doctors in Singapore. It brings about a system that allowed the institutions to take greater ownership of the training of junior doctors. This provided a more structured framework. As a chief resident, I'm now involved in training my junior colleagues. It's satisfying to see them reciprocate our efforts with enthusiasm and commitment.

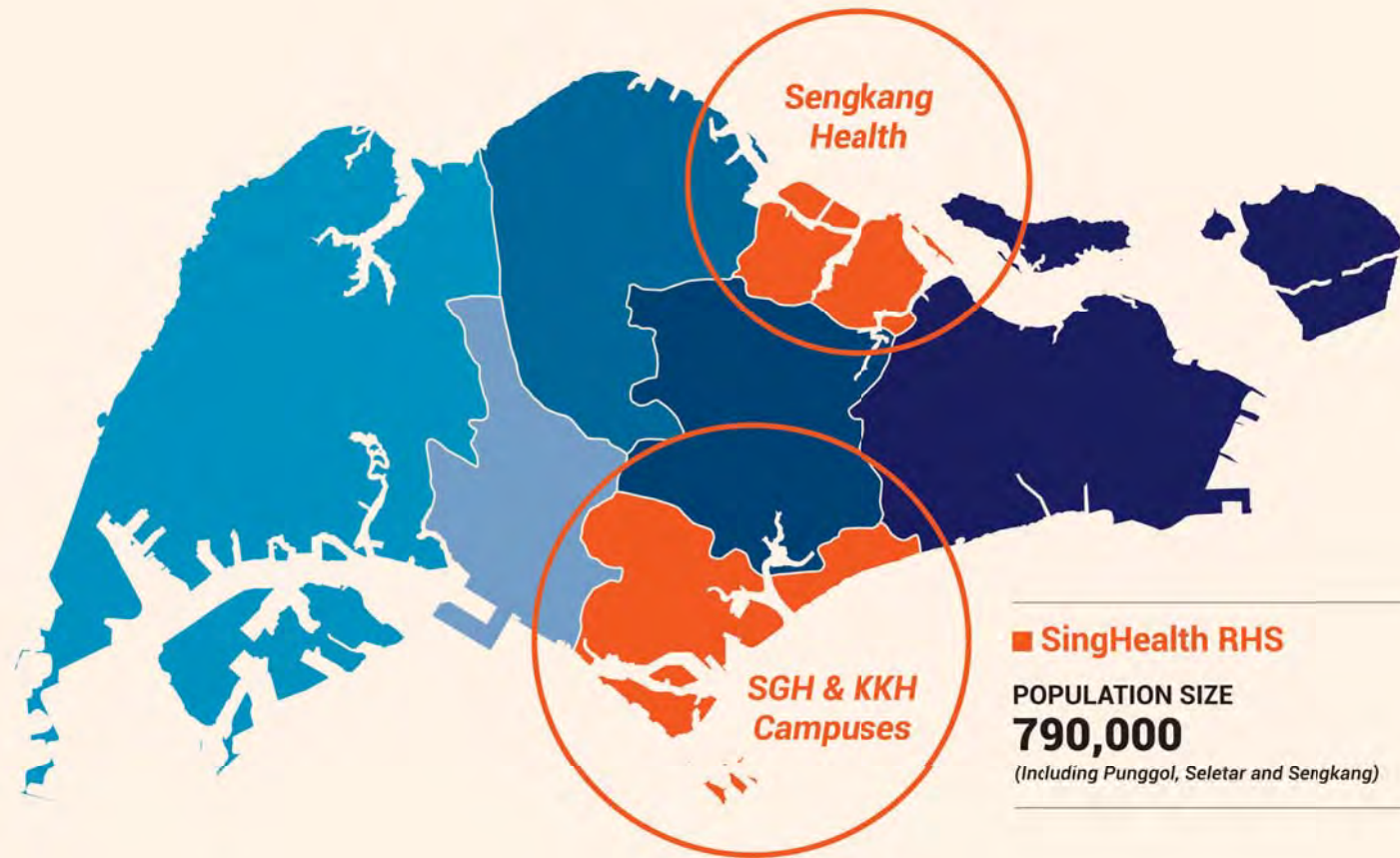
**CORINNA NG**

*Director,  
Communications and Organisational Excellence*

I'm constantly amazed by the indomitable human spirit of our many champions in healthcare, their ability to meet challenges, their dedication and their kindness. That's what makes working in healthcare so meaningful and inspiring. I hope to share these stories and learn from those around me.



# SINGHEALTH REGIONAL HEALTH SYSTEM

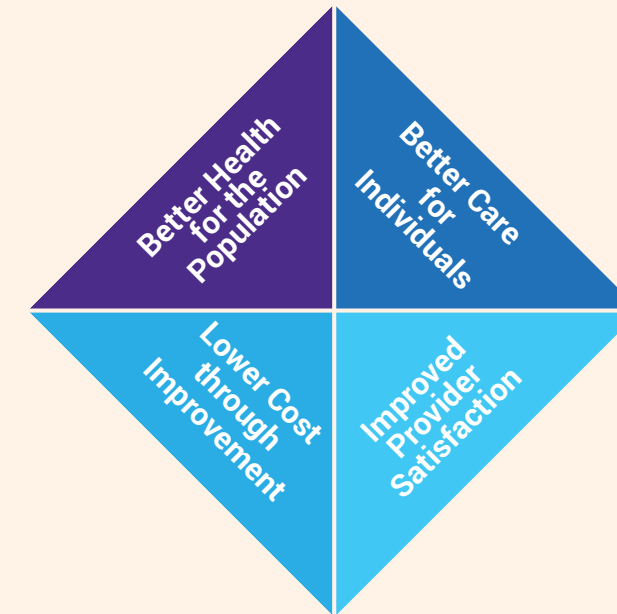


The SingHealth Regional Health System (RHS) believes that our population can be empowered to stay healthy in their communities and homes. To achieve this, we work closely with partners across the care continuum, such as General Practitioners, Intermediate and Long-Term Care agencies, and Voluntary Welfare Organisations to provide care and support for the population.

As an academic RHS, we also leverage health services research to better understand the population's healthcare needs and provide care based on those needs.

The Esther Network Singapore set up in June 2016 enables the SingHealth RHS to collaborate with like-minded organisations in the primary, intermediate and long-term care sectors. Similar to the 'Esther Network' in Sweden's Jönköping County, the Network constantly seeks to answer what's best for the individual and pools expertise and resources together to provide person-centred care beyond hospital walls.

## Our Quadruple Aim



### The Quadruple Aim is achieved through:

#### Population stratification

Accurate patient and population segmentation is a critical first step in defining the needs and groups that require intervention. The infrastructure for the SingHealth patient database will be launched in late 2016. The conceptual framework for population stratification is aligned with that of the Ministry of Health and the Quadruple Aim.

#### Seamless Care Transition

##### Transitional Home Care Programme

The SGH Office for Integrated Care runs a three-month programme for patients who are at risk of hospital re-admissions due to complex health issues and lack of proper support at home. Before a patient is discharged from SGH, a multidisciplinary team draws up a customised support plan. After discharge, patients are closely monitored for three months via phone calls and home visits to address any complications early. The **517** patients under the programme had an average reduction of 30% in hospital re-admissions, A&E attendances and length of hospital stay.

#### Partnering GPs on chronic disease management

**DOT**  
**Delivering on Target**

In FY2015, **1,162** SGH and NHCS patients with stable chronic conditions were referred to GPs to help co-manage their conditions under the Delivering on Target (DOT) programme. 150 GPs are currently on board the programme.

KKH worked with GPs and paediatricians to care for **138** children with stable asthma. According to the caregivers surveyed, 92% of the children remained exacerbation-free, and 75% did not have any symptoms of asthma within the first six months.

#### Patient Navigators (PNs)

PNs are trained nurses who support patients with complex health and social issues from the point of admission to discharge or end-of-life. The intervention by PNs has reduced A&E attendances by **53%** within six months, for **4,338** SGH patients enrolled in 2015.

#### Match-A-Nurse

This mobile app matches SGH and KKH nurses to patients who require home nursing services after their discharge. The service aims to provide a smooth transition and good continuity of care when patients return home.

#### Reduced waiting time for heart patients

Family physicians at SHP are now able to order advanced cardiac diagnostic tests for patients who fulfil certain criteria. This has helped patients to be diagnosed and treated sooner.

#### Community Partnerships

##### Building capabilities of nursing homes

The SingHealth Alice Lee Institute of Advanced Nursing and SGH Infection Control Unit have trained **19** staff champions at Bright Hill Evergreen Home and Ju Eng Home for Senior Citizens in areas such as infection control and pain management. The champions will go on to train their colleagues in these areas.

##### Early detection through community screenings

**486** residents have benefited from community health or dental screenings in five constituencies (Tanjong Pagar-Tiong Bahru, Mountbatten, Radin Mas, Tanglin-Cairnhill and Kreta Ayer-Kim Seng). More than 80% of residents screened were found to have abnormal or at-risk results and were referred to GP partners near them for follow-up care.

#### ST<sup>⊗</sup>P Diabetes

SCREENING for families at RISK

To enable early detection of diabetes, SingHealth has partnered over **90** GPs across the island to offer free health screening for parents, siblings and children of individuals with Type 2 diabetes.

#### millennia KIDS

Sengkang Health

Sengkang Health has been promoting healthy living to primary school students and training them to be Healthy Living Advocates in the Northeast region. To date, **4,500** students and their families have participated in healthy living workshops and family carnivals.



*In our preferred model of care, form has to follow function. All the stakeholders need to work together.”*

**LOH YONG HO**

Deputy Group Chief Operating Officer, Infrastructure Development, SingHealth

Chief Operating Officer, Singapore General Hospital (SGH)



*The aim is to ensure that every step of care is streamlined to optimise patients’ recovery.”*

**PROF FONG KOK YONG**

Deputy Group Chief Executive Officer, Regional Health & Medical, SingHealth

Chairman, Medical Board, Singapore General Hospital (SGH)



OPTIMISING REHABILITATION WITH **OUTRAM COMMUNITY HOSPITAL**

Located within the SGH Campus, patients at Outram Community Hospital will benefit from the seamless continuity of care as they transit from SGH to the Outram Community Hospital. Patients will also benefit from the co-management of the clinical care provided by SGH, the SingHealth National Specialty Centres and the Outram Community Hospital healthcare teams at every stage of their care.

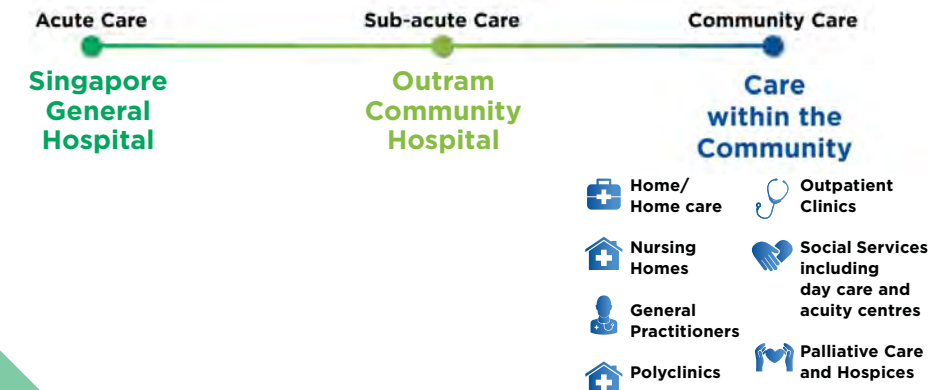


- OUR FOCUS:**
- From Care to Recovery
  - Integrating for Better Outcome
  - Rehabilitation in Every Space
  - Faster Recovery in a Healing Environment
  - Holistic Care for Better Patient Experience
  - Hospital for the Future



<b>148,000 SQM</b> gross floor area	<b>550</b> beds	<b>6 FLOORS</b> of inpatient wards	<b>1,550 SQM</b> rehabilitation garden	<b>7,700 SQM</b> outpatient rehabilitation centre

**INTEGRATED AND CONTINUING CARE**  
The Patient Journey at Outram Community Hospital



In the new model of care, a patient will be able to move seamlessly between the different levels of care, from an acute hospital ward, to a community hospital ward for longer term care and rehabilitation, before going back home. Enabling this vision is the new Outram Community Hospital (OCH) which will be located in the heart of the SGH Campus come 2020.

“The aim is to ensure that every step of care is streamlined to optimise patients’ recovery,” said Prof Fong Kok Yong. “OCH will therefore focus largely on optimising rehabilitation and the recuperation process for patients.”

In fact, healing spaces have been purposefully incorporated into all aspects of OCH’s design. “For example, the wards have wider corridors to facilitate movement and rehabilitation,” explained Mr Loh Yong Ho. “Integrated into each ward are also rooms for practising rehabilitation exercises to ease patients back into their routine.” These include dining rooms where they can have their meals and a simulated home environment to practise daily tasks.

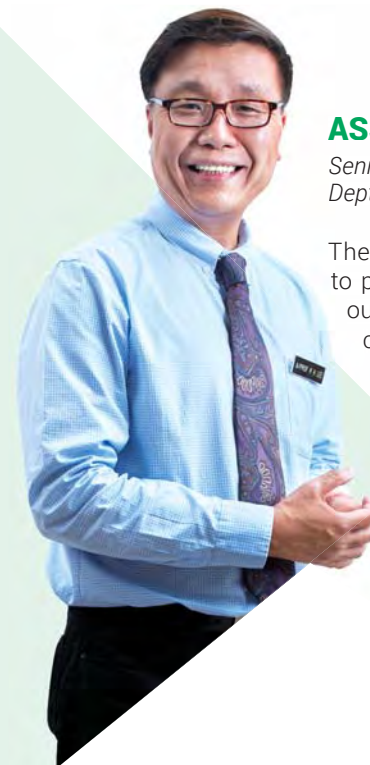
One floor has been allocated to acute rehabilitation for serious cases such as recent stroke victims. Other rehabilitative facilities include those for dialysis and degenerative diseases such as Parkinson’s Disease. Located on the top floor of OCH is the palliative care ward which is linked to a rooftop garden designed



to provide a serene environment conducive to physical and emotional wellness.

Planning OCH was no simple task as the infrastructure serves many stakeholders. “The building will also house an administration section as well as a campus logistics hub in the basement where materials and supplies are stored and managed,” said Mr Loh. “There will also be outpatient clinics which can be converted into wards for certain specialties, such as a sleep clinic. Where it makes sense, we cluster disciplines within the same location.”

The planning team has been hard at work, engaging stakeholders to make sure there is synergy. “For instance, we are working very closely with Voluntary Welfare Organisations (VWOs) offering long term care like hospices to ensure that our model of care dovetails with their needs,” elaborated Prof Fong. “OCH is, after all, about serving the community so we need to consider views from all perspectives.”



### ASSOC PROF LEE KHENG HOCK

Senior Consultant,  
Dept of Family Medicine & Continuing Care

The key to the success of OCH will be our ability to provide interdisciplinary and integrative care to our patients. As family physicians are in essence community-oriented generalists, my role is to bring this approach to the planning process and develop new models of care. I am really amazed by how well things have fallen into place. I think OCH breaks new ground for us and will become an icon of interdisciplinary collaboration.



### PHILIP HENG

Director,  
SGH Campus Development (Planning), SingHealth  
Project Director, OCH Commissioning Secretariat  
Director, Office of Safety Network

The OCH building is the first in a series of four buildings under Phase 1 of the SGH Campus Master Plan. As part of a mega jigsaw puzzle, it needs to be planned in relation to the entire Master Plan, such as the segregation of various modes of traffic (vehicular, pedestrian, patient and staff) and integration of carparks. We need to make sure the plans are integrated not only to fit the requirements of the OCH building project but also the upcoming phases, until 2032.

### LEILA ILMAMI BINTE NASRON

Head,  
Dept of Occupational Therapy

I’m most excited about the rooftop garden as it will allow rehabilitation to be done in the lush of greenery. The space has been designed to allow for rehabilitation activities such as walking, wheelchair mobility, training on how to get onto a bus safely, moving within an MRT cabin and so on. There will also be a space meant for patients to do gardening, under the supervision of a therapist. We hope that such activities will motivate patients to go outdoors and interact with one another.



### KAREN PERERA

Deputy Director,  
Division of Nursing

When designing the wards and working out the nursing care processes in OCH, I have to switch my mindset from one of acute care to that of community setting. Visits to other community hospitals have shown me how they are managed, staffed and what resources will be required. I am challenged to redesign job scopes with the help of simple and cost-effective technology.



**PROF TAN PUAY HOON**

*Chairman,  
Division of Pathology*

In my 30 years in healthcare, I have seen it transform in many aspects. In pathology, where we once relied on manual work processes, technology and automation have now significantly improved laboratory workflows and quality. Digital pathology is an empowering tool, while molecular investigations are becoming routine elements in pathology diagnostics. I envision that pathology will continue to rapidly expand its scope of tests for personalised patient care, harnessing technology for efficiency and aiding the pathologist in rendering diagnoses.



**ANG SHIN YUH**

*Senior Nurse Manager,  
Nursing Research and Knowledge Enterprise*

In healthcare, everything is interconnected. It's like a huge machine — every single part needs to work well for the machine to run, down to the last bolt and nut. We are currently looking at how we can further improve the clinical handover process to enhance patient safety and satisfaction. Using research methods that we had never done before, such as filming actual handovers and adopting participatory methods, we bring real change to the clinical setting.



**ASSOC PROF WONG KOK SENG**

*Head & Senior Consultant,  
Dept of Internal Medicine*

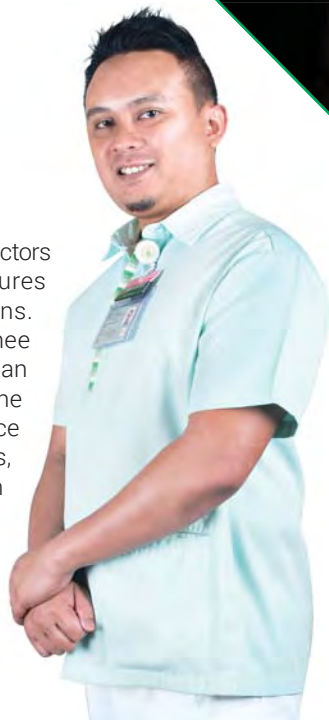
As care and technology become more complex, the need for the clinician to figure out what is the matter with the patient and what matters to the patient remains paramount. It is too easy to order another test or scan. These can produce more noise than meaningful signals. Internal Medicine plays a key role in the education of medical students and junior residents to ensure they receive a sound foundation before they launch into areas of specialisation and sub-specialisation.



**MOHAMMAD NAZRI BIN JOHRI**

*Nurse Clinician (Resident Nurse)*

Advancements in robotic surgery have allowed doctors to perform many types of complex procedures with more precision and fewer complications. Many patients who have undergone total knee replacement can walk the following day and can be discharged as early as three days after the procedure. Currently, I am working to introduce the KneeBuddy app, available on smartphones, to my patients. The app provides patients with information on pre- and post-operative care, and treatment plans, thus reducing their anxiety.



**DR KENNETH TAN**

*Consultant,  
Dept of Emergency Medicine*

I have witnessed the transformation of medicine with the development of new subspecialties as well as the increasing complexity of the patients we see. We also see more patients with transplants and chronic diseases. As Emergency Medicine physicians, we have to treat a wide variety of conditions and manage some of the complications that might come with treatments. To stay ahead of the curve, we need to constantly upgrade ourselves and enhance research capabilities, so as to improve workflow and patient care.



**ROBYN FOO**

*Principal Speech Therapist*

It has been rewarding to see the career pathways for speech therapists evolve over the past five years. Today, we have meaningful opportunities for speech therapists to grow knowledge and skills for the advancement of careers via clinical fellowships and other training programmes. With increasing emphasis on multidisciplinary care, allied health professionals have stepped up into primary care roles, contributing significantly alongside doctors to improve clinical outcomes for our patients.



**ASSOC PROF TAN BIEN KEEM**

*Director,  
Transplant Tissue Centre and Deputy Director,  
Cell and Tissue Transplant Programme, SingHealth  
Head & Senior Consultant,  
Dept of Plastic, Reconstructive and Aesthetic Surgery*

Our work in liver transplant over the past year has been very fulfilling and we have learnt new techniques adapted to deep cavity work. More recently, we are looking at the feasibility of uterine transplantation with the Obstetrics & Gynaecology department, as well as face and hand transplantation with the Hand Surgery department. Patients with severe facial disfigurement and hand amputations stand to gain from the latter but the major hurdle is tissue rejection. Research is now focused on creating immune-tolerance with stem cell transplant.



**NORSHAHIMAN BIN AHMAD SHAH**

*Senior Manager,  
Human Resources (HR Technology)*

The healthcare industry focuses primarily on the rendering of medical care to patients. Yet, support functions like HR are critical as we maintain systems that enable the frontline professionals to carry out their work effectively. I am currently involved in a project to consolidate all the HR systems within SingHealth onto a common platform, to facilitate collaboration among the ten institutions. Hospitals and specialty centres no longer operate as independent silos today and our systems need to support this collaboration.





**DR TAN YORK KIAT**

*Consultant,  
Dept of Rheumatology & Immunology*

There is now greater emphasis on research mentoring and career development in our hospital. This is important in supporting and nurturing the next generation of clinician researchers. Research is a team effort, from research coordinators to biostatisticians and other research collaborators or co-investigators. It is important to have an inquisitive mind, to continue developing new research ideas, and asking impactful and clinically relevant research questions that can ultimately lead to enhanced patient care.

**DR DIXON GRANT**

*Senior Resident,  
Dept of Haematology*

I am currently working on a research project to identify a recently described sub-type of acute lymphoblastic leukaemia, using FISH and PCR instead of the more expensive techniques (gene expression profiling and RNA sequencing) initially used to describe this subtype. I foresee that in the next ten years, along with CT scans, PET scans and biopsies, we will also have routine genomic sequencing of the diseased and normal cells for patients with cancer. This will lead to more individualised treatment, and hopefully better outcomes for patients.



**LIM TEONG GUAN**

*Senior Principal Clinical Pharmacist*

I spearheaded the Inflammatory Bowel Disease (IBD) biologics patient registry. This IBD biologics registry, believed to be the first in Singapore, is a collection of data on IBD and biologic treatment. It provides real life data on the efficacy and safety of biologics, which are drugs made from a synthetic antibody. Through analysis, the data can help clinicians and researchers to better manage IBD as well as tailor biologic treatment for each patient, depending on the disease characteristics.



**DR PUA YONG HAO**

*Principal Physiotherapist*

I am currently maintaining three clinical databases in the area of total knee replacement, anterior cruciate ligament reconstruction and lower back pain. By merging databases from multiple sources, we can generate insights from combined data to compare outcomes, identify risk factors and develop prediction models. My profession can enrich its practice with analytics and innovation to provide better patient care. Innovation is not just about creating something new but finding new applications for existing “commonplace” devices, such as the smartphone.



**DR PREMA RAJ S/O C JEYARAJ**

*Head,  
SingHealth Duke-NUS Liver Transplant Centre  
Senior Consultant,  
Dept of Hepato-Pancreato-Biliary Surgery*

While we invest for the future, we also need to be mindful of costs, especially procedural costs. For Singapore to compete on a global scale, we must be fiscally responsible and smart about our investments. For everyone to be on the same page, we should bring together medical, allied health and administrative staff together to share a common vision.



**LINDA LIM**

*Senior Manager,  
Admissions Office*

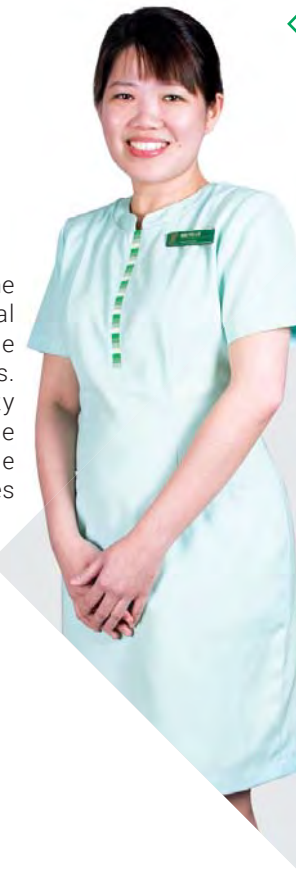
I’m passionate about reviewing and streamlining workflows so that our patients’ journey will be more hassle-free. SGH has leveraged technology extensively to improve processes, such as online access of documents, e-Appointments and setting up of a Bed Management System using RFID. More back-end functions will be done electronically for payment, form submission and so on. I also conduct training sessions for staff and build up their confidence to manage new workflows or systems.



**KOK PEI LAI**

*Nurse Clinician*

As part of the Commissioning Committee for the Elective Care Centre and new National Dental Centre Singapore (NDCS), I am involved in the development and designing of operating theatres. It is an eye-opener and a valuable opportunity for me to apply the knowledge and experience that I have accumulated all these years. In the future, I foresee more hybrid operating theatres being established and more focus on simulated skills training and in-situ crisis response management-based training. This would allow novice nurses to gain proficiency before they look after patients.



**KEVIN LOW**

*Director,  
SGH Campus Development (Projects), SingHealth  
Director,  
Facilities Development and Projects*

The next 10 years will see the SGH campus undergo major developments, namely the Outram Community Hospital, SGH Accident and Emergency (A&E) Block and new National Cancer Centre Singapore (NCCS) as well as the Elective Care Centre and new NDCS. Each of these projects is critical as we move towards an integrated public healthcare system. Planning for the campus redevelopment allows us to create a Smart Campus – one that adopts technology to reduce manpower demands and increase operational efficiency.



# PATIENT SAFETY

## Background

A study by researchers from John Hopkins Medicine published in the BMJ (formerly the British Medical Journal) in May 2016 estimated that medical error is the third most common cause of death in the United States.

While there is no similar study in Singapore, the Hepatitis C virus infection at the SGH's renal ward in 2015 was a sombre reminder that ensuring patients are safe in our care must be our top priority and must always come first. This painful lesson has led to a review and strengthening of safety processes and infection control measures throughout the SingHealth cluster.

Collectively, we have set Target Zero Harm as a goal to ensure that our patients receive the care they deserve – safe care. Target Zero Harm is a sustained and deliberate effort to foster and strengthen a culture of continuous improvement in patient safety and quality.

**To continually improve patient safety, everyone in SingHealth must play an active part in:**



Identifying and mitigating risk to prevent harm



Fixing system defects and incorporate human factors in system design



Open sharing of good catches and best practices



Building a culture in which everyone is accountable for patient safety

With over 20,000 staff in SingHealth, we can be one formidable safety network. In the coming year, a cluster-wide Institute of Patient Safety and Quality will be set up to further drive patient safety and quality improvement across institutions, domains and platforms.

## Strengthening A Patient Safety Culture



## SingHealth Family Target Zero Harm Awards

The SingHealth Family Target Zero Harm Awards was set up to encourage and affirm individuals and teams who:

- Speak up against unsafe practices
- Spot, highlight and share good catches
- Inspire, advocate or implement significant improvements in patient safety

Funds for this award were donated by the SingHealth family as a show of commitment to patient safety. To show their support, a team of doctors, nurses, allied health professionals and healthcare administrators, known as the SingHealth Freewheelers, also cycled a gruelling 195km across Singapore over two days to raise a total of \$22,550 for the award.

On 1 August 2016, ten nurses and two nurse-led teams from KKH, NCCS, NHCS and SGH became the first recipients of the SingHealth Family Target Zero Harm Awards for their efforts in raising patient safety standards and eliminating preventable errors.



## TARGET ZERO HARM



### PROF IVY NG

Group Chief Executive Officer, SingHealth

Our patients must be safe in our care. Speak up if you think something is not right. Be open to improvements and share freely. From care team to the patient and their family, we have the power of teamwork in keeping patients safe.



### DR TERENCE KEE

Senior Consultant, Dept of Renal Medicine, SGH  
Member of SingHealth Freewheelers

In 2015, my mother-in-law was hospitalised. During her stay, I was surprised to learn that she was given the wrong medication in the ward. Being in healthcare, it was especially difficult to accept that this could happen to my loved one. It spurred me to do something to help build a safer environment for those we are responsible for and love. This is why I contribute to this cause by raising funds for the SingHealth Family Target Zero Harm Award.



### IAN WONG

Principal Radiographer, SKH  
Member of SingHealth Freewheelers

As a radiographer, I only come into contact with patients when they need an X-ray or CT scan. Because of this, I tend to take for granted what can be achieved within this short period of time. In fact, a lot of things can be done for better patient care and safety. No matter how short the contact time or how small an action, we can make a difference in ensuring our patients get the best treatment and minimise harm.



### YVONNE TAN

Senior Staff Nurse, SGH

My first priority is always to ensure the safety of the patient. This means conscientiously looking through patient records before taking over the shift and making it a point to familiarise myself with their condition so that I can spot anything amiss. Each of us in the medical team can play "gatekeeper" to preventable harm by helping each other spot good catches and learn from them!

**Zero Harm, Zero Incidence, Zero Compromise.**



*It's always sad to see stillbirths, especially when they occur in women who defaulted on care and were subsequently found to have Gestational Diabetes Mellitus. Hopefully, this screening programme can reduce such instances."*

### PROF TAN KOK HIAN

Senior Consultant, Maternal Fetal Medicine  
Head, Perinatal Audit & Epidemiology,  
KK Women's and Children's Hospital (KKH)

## HEALTHIER MUMS, HEALTHIER BABIES

KKH and SGH have started offering routine Gestational Diabetes Mellitus (GDM) screening to all expectant mothers at 24 to 28 weeks, as part of a six-month pilot programme since January 2016. By detecting GDM early, patients can access timely interventions that reduce complications during and after pregnancy. This initiative follows a study by KKH and Duke-NUS that found routine GDM screening to be a cost-effective approach.

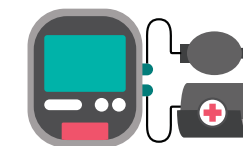
### GESTATIONAL DIABETES MELLITUS (GDM)



GDM affects 15 per cent of pregnant women worldwide, but the current targeted screening method fails to identify many of them. Singapore has recorded a prevalence of 10-20 per cent for GDM.



Babies born to mothers suffering from GDM are at risk of weighing more than 4kg at birth and may suffer conditions with long-term effects.



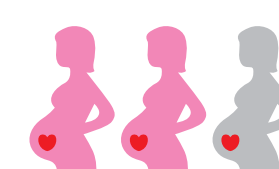
The expectant mother may develop high blood pressure which is associated with preterm delivery together with an increased risk of death in both mother and baby.



Medical interventions for patients with GDM reduce complication rates by as much as 40 per cent, giving both the mother and her baby a better prognosis in the long-term.



Pregnant women benefit most from routine screening with the Oral Glucose Tolerance test (OGTT) as it allows for timely intervention and is a cost-effective approach to reduce the complications of GDM in Singapore.



Existing targeted screening approach fails to identify as many as 1/3 of GDM cases.



As part of a six-month pilot programme, all pregnant patients at 24 to 28 weeks of gestation are offered routine screening for GDM.

**U**nhealthily large babies, difficult delivery, increased risk of stillbirth – these are just some of the many complications faced by pregnant women who suffer from Gestational Diabetes Mellitus (GDM).

Even though GDM affects as many as 20 per cent of pregnant women worldwide, targeted screening has been the standard of care for pregnant women identified as at risk of GDM. Suspecting that targeted screening may lead to some patients at risk of GDM in not being identified, Prof Tan Kok Hian spearheaded a study that compared the benefits of routine GDM screening versus targeted and no GDM screening for pregnant patients.

The results validated Prof Tan's hypothesis and were in line with studies from other parts of the world. "Not only did targeted screening fail to identify as many as one-third of GDM cases, it was also less cost-effective than routine screening," said Prof Tan. "By missing out on such a significant number of women, we are missing the opportunity to provide early medical intervention, which can reduce complication rates for both mother and baby by as much as 40 per cent."

The SingHealth Gestational Diabetes Mellitus Workgroup  
Clockwise from top left: Prof Tan Kok Hian, Prof Kenneth Kwek, Ng Mor Jack, Loke Chui Yee, Dr Shephali Tagore  
Not pictured: Cynthia Pang, Bryan Lim Boon Heng, Prof George Yeo, Assoc Prof Tan Lay Kok

Following the study, a six-month pilot programme was rolled out at KKH and SGH in January 2016, providing GDM screening for all pregnant women between 24 to 28 weeks of gestation. The routine screening and switch of criteria to The International Association of the Diabetes and Pregnancy Study Groups (IADPSG) managed to diagnose on average 23.2 per cent of pregnant women with GDM. This criteria which derived its evidence in part from KKH, one of the 15 centres of the international Hyperglycaemia and Adverse Pregnancy Outcome (HAPO) study, enables more at risk pregnant women to be detected early and be given proper medical advice and care.

Prof Tan said "With tremendous advances in technology, we are now able to detect many underlying diseases that we can try to manage before they become full-blown problems. It's always sad to see stillbirths, especially when they occur in women who defaulted on care and were subsequently found to have GDM. Hopefully, this screening programme can reduce such instances."

Ever energetic, Prof Tan is already looking ahead to the next project to improve care. "Mothers who have had GDM are at higher risk of developing diabetes later in life. However, after they have given birth, we usually don't do more than counsel them to maintain a healthy diet and lifestyle for their own good and the good of their baby. We are looking into ways to systematically follow up with them, so that they can continue to come for checkups and ensure that they receive the care and counsel they need."

## DR SHEPHALI TAGORE

Head,  
Peripartum Unit

Senior Consultant,  
Dept of Maternal Fetal Medicine

Director,  
O&G International Medical Programmes

With my passion to improve Maternal and Fetal care in KKH, I enthusiastically agreed to be involved in this project. It needed extensive collaboration with different teams but the greatest challenge was convincing patients of the importance of having this test. I had a patient from India who was planning to deliver in India. The patient was at first hesitant to test for GDM but finally agreed to do the test at about 29 weeks after extensive counselling. She had abnormally high levels of blood sugar and needed dietary adjustments, even insulin. They were very grateful and eventually decided to have their baby in Singapore – a healthy baby girl.

## CYNTHIA PANG

Assistant Director,  
Nursing

My role in this project is to ensure that nurses at the Obstetric Day Assessment Centre (ODAC) counsel and educate expectant mothers diagnosed with GDM on how to manage their condition. One of the challenges is contacting and recalling patients who fail to turn up for counselling.

A mother with GDM shared her joy of having delivered normally without developing any complications. She was thankful that her child is healthy.

## LOKE CHUI YEE

Director,  
Specialty & Ambulatory Services

The universal GDM screening for all pregnant women is a very meaningful project. The tremendous drive and enthusiasm shown by the staff had motivated me to want to contribute my best. The initial anxiety caused by possible surge in workload and queries from the patients were allayed when we achieved good progress in the results! All of us are ready to fight the war on diabetes.

## PROF GEORGE YEO

Chief of Obstetrics  
Head, Dept of Maternal Fetal Medicine  
Director, Antenatal Diagnostic Centre  
Academic Vice Chair, Research  
Obstetrics and Gynaecology Academic  
Clinical Programme

I was the local co-investigator of the Hyperglycaemia Adverse Pregnancy Outcome (HAPO) project ten years ago. Before HAPO, Singapore recorded a prevalence of 8.6 per cent for GDM. Because of HAPO and GUSTO, we now know that this figure is closer to 20 per cent. This prevalence is similar to some parts of India, such as 16 per cent in Chennai and 17.9 per cent in Tamil Nadu. These findings emphasise the need for prenatal and universal screening for GDM, to better address adult metabolic disease such as Type 2 diabetes.



**ASSOC PROF LIM SOK BEE**

*Senior Mentor & Senior Consultant,  
Dept of Child Development*

Over the years, I have seen a mindset shift towards attending to the care of the vulnerable. We now have the Development Support Programme which empowers early childhood educators to detect and help children with special needs; as well as the Supporting Autism through Family Empowerment programme where a team of healthcare professionals provides home-based care for children with autism. We need to develop a passionate team of advocates to plug the societal gaps in understanding and accepting people with special needs.



**JUWARIAH BINTE TAIB**

*Team Leader,  
Patient Transport Services*

I am currently involved in the e-Portering project which is a process improvement project to increase productivity. Instead of manually recording the time and task such as the dispatch of specimens or the transfer of patients on beds within the hospital, everything is done online via the system. Staff will have to log in to the e-Portering system to raise their requests which will be sent to the mobile phones of the Patient Transport Assistants who will then respond and complete the tasks. This project speaks volumes of how the healthcare system is evolving from manual pen and paper to being paperless and environmentally friendly. It also helps me to be more efficient in my daily work.

**DR SAUMYA SHEKHAR JAMUAR**

*Consultant,  
Dept of Paediatrics,  
Genetics Service*

I'm passionate about increasing our understanding of the genetics of rare diseases. We have been able to make significant headway because of the growing emphasis, funding and support for research, especially in the area of translational research. My team is trying to implement a programme that will bring the benefits of such research directly into our clinics to help patients with rare diseases.



**GIAM POH ENG**

*Assistant Director,  
Nursing (Education) & Nurses Development*

I currently oversee and coordinate mock codes in the clinical settings for nurses working in the adult wards. During the mock codes, the nurses recognise signs of clinical deterioration and manage them promptly before the arrival of the code team to achieve better outcomes for the patients. The trainers assess the skills of the nurses and conduct training to achieve a consistent standard of care at all times.

**IRENE QUAY**

*Head & Assistant Director,  
Dept of Pharmacy*

At KKH, we recently implemented the Pharmacy Automation System at our emergency pharmacy to improve patient safety and experience. We are exploring the possibility of extending this project and working with the SingHealth cluster to materialise the Central Pharmacy concept. This entails consolidating prescription refills across SingHealth institutions, automating medication packing at a central location and providing patients with various preferred delivery options. Other than providing greater convenience to patients, we also expect to reap manpower efficiencies.





*Our efforts in creating a conducive environment contribute to holistic healing. Every bit counts.”*

### RICHARD THONG

Director of Operations,  
Sengkang Health (SKH)

## DESIGNING HOSPITALS FOR THE COMMUNITY, WITH THE COMMUNITY

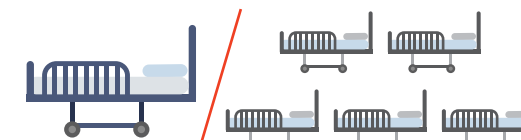
Sengkang General and Community Hospitals will be the newest integrated hospital development when completed in 2018. It will serve the growing population in the northeast, in particular Sengkang, Punggol, Hougang and Pasir Ris. More than just caring for the sick, Sengkang Health aims to cultivate a healthy living ecosystem where residents actively participate in their own wellness so that they can live life to the fullest.

### QUICK FACTS



**Total Beds: 1,400 beds**  
General Hospital  
**1,000 beds**  
Community Hospital  
**400 beds**

200 of the 1,400 beds are “swing” beds which can be converted for use as community or acute hospital beds.



**5 times more beds** in subsidised wards (B2/C) than private wards.



Land area  
**9 football fields**

### MORE THAN JUST A MEDICAL FACILITY



The Community Heart at Level 1 brings the community together with cafes, retail outlets and open event spaces.



Wellness garden and pockets of greenery that provide a conducive environment for healing in the midst of an urban setting.

## Serving the Northeast Community



- The newest integrated hospital development when completed in 2018
- Serve the growing population in the northeast, in particular Sengkang, Punggol, Hougang and Pasir Ris
- Provide comprehensive range of medical facilities and services
- Co-location of general and community hospitals

### ACCESS TO EXPERTISE OFFERED BY SINGHEALTH

- Interlinked network of tertiary hospitals, national specialty centres and polyclinics

Come 2018, the northeastern part of Singapore will welcome one of the largest regional hospitals right at their doorstep. The general hospital and community hospitals are co-located under one roof, allowing for the seamless transfers of patients from acute to intermediate care and vice versa.

What is interesting about the planning of the Sengkang Hospitals is that it was done in collaboration with the community, right from the get go. According to Mr Richard Thong, this was the vision from day one.

“As the hospitals will be surrounded by HDB estates, we wanted to be community-centric in designing the facilities and services. An example is offering paediatric services in the A&E to cater to the demographics of the northeastern part of Singapore, which is characterised by young families. We have actively engaged the community for their inputs on hospital design, facilities, lifestyle needs and even the selection of our corporate logo! Based on their feedback, we then designed the ground level to be completely porous to make it open and accessible. We will have covered walkways, a food court, cafes, retail outlets and open event spaces. We call this the “Community Heart”.

Beyond providing functional needs, Sengkang Health believes that a conducive environment and mindfulness are important for healing to take place. “We have designed pockets of greenery throughout the hospital to create an oasis of calm and relaxation,” Mr Thong elaborated. “A ward that is dedicated to treating dementia patients will be linked to a roof garden which has been specially designed to evoke the five senses. Patients and the public will be able to enjoy the showcase of visual arts and music performances in the open areas which is part of our Arts in Healing programme. All these initiatives contribute to holistic healing. Every bit counts.”

As a member of the SingHealth family, the Sengkang Hospitals can leverage the expertise and resources of SingHealth cluster. “Many of our doctors and nurses have honed their skills and expertise at the Singapore General Hospital (SGH) and other institutions under the cluster. Our planning team have sought and benefitted from the valuable advice given when designing the hospital and specialist outpatient clinics,” he explained. The benefit of the hub and spoke model also means that appropriate siting of patients can be done when needed. “While our hospitals in Sengkang will provide a comprehensive suite of medical services, they will not replicate high acute tertiary services that are currently offered at SGH and KK Women’s and Children Hospital. When dealing with complex cases which require specialist treatment, we can directly refer our patients to our hospitals if needed, without worrying about the transferring of medical records. All these work towards better care for our patients.”

From left to right: Jen Koh, Elizabeth Tan, Tan Kian Ann, Richard Thong, Daniel Chan and Serene Poh



**TAN KIAN ANN**

*Assistant Director,  
Operations*

Managing a project of this scale is tremendous – there are so many line items to look at! We look into the minute details, from the shape and size of the countertop to material selection for floor tiles. We will also be making the most of automation and technology to address manpower constraints. Our new Automated Guided Vehicles (AGV) will fit under trolleys and move along specific routes to transport food, linen, waste and so on. They can be programmed to work 24/7, reducing the need for humans to perform these transportation tasks.

**ELIZABETH TAN**

*Assistant Director,  
Commissioning Secretariat*

In planning a hospital, it’s patients first. But all stakeholders should also feel that their requirements were being met in terms of planning and design. If the cleaners are unhappy with the cleaners’ room, we would have fallen short in some respect. We have to look at every last painstaking detail, right down to the position of a tap and the height of a shelf. It’s a once-in-a-lifetime opportunity to be involved in designing and building a hospital of this scale. I’m honoured to have been involved in this project. The greatest satisfaction is to be able to provide what the users require operationally.



**JEN KOH**

*Assistant Manager,  
Commissioning Secretariat*

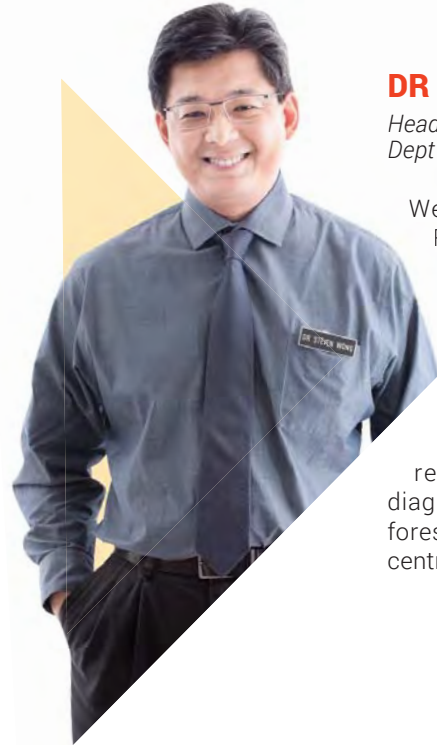
We are adopting a universal design for the hospitals to ensure they work well for everyone, regardless of age or physical ability. Whether it is planning for the clinics, pharmacy or A&E, we will ask ourselves questions such as, “will this be a safety hazard for the elderly?” or “will users be able to navigate their way through our hospital easily?” Applying the SingHealth age-friendly infrastructure design guidelines on the various touch points, including signages, we developed a universal design with the user in mind. Starting from ground zero gives us the leeway to plan the hospitals as optimally as possible. I’m grateful to be involved in this meaningful journey of building the future Sengkang hospitals.

**DANIEL CHAN**

*Manager,  
Commissioning Secretariat*

I’ve worked on other building projects and comparatively speaking, hospitals require a more sophisticated level of planning. It’s like planning a mini-city with many towns. The challenge is ensuring every functional space is well linked and works well together within the entire hospital. With the allocated budget and resources, we also need to be strategic in our space and service planning to achieve the desired outcomes. Integrated hospitals are, operationally, more resource-efficient. In consolidating the shared and support services such as kitchen and housekeeping facilities, we can enjoy economies of scale when purchasing items like food and linen.





**DR STEVEN WONG**

*Head and Senior Consultant,  
Dept of Radiology*

We're preparing for the Department of Radiology for the future Sengkang hospitals to be operationally ready by 2018. This includes planning for a common Picture Archival and Communication System (PACS) that will be able to store and provide access to medical images for all the specialties in SKH. With increasing reliance on the role of imaging in the diagnoses and management of diseases, I foresee that Radiology continues to play a central role in healthcare.

**DORIS LIM**

*Nurse Clinician,  
Specialist Outpatient Clinics*

SKH has many disciplines within the same building or even the ward. We need to understand each of these disciplines characteristics and services in order to ensure the patients' well-being. Planning for the outpatient clinics is a large scale project in terms of infrastructure, workflow and medical equipment needed. Although the learning curve is steep, it has broadened my knowledge significantly and has been a priceless learning experience.



**DR ANNITHA ANNATHURAI**

*Head and Senior Consultant,  
Emergency Dept*

The boundaries of Emergency Medicine are expanding and cannot be confined and practised within the hospital boundaries. It's about giving the right care to the right patient at the right site in a timely manner. It's essential to reach out to our community healthcare providers to deliver emergency care in a collaborative manner, even more so now. We also need to reach out across the international boundaries to share our knowledge and skills in Pre-hospital, Disaster and First Response care which can help developing nations become 'emergency prepared' in a crisis.

**SHARON WONG**

*Nurse Clinician,  
Infection Control Dept*

I'm working on a project to improve hand hygiene compliance among healthcare workers. In healthcare, we are seeing a growing severity of infectious diseases, made worse by the increase of multi-drug resistant pathogen infections. We need to go back to basics in infection prevention via simple measures like hand hygiene. When properly implemented, hand hygiene alone can significantly reduce the risk of cross-transmission of infection in healthcare facilities.



**DR CAMILLA WONG**

*Director,  
Allied Health*

Working in silos is not ideal and not in sync with progressive models of healthcare. When planning for a project as large as the future Sengkang hospitals, we need to plan in a more holistic manner so that all the parts fit together. Healthcare has shifted from being product or process-centric to patient-centric. I would like to see allied health professionals playing a deeper role in multidisciplinary teams.



**TENG JYH LEI**

*Assistant Director,  
Operations*

We need a paradigm shift in how hospitals manage assets and supplies. Technology and automation mean we can use tracking tools to position these things in the right place and right time, according to patient and operational needs. This is more efficient than stocking assets and supplies just in case. The challenge is understanding how these changes impact on the existing workflow, and communicating these changes to stakeholders.



**DR PAULINE LEONG**

*Head,  
Physiotherapy*

Physiotherapists can play an important part by educating people on the right exercise habits and techniques. I remember 14 years ago, I saw a patient for a sports injury. He was only 19 years old. He is now married and with kids, and says his physiotherapy sessions not only taught him how to manage his injury but how to perform better in his sport and avoid injuries. He is still an avid runner and his whole family runs with him.



**SEBASTIAN LOW**

*Manager,  
Food Services*

Food can be the highlight of the day for patients on their journey to recovery. I'm excited to show that hospital food need not be bland or boring. I hope to be able to take hospital catering to the next level by creating nutritious, satisfying and flexible meal options. One concept we're trying out is the dual-flow food trolley which helps keep hot food hot and cold food cold. It also reduces the workload for nurses.



# SINGHEALTH DUKE-NUS ACADEMIC CLINICAL PROGRAMMES (ACPs) SYNERGISED TO ADVANCE MEDICINE

## WAVE 1

### MEDICINE

*Academic Clinical Programme  
Formed in Q2 FY2011*

- 5 recipients of National Medical Research Council (NMRC) Transition Awards, of which 4 are Nurturing Clinician Scientist Scheme (NCSS) awardees
- Developed an integrated Quality Improvement (QI) framework with the formation of the Clinical Performance Improvement (CPI) Committee and introduction of initiatives such as the QI portal, annual QI day, QI pilot programme funds and QI awards
- Set up an Education Oversight Committee (EOC) to share and drive education-related issues
- Internal Medicine residency programme and all medicine senior residency programmes were successfully re-accredited
- Launched the quarterly e-newsletter, "Advancing As ONE" in 2015 to profile achievements and academic activities
- Launched the Master Physicians of Internal Medicine Award in 2016

### PAEDIATRICS

*Academic Clinical Programme  
Formed in Q2 FY2011*

- Launched the KKH Vaccine Pocketbook App, Singapore's first ever vaccine calculator
- Published the 3rd edition of "The Baby Bear Book – A Practical Guide on Paediatrics"
- Set up undergraduate curriculum for Lee Kong Chian School of Medicine
- Led in the development of the curriculum for NUS' Master in Nursing (Paediatrics) and 4 graduates of the programme had since become full-fledged Advanced Practice Nurses
- Nurtured 1 NMRC Transition Award and 3 NCSS awardees
- Established Tan Cheng Lim Research and Education Fund (\$1.7 million), Tan Cheng Lim – CCF Professorship in Paediatric Oncology (\$2.5 million) and VIVA-KKH Paediatric Brain and Solid Tumour Programme (\$12.95 million)
- Launched Kids Integration Development Service (KIDS) 0-3 to augment home visiting services for families
- Kids in Tough Situation (KITS) has trained 67 community therapists and school counsellors in trauma-focused therapy which will benefit at least 800 children

### OBSTETRICS AND GYNAECOLOGY

*Academic Clinical Programme  
Formed in Q3 FY2011*

- Residency programme takes the lead in the obstetrics and gynaecology specialist training programme in Singapore
- Pilot trial of routine Oral Glucose Tolerance Test screening for all pregnant mothers
- Part of Growing Up in Singapore Towards Healthy Outcomes (GUSTO II) with KKH taking lead in the Singapore PREconception Study of long-Term maternal and child Outcomes (S-PRESTO) research recruitment
- Designed and launched SingHealth In Vitro Fertilisation (IVF) App in 2015 for couples considering IVF
- "TrustedCare: Process Redesign for Elective Caesarean Section" project won a National Health IT Excellence Award

## WAVE 2

### SURGERY

*Academic Clinical Programme  
Formed in Q4 FY2011*

- Created a new Faculty Affairs and Professional Development office to provide the resources for faculty to develop skills in navigating fulfilling careers
- Organised the 2nd SingHealth Surgical Congress in 2015 which was attended by more than 700 participants
- Device development programme won the National Health Innovation Centre's grant of \$250,000 in 2015
- Added 2 NCSS awardees to a growing group of clinician scientists which includes 2 NMRC Clinician Scientist Award (CSA) winners and 1 Transition Award winner.
- Clinched 2 Academic Medicine – Enhancing Training, Healthcare, Outcomes & Standards (AM-ETHOS) Medical Simulation & Inter-Professional Learning Project Grants
- Both Orthopaedic Surgery and Urology were ranked first in the AY14 Accreditation Council for Graduate Medical Education (ACGME) Programme and AY15 Joint Committee on Specialist Training (JCST) Programme respectively

### OPHTHALMOLOGY AND VISUAL SCIENCES

*Academic Clinical Programme  
Formed in Q4 FY2011*

- Filed 10 patents in FY15 bringing the total number of patents filed to 81
- Achieved a world's first through the discovery of novel genes for age-related macular degeneration, a leading cause of global blindness
- Developed the module on cataract surgery for Touch Surgery App
- Was awarded \$20 million for a joint SERI-Institute of Molecular and Cell Biology Programme in Retinal Angiogenic Diseases to develop an industry-standard research platform in retinal angiogenic diseases
- Hosted the EYE Ball 2015 and raised about \$500,000 for eye research



### NEUROSCIENCE

*Academic Clinical Programme  
Formed in Q4 FY2011*

- Published 91 articles in CY15
- Received research funding of \$14.36 million at an annualised rate in CY2015
- Received over 13 educator-related awards and the Academic Medicine Education Institute (AM•EI) Education Grant
- 4 doctors have graduated with Masters in Education and 1 Advanced Practice Nurse has achieved An International Association for Medical Education Certificate
- 1 doctor and 1 nurse clinician have been successfully accepted into the Health Profession Educators' Essential programme

## WAVE 3

### CARDIOVASCULAR SCIENCES

*Academic Clinical Programme  
Formed in Q3 FY2012*

- Organised the first CVS ACP Learning Week in 2015
- Piloted "front-loading" of cardiac tests at Specialist Outpatient Clinic (SOC) and almost half of the patients were able to be discharged at first consult
- Organised SingLIVE in 2016 which was attended by more than 2000 participants from 60 countries
- Cardiothoracic Surgery attained the foundational and advanced specialty accreditation from JCST
- Inaugural batch of 9 nurses graduated from the Cardiac Course for Specialty Nurses

### ONCOLOGY

*Academic Clinical Programme  
Formed in Q4 FY2012*

- Clinical oncology programme became part of the core Duke-NUS undergraduate curriculum
- Revised Faculty Development Roadmap to outline key skill sets and build competencies of educators
- Added 4 to a growing group of clinician scientists, which includes 2 NMRC Cluster Clinician Scientists, 1 CSA winner and 1 Transition Award winner

- Secured research fund of \$33.6 million in CY14
- Funded 10 researchers under the ONCO ACP Collaborative Cancer Research Scheme where a principal investigator partners with a senior mentor for cancer research

### PATHOLOGY

*Academic Clinical Programme  
Formed in Q4 FY2012*

- Residency programme was successfully re-accredited
- Published 104 articles in CY15
- 2 clinician scientists received the NMRC Transitional Award and Singapore Translational Research Investigator Award respectively
- Received \$4.03 million of competitive research grants in CY15
- Collaborated with the Diagnostics Development Hub, A\*STAR and HistoIndex Pte Ltd to develop a platform for comprehensive liver diagnosis and treatment management

- Performed clinical validation of tests for Circulating Tumour Cell Center of Research Excellence (CTC CoRE) and conducted CTC CoRE studies in non-small-cell lung cancer tumours
- Organised international and regional courses on breast pathology, prostate pathology, neuropathology and cytology

## WAVE 4

### RADIOLOGICAL SCIENCES

*Academic Clinical Programme  
Formed in Q1 FY2014*

- Clinched Research Support Programme Grant for 2 signature programmes, Translational Imaging Programme and Interventional Radiology Clinical Trials Programme, and a Clinical Innovation Support Programme grant for the set up of a Computerised Objective Radiology Assistant
- Successfully awarded 4 Pitch-for-Fund grants and 2 NCSS grants
- Launched the inaugural Radiological Sciences ACP Mentorship Programme with 7 pairs of radiologist mentors and mentees
- Collaborated with Oncology ACP for the launch of Lee Kok Wah Hepatobiliary Cancers Collaborative Research Grant

### ORAL HEALTH

*Academic Clinical Programme  
Formed in Q2 FY2014*

- Published 22 articles in CY15
- Forged research collaborations with NTU and A\*STAR's Institute of Medical Biology through the signing of MOU with total project value of over S\$2 million
- Signed MOU to formalise educational partnership with NUS' Faculty of Dentistry for the Masters of Dental Surgery Residency Programme
- Received \$1.38 million of competitive research grant in CY15

## WAVE 5

### ANAESTHESIOLOGY & PERIOPERATIVE SCIENCES

*Academic Clinical Programme  
Launched on 1 July 2016*

### MUSCULOSKELETAL SCIENCES ACP

*Academic Clinical Programme  
Launched on 1 July 2016*



*For cancer patients with only six months to live, every minute is precious. Hence, all the staff at NCCS are committed to enhancing the patient's journey and making them feel as comfortable as possible."*

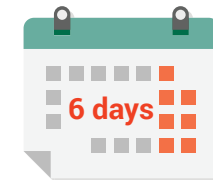
### ASSOC PROF TOH HAN CHONG

Deputy Director,  
National Cancer Centre Singapore (NCCS)

## RAISING SERVICE LEVEL AT NCCS

NCCS engaged Disney Inc. in 2011 to raise service levels within the centre. The efforts that went into transforming the care delivery paid off when NCCS clinched the Singapore Service Excellence Medallion in 2015.

### IMPROVEMENTS MADE TO THE SERVICE PROVIDED AT NCCS:



New case referrals received an appointment within 6 days for both subsidised and non-subsidised patients.

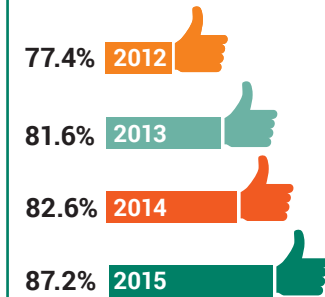


Waiting time to see the doctor has been cut down to an average of 1 hour.



Real Time Ambulatory Patient Information Deployment Enabler (RAPIDE) system allows more efficient and effective management of patient flow at the NCCS' chemotherapy unit, saving 825 man hours for nurses.

### OUTCOMES OF NCCS' SERVICE IMPROVEMENTS:



Overall satisfaction has risen by 9.8 per cent points from 2012, and 4.6 per cent points from 2014 (based on MOH's Patient Satisfaction Survey 2015)



"Excellent" rating given by patients for overall satisfaction rose from 41 to 55 per cent.



*“Service in healthcare is different from that in other sectors, such as tourism. Healthcare service quality is also about making a patient feel better physically, emotionally, mentally and even financially.”*

— Assoc Prof Toh Han Chong

**W**hat relevance does a worldwide entertainment company have on a cancer centre? More than it would appear at first glance. Convinced that it could

benefit from an injection of service excellence, National Cancer Centre Singapore (NCCS) engaged Disney Inc. in 2011 to raise service levels within the centre.

What followed was four concerted years of rethinking and transforming the delivery of care, from people strategies, systems and processes, to innovative services. This resulted in NCCS clinching the coveted Singapore Service Excellence Medallion in 2015.

Assoc Prof Toh Han Chong attributed the win to the commitment to service across levels and disciplines. “For service quality to happen, we must have buy-in from everyone – from the leaders to the staff at the front counter and the patient navigator. Disney provided the framework but we adapted it to suit the healthcare setting.”

One of the pet peeves addressed was that of waiting time. Previously, patients complained of long waiting times, both for an appointment and during the visit at NCCS. “We set up a workgroup to study patient flow and systematically tackled the choke points,” Assoc Prof Toh explained.

The outcomes were tremendous. Today, all new case referrals to NCCS receive an appointment

within six days, for both subsidised and non-subsidised patients. Waiting time was also cut down to an average of an hour. These are laudable results, considering that NCCS sees almost 70 per cent of Singapore’s public sector cancer patients.

Another project initiated to shorten waiting times was the Real Time Ambulatory Patient Information Deployment Enabler (RAPIDE) system. Using radio-frequency technology, it allows staff at NCCS’ chemotherapy unit to track in real time patients’ locations, drug status and available treatment chairs. This translated into more efficient and effective management of patient flow in the 50-chair unit. Not only did waiting times reduce significantly for chemotherapy patients, nurses also save some 825 man hours a year from not needing to manually search for unoccupied chairs.

NCCS’ efforts have not gone unappreciated. The Ministry of Health’s Patient Satisfaction Survey revealed that overall satisfaction rates have risen.

“Service in healthcare is different from that in other sectors such as tourism. Healthcare service quality is also about making a patient feel better physically, emotionally, mentally and even financially.” Assoc Prof Toh continued poignantly, “For cancer patients with only six months to live, every minute is precious. Hence, all the staff at NCCS are committed to enhancing the patient’s journey and making them feel as comfortable as possible.”



### JUSTINE TAN

*Assistant Director,  
Clinic Administration*

I believe the difference lies in leadership. Leaders are the change enablers. They lead, sustain the rhythms of changes and maintain these efforts. We can build many IT enabling platforms to improve patient care. However, what is close to my heart are our staff who consistently give 100% of themselves in healthcare. One shining example is our patient relations officers who stand up to eight hours during their work day to serve patients and act as a constant figure of service and comfort at patient care touch points.

### DR TERENCE TAN

*Head, Medical Affairs  
Chief Quality Officer,  
Quality and Clinical Governance  
Senior Consultant,  
Division of Radiation Oncology*

Disney helped us look comprehensively at what it takes to build a strong service framework. It taught us the importance of good leadership and how staff should be united under a common purpose. It also gave us insights into how our delivery systems should be used to meet patient’s needs. Since the improvements have been made, complaints on wait times have fallen significantly. Now, we typically receive about 300 or more compliments a month for the service provided by our staff and our “excellent” rating for overall satisfaction has risen from 41% to 55%.





**ASSOC PROF LIM SOON THYE**

*Director,  
Cancer Service Lines Development  
Head & Senior Consultant,  
Division of Medical Oncology*

We have changed the way we communicate with patients and families as they are becoming more educated and have higher expectations of service quality. We constantly help staff upgrade their communications skills, such as conducting courses for junior doctors to communicate difficult diagnoses, treatment options and even end-of-life issues. A lot of effort is also being made to educate physicians on the responsibility of ensuring that therapy recommendations do not set families back too much financially.

**DR ALETHEA YEE**

*Head and Senior Consultant,  
Division of Palliative Medicine  
Director of Education,  
Lien Centre for Palliative Care, Duke-NUS*

There will not be enough palliative care physicians, nurse clinicians and social workers to meet the palliative care needs of an ageing population, so the only way forward is to train all healthcare professionals to integrate basic palliative care principles and approach in their practice when managing patients with serious illnesses. Working with passionate health care professionals in various disciplines, we have already begun to test out models of integration in areas such as lung oncology and end-stage renal disease. This is an encouraging development.

**DR YAP YOON SIM**

*Senior Consultant,  
Division of Medical Oncology  
Deputy Director,  
Division of Community Outreach and Philanthropy  
Director of Public Education*

Together with Ain Society, we have started a Cancer Education bus to raise awareness of the symptoms and signs of cancer and the importance of screening. Cancer is the number one killer in Singapore and unfortunately, many do not seek medical attention for their condition until the tumour is very advanced and no longer curable. We hope the Cancer Education bus can enable us to reach out to more segments of the population. The Cancer Education Information Services (CEIS) team led by Nurse Manager Ms Jenna Teo, as well as several other colleagues in the Division of Community Outreach and Philanthropy, have certainly been instrumental in turning this vision into reality.



**DR FONG KAM WENG**

*Head and Senior Consultant,  
Division of Radiation Oncology  
Director, Cancer Informatics  
Adjunct Associate Professor,  
Duke-NUS*

The pace of development in Medicine has been incredible. Over the course of my career, I have seen radiotherapy advance from a 2D “mark the treatment area on skin” to 3D “visualise and localise tumours with CT/MRI scans”, to 4D imaging where motion effects on tumour location due to breathing can be tracked. I’m especially excited about the upcoming Proton Therapy with its potential to improve cure rates with fewer side effects. It will be a game-changer.

**PROF KANAGA SABAPATHY**

*Director, Planning & Strategy  
Head, Division of Cellular and Molecular Research  
Principal Investigator,  
Laboratory of Carcinogenesis*

It has been almost 35 years since the discovery of the p53 gene – the most mutated gene in cancer that leads to cancer formation and resistance to therapy. We are working on targeting p53, which offers huge potential for cancer treatment. With more funding and government support, research has certainly come a long way. In the next 15 years, there will be a lot more emphasis on translational research, where research findings are being translated into medical practice.



**ASSOC PROF MELISSA TEO**

*Head & Senior Consultant,  
Division of Surgical Oncology  
Chairman,  
New NCCS Commissioning Committee*

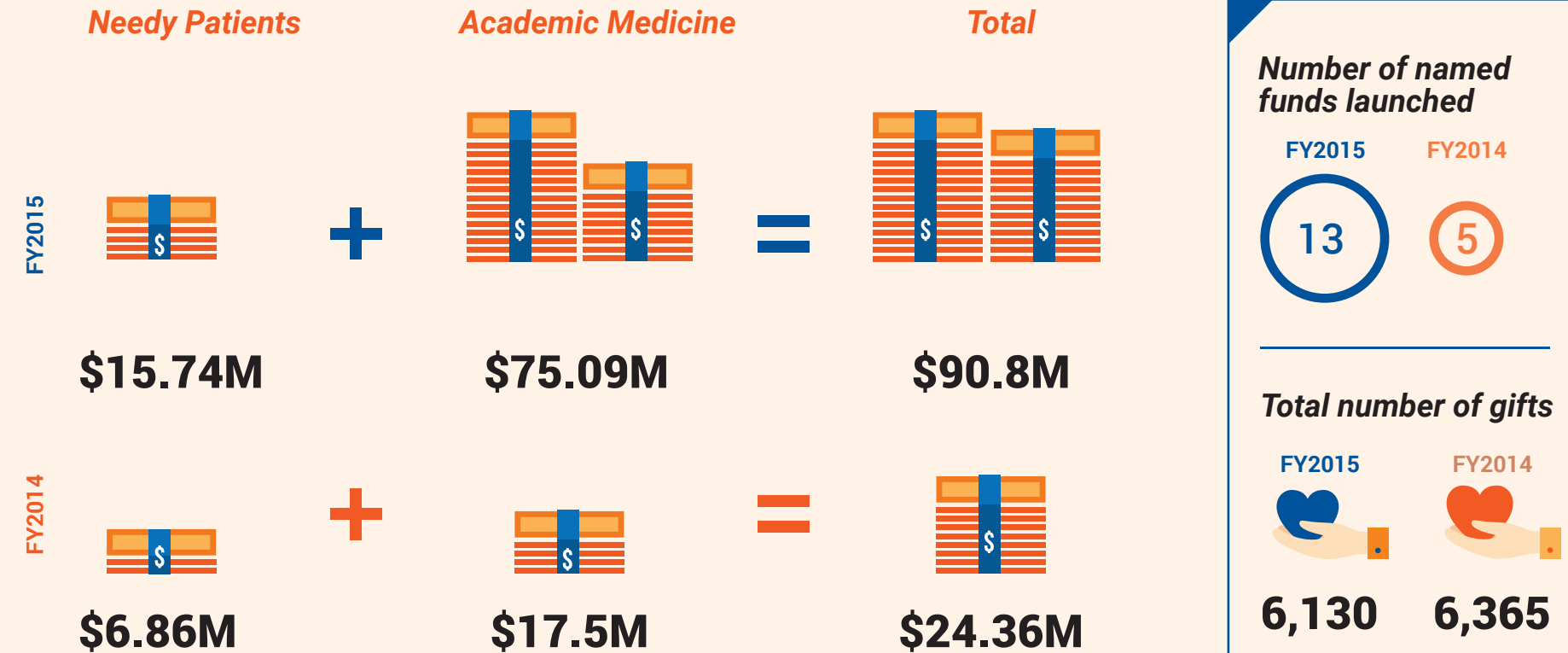
The distinct positive change that has occurred over the past decade is the increased academic focus of our campus. We need to be proactive about grooming this mindset. Pursuing the science behind cancers will lead to answers on how best to treat them. In addition, the need for multidisciplinary care is inevitable in the practice of any oncology-related field. We will continue to build on existing collaborations with colleagues to improve cancer management standards.



# GIVING

Philanthropic investments from like-minded individuals and organisations are the enabling force for our clinicians, scientists and researchers to pursue research ideas, discover breakthroughs and find new solutions for our patients.

The partnerships we forge from philanthropy enable us to advance our goal to find better treatments, train highly skilled medical professionals and pursue world class research and outcomes. Our efforts ensure that future generations of patients will continue to benefit from better medical care and improved quality of life.



## Advancing Medicine through Philanthropy: Four Distinguished Professorship Recipients explain the impact of philanthropic partnership on their work



### PROF SOO KHEE CHEE

*Benjamin Sheares Professor in Academic Medicine  
Dy Group CEO (Research and Education)  
Director, National Cancer Centre Singapore*

"Philanthropic resources have gone beyond just enabling me to further my clinical research in cancer. The impact of philanthropy is multiplied many times over when the community believes in and supports our research endeavours. Ultimately, it is the community that benefits when, together, we find new insights about cancers and new ways of treatment to save more lives."



### PROF STUART COOK

*Tanoto Foundation Professor of Cardiovascular Medicine,  
SingHealth Duke-NUS Academic Medical Centre  
Director, National Heart Research Institute Singapore  
Deputy Director (Clinical), SingHealth Duke-NUS Institute of Precision Medicine (PRISM)  
Director, Programme in Cardiovascular & Metabolic Disorders, Duke-NUS Medical School*

"Our understanding of the genes and DNA mutations that cause inherited heart muscle disease is incomplete. The support from the Tanoto Foundation has helped our research team to glean new insights on the disease mechanisms and get closer to potential therapies. We are privileged to be sharing the journey of discovery with philanthropists who believe in transforming clinical outcomes through science."



### PROF YANN BARRANDON

*Lee Seng Teik and Lee Hoo Leng Professor in Plastic Surgery and Regenerative Medicine  
Joint Professor, Stem Cell Dynamics, Ecole Polytechnique Fédérale Lausanne and Lausanne University  
Head of Department, Experimental Surgery, Lausanne University Hospital*

"As a researcher, work in the laboratory can become repetitive. Seeing patients recover reminds me of the real reason why I pursue science. That is the real purpose of doing research. As the recipient of this Professorship, I hope to see life in the eyes of more burns patients and those with extensive skin diseases as we discover more breakthroughs in basic and translational research in epithelial stem cells."



### ASSOC PROF LIM SOON THYE

*Tanoto Foundation Professor in Medical Oncology  
Head & Senior Consultant,  
National Cancer Centre Singapore*

"My vision is for Singapore to be the leader in therapeutic trials for lymphoma research in Asia, as we consolidate Singapore's cancer network and expand our partnerships to improve survival rates for patients with lymphoma. With this Professorship, I hope we can uncover the molecular profile of the T and NK/T cell lymphomas to customise targeted anti-cancer therapy and treatments. The ultimate goal is to improve the prognosis for patients and save more lives."



*For this group of patients, the focus is not just on the delivery of treatment, but to give special attention to the unique needs of each individual.”*

### DR TAN CHING CHING

Consultant, Periodontic Unit,  
Department of Restorative Dentistry,  
National Dental Centre Singapore (NDCS)

## HELPING TO PUT A SMILE ON THEIR FACES

NDCS' Geriatric Special Care Dentistry Clinic (GSDC) is Singapore's first and largest one-stop specialty clinic which caters to elderly with complex medical conditions and special needs patients. The clinic is equipped with 10 dental chairs, minor operating theatre and an intra-oral X-ray machine in every room to cut treatment time.

### OUR GOALS



#### RESEARCH

NDCS is collaborating with Duke-NUS to study and improve the oral health of the elderly and special care population in Singapore. Good oral health is important for their quality of life and general health.



#### TRAINING

The GSDC is a training ground for those who are keen to specialise in geriatric and special needs dentistry. One NDCS dental officer has been awarded the MOH scholarship to pursue a specialty in this new and emerging field. NDCS has plans to train more scholars in the coming years.



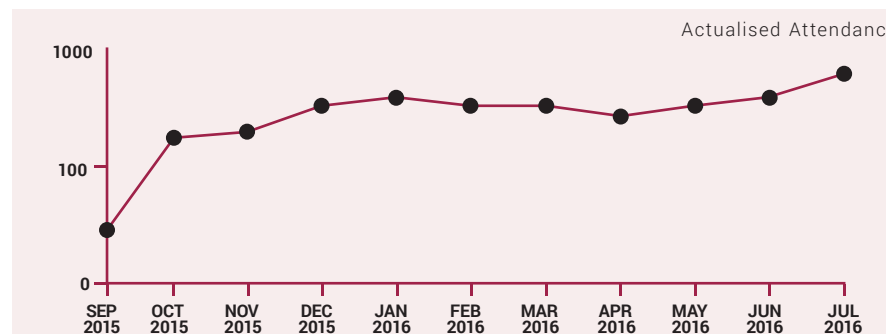
#### COMMUNITY OUTREACH

NDCS is collaborating with SingHealth Regional Health System and community partners (e.g. nursing homes, elderly care centres, etc) to provide oral hygiene education, screening and care for the elderly and oral care education for their caregivers.



#### DENTAL ATTENDANCE

GSDC has seen more than 4,000 patient attendances since September 2015. At full capacity, NDCS expects to see 12,000 patient attendances annually at the clinic.



### AGE-FRIENDLY DESIGN FEATURES

- Wheelchair-friendly dental chair
- Spacious walkways
- Large and bright signages
- Dedicated vehicle drop-off area

**F**or people with special needs or the elderly with mobility or complex medical issues, even the simplest act of brushing their teeth can be a struggle. As a result of their poor oral hygiene, they often suffer from complex oral health conditions.

One dental care professional troubled by this under-served group of people was Dr Tan Ching Ching. When the Ministry of Health appointed NDCS to look into improving oral healthcare for

the elderly and people with special needs, Dr Tan took up the challenge. Several years later, the new Geriatric Special Care Dentistry Clinic (GSDC) was born.

Located on the ground floor of NDCS, the age-friendly clinic features specially designed dental chairs that allow easy transfer of patients from the wheelchair onto the dental chairs. For wheelchair-bound patients with severe mobility impairment, there is a wheelchair reclining platform – the first of its kind in Singapore – that allows the patient to be treated in the wheelchair.

GSDC adopts the patient-centric model of care. In the past, patients had to visit different specialists located on different floors. With the introduction of GSDC, the oral healthcare team now works around the patients. “For this group of patients, the focus is not just on the delivery of treatment, but to give special attention to the unique needs of each individual,” Dr Tan, Head of GSDC clarified. An autistic patient often finds it stressful seeing a different dentist at a different clinic every visit. At GSDC, the patient would see the same primary care dentist each time, who will take time to ease the patient by introducing him to the clinic environment and the oral healthcare team. It may take several visits before the patient feels comfortable enough to allow

proper dental examination to be performed. On the other hand, an elderly person with Parkinson’s Disease may present with dexterity problems and is not able to manage simple tasks such as gripping a toothbrush firmly. That is where we need to either improvise the toothbrush handle or to formulate an alternative method of tooth brushing for them. Therefore, besides identifying their dental problems, we have to understand their medical conditions and behavioural issues well and manage them holistically.”

The main challenge in setting up the clinic was getting the whole team on board adequately trained and prepared to serve. “This is the first dental clinic in Singapore dedicated to special care dentistry. Since geriatric special care dentistry is an emerging dental specialty with many unique needs, there are not many dental health professionals trained or knowledgeable in this area,” said Dr Tan. “We have to send dentists, dental surgery assistants and allied health professionals to learn how to manage these patients, which involve acquiring both physical and soft skill-sets.”

Despite the challenges, the project has been rewarding. NDCS is proud to do her part in extending the outreach to this under-served community. “A mother once shared with me that her autistic child doesn’t mind coming for dental check-ups now because he feels comfortable at the clinic each time, and his oral health has improved tremendously. Stories like these make all the effort worthwhile.”



The first of its kind in Singapore – a wheelchair reclining platform, that allows patients to be treated in their wheelchairs.



### ASSOC PROF TEOH KHIM HEAN

*Deputy Director (Clinical)  
Head and Senior Consultant,  
Dept of Restorative Dentistry  
Adviser,  
GSDC*

The GSDC is set up to deliver coordinated and holistic treatment for patients requiring special care. Through integrating the provision of services to geriatric and special needs patients under a single dedicated department, GSDC also serves as a training ground for more dentists to be trained in this emerging specialty. We have received very positive feedback from patients, mainly because they now have more time with the clinicians, and are not rushed from one place to another since facilities and services are located within reach in the clinic.

### DR YANG JINGRONG

*Registrar,  
Periodontic Unit, Dept of Restorative Dentistry  
Clinicians’ Lead in GSDC Outreach Activities*

Prior to the setting up of the GSDC, the dental needs of these patients were managed mainly at the community level, with volunteer dentists offering their expertise in various community homes. Tertiary care was offered at hospitals but without the use of specialised physical infrastructure that catered to this group of patients. Recently, our team embarked on our first outreach efforts at Saint Andrew’s Community Hospital to share our dental knowledge with the nurses and doctors. The overall feedback was positive and this has encouraged our team to reach out to more nursing homes and eldercare centres.



### CLINICAL ASSOC PROF CHEN NAH NAH

*Senior Consultant,  
Endodontic Unit, Dept of Restorative Dentistry  
Adviser,  
GSDC*

From the start, the GSDC had to be planned differently. Attention was given to age-friendly features which are not the norm in general dental clinic settings, such as wider corridors, sliding doors, larger waiting areas and toilets for wheelchair bound patients. There is also a dedicated ambulance entrance to allow for the direct transfer of trolley patients to a specially designed treatment room. Our dental chairs have a kneedrop feature which makes it easier for elderly patients to sit in. All these special features have garnered very favourable feedback from both patients and staff at the clinic.

### DR SEE TOH YOONG LIANG

*Consultant,  
Prosthodontic Unit, Dept of Restorative Dentistry  
Deputy Head,  
GSDC*

The GSDC sees special needs patients who are aged 13 years and above. Many of these children are seen from a young age at our paediatric dentistry unit. As these children grow into young adults, they will be transferred to the GSDC for follow up. Some of them require more time and a familiar environment for routine dental checkups and some may not be able to clean their own teeth well. Hence a closer follow-up regime is required.





**DR CHEE HOE KIT**

*Consultant,  
Periodontics Unit, Dept of Restorative Dentistry*

Many a time, I see patients whose teeth could have been salvaged if they had better oral care and dental health education. As a periodontist, I strive to help my patients preserve their teeth for as long as possible with adequate gum treatment and regular maintenance. There's nothing more satisfying than to see my patients have a healthy smile and able to maintain their teeth by themselves. To treat our ageing patients more effectively, we need to do more research based on our local population of geriatric patients.

**DR PRISCILLA ANG**

*Dental Officer*

There is still a lot of work to be done to improve the oral health status of this special group and that is what drives my passion in geriatric special care dentistry. Oral health negligence stems from a lack of knowledge which can be addressed through outreach and education programmes to caregivers for the elderly. Most dental emergencies can be prevented with early intervention and proper oral hygiene. Government schemes have also encouraged the elderly to go for dental screening and treatment, which can help reduce events such as aspiration pneumonia.



**YAP XIN YING**

*Senior Oral Health Therapist,  
Dept of Restorative Dentistry*

I get a huge sense of job satisfaction when my patients' dental health improve and the smiles on their faces certainly motivate me to excel in my role. I encourage my patients to take ownership of their oral health so that they can maintain a healthy set of teeth and gums for life.

**LOW HONG FONG**

*Patient Service Clerk*

I interact with many elderly and special needs patients daily. The challenge is to ensure that I can effectively convey instructions to them and vice versa. Sometimes, it's hard to understand what they need as some are hearing-impaired or mute. We need to equip ourselves with the skills to communicate effectively, like learning sign language. I get an unexplained sense of satisfaction when I see these patients' faces light up with their big bright smiles—that's priceless.



**LORRAINE JOHNSON**

*Manager,  
Dental Assisting*

I joined healthcare because I love to help and care for people. It is a privilege to be able to serve, not just our patients but the caregivers as well. We need to constantly attract and retain the next generation of Dental Surgery Assistants who can commit to the development of the GSDC. As a trainer, I want to ignite their passion and inspire them to take on the challenge of serving this group of patients.



**AISHA KALSOM BTE ABDUL RAHMAN**

*Dental Surgery Assistant*

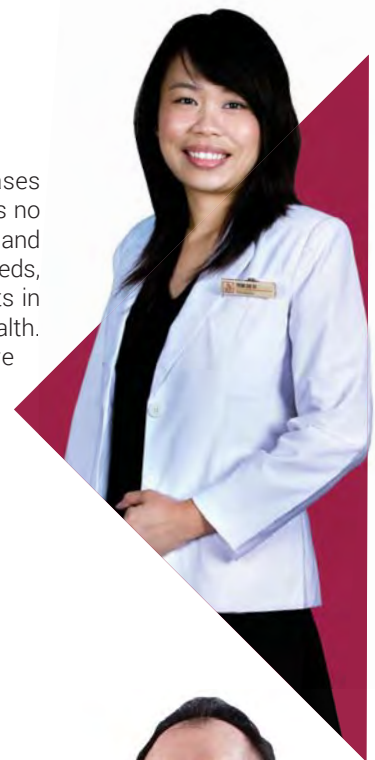
I belong to the pioneer intake of the GSDC, so I wish to set a good example for my juniors by displaying professionalism and sharing my job passion. Then they can learn how to care for this unique group of patients. The main challenge I face is caring for patients with different needs, for example the elderly with Dementia, the wheelchair and bed bound and special needs patients. Besides learning how to communicate with them, I also need to constantly watch out for patients who are at risk of falls.



**YEW JIE SI**

*Radiographer*

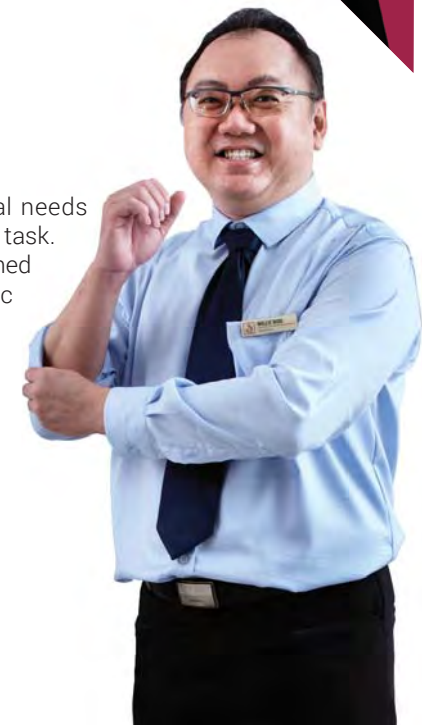
Despite the training we've received, the cases we see here at NDCS are very challenging as no two patients are the same. We have to adapt and work around patients' unique and diverse needs, to produce x-rays that can best help dentists in their management of these patients' oral health. Whether one is a dentist or a healthcare assistant, everyone here in the Centre works closely as a team.



**WILLIE WOO**

*Senior Manager,  
Facilities and Support Services*

Setting up the first elderly and special needs dentistry clinic in Singapore is no easy task. Every fine detail had to be carefully planned to ensure our patients' visits to the clinic are safe and pleasant. By tapping on elderly-friendly design concepts, we are able to provide better facilities and experience for our patients.






# EDUCATION


## Undergraduate

**565** 

Average No. of Students on Clinical Postings Per Day (AY2015)

## Cluster Clinical Postings (AY2015)


 **>54,000**  
Medicine student days

 **>75,000**  
Nursing student days

 **>9,000**  
Allied Health student days

## Undergraduate Teaching Faculty

 **>900**  
Medicine

 **>200**  
Nursing

 **>300**  
Allied Health & Pharmacy

## Postgraduate

### Medical


(July 2015 to June 2016)

**224** 

New resident intake


**930** 

Total residents in training

**1,242** 


Total number of faculty


### Allied Health & Pharmacy


 **4** Allied Health Residency Programmes


 **9** Allied Health Residents Trainees

 **43** Faculty in Residency

 **3** Residents in National Pharmacy Training Residency Programme


 SingHealth received **4** years continued institutional accreditation


 **6** programmes received continued ACGME-I accreditation


 **2** programmes received local JCST accreditation, and **1** programme received re-accreditation


 **81** residents graduated from Residency


### Nursing


 First intake of **17** nurses have graduated with Postgraduate Diploma in Wound, Ostomy and Continence Nursing (WOCN) course and received the World Council of Enterostomal Therapists (WCET) Certificate.

 **24** nurses sponsored for Bachelor Degree, **19** nurses for Master Degree, **33** nurses for Master in Clinical Nursing at NUS to be prepared as Advanced Practice Nurses.

 **9th annual SingHealth Best Junior Doctors Awards**  
**45** awards given to medical officers, house officers and registrars

 **Residency in SingHealth Excels! (RiSE) Awards 2015**  
**259** awards given to residency faculty, education partners, top performing residents and programmes

 **Duke-NUS Faculty Appreciation Awards**  
**18** SingHealth Faculty awarded

 To date, **155** nurses have been trained to be Resident Nurses, taking on expanded roles in various nursing specialties.

## Continuing Education

### Medical

 **>532**

overseas doctors from across **36** countries came to SingHealth for fellowship attachments.


**319** were led by SGH-PGMI.

### Nursing


 **16,308**  
Professionals trained


 **56**  
Courses conducted

 **1,255**  
International professionals trained

 **51,850**  
Nursing student days

### Allied Health & Pharmacy

 **44**  
Allied Health (PGAHI) Faculty

 **2,620**  
Training places offered in FY15 by PGAHI  
**22,765** training places since its launch in 2003

### List of International and Local Collaborations:

#### International

- Charles Stuart University (AU)
- Curtin University of Technology (AU)
- Flinders University of South Australia (AU)
- La Trobe University (AU)
- University of Melbourne (AU)
- University of Newcastle (AU)
- University of Queensland (AU)
- University of South Australia (AU)
- University of Sydney (AU)
- University of Western Australia (AU)
- Shinshu University (JP)

- London South Bank University (UK)
- University of Salford (UK)
- University of Southampton (UK)
- University of Illinois Chicago (USA)
- University of Nebraska Medical Center (USA)

#### Local

- James Cook University
- Singapore Polytechnic
- Ngee Ann Polytechnic
- LASALLE College of the Fine Arts
- Nanyang Academy of Fine Arts
- Republic Polytechnic
- Temasek Polytechnic
- Singapore Institute of Technology

### WSQ Higher Certificate in Healthcare Support (Pre-Hospital Emergency Medical Services)

Jointly organised by Alice Lee IAN, MOH and WDA, the programme trained **57** ambulance operators without any healthcare background to gain knowledge and skills to deliver basic nursing and emergency care to patients in a pre-hospital setting.

### Campus-wide Basic Cardiac Life Support and Automated External Defibrillation (BCLS+AED) Certification and Recertification Training Course

From June 2015, Alice Lee IAN took over the life support training programmes to equip participants with basic cardiac life support knowledge and skills and improve the time taken to perform

defibrillation. About **4,500** doctors, nurses and allied health professionals attended the courses in FY 2015.

### Patient Navigator Course

**79** nurses have been trained as Patient Navigators to enhance their knowledge and skills on community services and discharge planning of complex cases. During the training, they underwent a 3-month internship and attachment with Family Medicine and Continuing Care, Bright Vision Hospital, ACTION Team Care Co-ordinator and social services.

### Overseas Clinical Training

SingHealth nurses trained **938** healthcare workers overseas in countries like China, Indonesia, India, Sri Lanka, Papua New Guinea, Myanmar and Cambodia.

In June 2016, SingHealth and West China Hospital signed a Memorandum of Understanding for SingHealth to provide training for **600** nursing leaders and nurses from Sichuan Province.

### Infection Control Refresher Course

The Infection Control Refresher Course enhances clinical knowledge and skills in current Infection Control practices and safe injection procedures. About **6,000** healthcare staff were trained.

### Peritoneal Dialysis Training Programme

**164** Nurses were trained from Mar 15 to Apr 16 to perform the preparation, implementation of Peritoneal Dialysis (PD), including monitoring and exit site care of PD patients.


## Faculty development


### Academic Medicine Education Institute (AM•EI)

 **1,900** members  
(as of end of FY2015)


#### Faculty Development Programmes


 **Education Grand Rounds and workshops**  
**2,303** Participants

 **Faculty Development for Advanced Educators**  
Launched new series of Level 2 Programmes

 **AM•EI Educational Leadership (AMLead) Programme**  
Inaugural cohort of **9** ACP educational leaders completed the 9-month long programme.


 **AM•EI Fellows Programme**  
The third cohort, consisting of **28** Fellows completed the programme in 2016.  
**84** interprofessional healthcare educators have completed the programme.

 **AM•EI Fellowship in Team-based Learning (TBL)**  
**75** participants completed the first series of the programme. Two TBL Fellows are now recognised as certified TBL Consultant/Trainers.


 **AM•EI Online Essentials in Clinical Education Course**  
Completed four runs with more than **500** educators sign-ups.

 **AM•EI Golden Apple Awards 2015**  
**44** nominations received  
Introduced AM•EI Generativity Awards to recognise individuals who have provided outstanding mentorship in guiding and nurturing healthcare professionals and their peers.


 **Tan Yew Hock Faculty Development Fund**  
**18** educators were recognised for educational excellence.


 The AM•EI Education Grant 2015, supported by the fund, received **22** Letters of Intent submissions.


 **\$35,000** was awarded to 7 projects and respective Principal Investigator's host institution in March 2016.

 **106** Nursing and Allied Health Professionals were supported by the fund to attend AM•EI Faculty Development Programmes to enhance their teaching skills.

### 2nd SingHealth Duke-NUS Education Conference

 **>1,000** interprofessional healthcare educators and learners attended the two-day conference.

 **>40** speakers from SingHealth and Duke-NUS as well as other healthcare and tertiary institutions in Singapore and around the region.

 **>100** entries received for the inaugural Call for Entries. This is the first time that the Conference hosted an oral and paper competition to invite conversations on education innovation.

## Medical Simulation

### SingHealth Duke-NUS Institute of Medical Simulation (SIMS)

Formed in February 2016, SIMS aims to optimise resources and expertise in simulation training across professions and institutions in SingHealth and Duke-NUS to enhance the quality of simulation training.

Consolidation of several hospital and departments' simulation centres within SingHealth and Duke-NUS

- SGH's Institute of Medical Simulation and Education (SGH-IMSE)
- SingHealth Duke-NUS Surgical and Simulation Centre (SSSC)
- KKH Paediatric Simulation Training Centre (PSTC)
- Duke-NUS' Clinical Performance Centre
- Committee for Simulation in Anaesthesiology (CoSA)

With the formation, the Admin and Operation team started to harmonise the operation processes of the various existing simulation entities and created common processes to streamline the operation.

## Education Support & Services

### Temasek Foundation Healthcare Asian Leadership (TF HEAL) Programme

SingHealth Academy, SingHealth International Collaboration Office (ICO) and NHG jointly launched the inaugural programme as a platform for healthcare leaders around the region to share best practices and build networks of cooperation.

### SingHealth Academy Learning Technologies team

Developed an award-winning online learning programme – "Using online and scenario-based learning to improve nurse-patient interaction and enhance patient experience" – with KKH Division of Nursing that won **6** awards, including **3** Excellence Awards in the 2015 Asian Hospital Management Awards (AHMA) held in Myanmar.

### First 3D Live Surgery Streaming

Performed in SingHealth from multiple locations in SGH to Academia at the 10<sup>th</sup> International Society of Laparoscopic Colectectal Surgery Congress 2015.

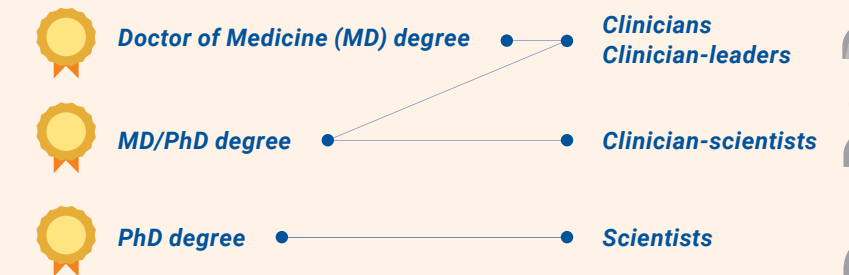
### Proceedings of Singapore Healthcare

SingHealth Academy embarked on a partnership with SAGE to publish the cluster's flagship journal. This has increased manuscript submission rates from 80 in 2014 to 115 in 2015.


## Duke-Nus Medical School

Established in 2005, Duke-NUS Medical School is Singapore's first US-style graduate-entry medical school. It has pioneered a medical training programme based on Duke University School of Medicine's curriculum, with an annual enrolment of over **60** medical students.


### Programmes




### Key Figures

 As at 31 March 2016, Duke-NUS has enrolled **516** students (MD, MD/PhD, PhD). This includes students who have graduated from the school.

They hail from more than **20** countries and over **80** universities.

 Students have also excelled in the area of medical research with more than **240** student publications since 2010.

 **>1,000** full-time and adjunct faculty engaged in research and education.



*We can no longer continue to look at increasing capacity. It's just not sustainable. A better alternative is to streamline work processes so we can eliminate unnecessary steps and do things more efficiently."*

**PROF TERRANCE CHUA**

Medical Director,  
National Heart Centre Singapore (NHCS)



National Heart  
Centre Singapore

DELIVERING BETTER  
SPECIALIST CARE WITH  
**IMPROVED  
WORKFLOW**

Traditionally, patients referred to NHCS will see a doctor on the first appointment to share on their symptoms followed by diagnostic tests on the second appointment and a third visit for a possible diagnosis. With the front-loading initiative, tests are prescribed for referred patients even before they see our doctors, through the use of an algorithm that guides the prescription of tests based on the patient's medical history.

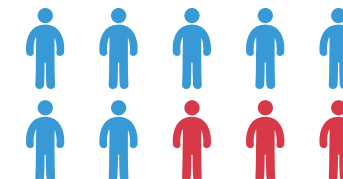


**PATIENTS**

First rolled out to all nine SingHealth Polyclinics in January 2015. Now, close to 100 patients are front-loaded each month.



An algorithm (flowchart) is used to determine if a referred patient should go to the A&E, requires an earlier appointment or a routine appointment with front-loading of diagnostic tests.



Existing patient data showed that 70 per cent of referred patients were generally at low risk for cardiovascular disease with no significant abnormalities.



Patients referred from SingHealth polyclinics to NHCS will have their diagnostic tests done before they see the cardiologist, saving them one visit to NHCS.

**Potential  
impact of the  
front-loading  
initiative**

For every 100 patients  
referred to NHCS



**Up to 35 will be suitable for discharge**

**About 50 will be discharged at their first consultation with a cardiologist, and they will be followed up at the primary care level**



In the past, patients referred to National Heart Centre Singapore (NHCS) by the polyclinics would typically see a doctor on their first visit, describe their symptoms, then undergo some diagnostic tests on the second visit and see the doctor again to receive a possible diagnosis. The front-loading initiative, piloted in December 2014 and rolled out to all nine SingHealth polyclinics in January 2015, changed all that.

“With the front-loading initiative, an algorithm is used to determine if patients with symptoms such as chest pain or murmurs should be sent for diagnostic tests, even before they see the cardiologist,” explained Prof Terrance Chua. “By the time the patient sees us, the cardiologist would be able to offer a diagnosis based on the test results. This means that the patient has saved one trip to the specialist, and the visit is also more meaningful.”

The initiative has benefitted close to 1,200 patients in 2015, freeing up about 100 specialist outpatient slots a month at NHCS. This allows for shorter waiting periods to see the specialists and quicker discharge for front-loaded patients. “With the growing demand for specialist outpatient consultations at NHCS and limited resources, we can no longer continue to look at increasing capacity. It’s just not sustainable,” emphasised

Prof Chua. “A better alternative is to streamline work processes so we can eliminate unnecessary steps and do things more efficiently.”

An analysis of existing patient data showed about 70 per cent of referred patients reporting chest pain were generally at low risk for cardiovascular disease with no significant abnormalities in their test results. “If we have a risk calculator that can systematically indicate which patients should be sent for tests and which are unlikely to need further testing, we would enjoy better productivity at NHCS,” shared Prof Chua. “In fact, my wish is to have a risk calculator that can learn from our actual patient data and be calibrated for the local population, instead of importing information from the West.”

What may come as a surprise is that the project has its origins as a Duke-NUS student’s project supervised by Asst Prof Tan Swee Yaw, Senior Consultant, Department of Cardiology, NHCS, which then opened up an opportunity for another Duke-NUS student to develop a risk calculator for the likelihood of heart disease. A pilot project initiated with 50 patients and 50 control subjects became the basis of the front-loading initiative.

“This is a prime example of how research, even those by students, can have tremendous clinical impact,” said the veteran cardiologist and research mentor. “That’s how medicine can advance.”



### ASST PROF JACK TAN

*Deputy Head and Senior Consultant,  
Dept of Cardiology*

Feedback on the front-loading initiative has been very positive. Patients are happy that they can get faster access. I worked closely with Dr Derek Tse from SingHealth Polyclinics to communicate to our respective institutions how front-loading streamlines the process. This has helped drive the change in our workflow and push ourselves to deliver better care for our patients.



### NURHIDAYU BINTE HATBAR

*Senior Staff Nurse (Clinical),  
Heart Care Unit*

My role is to expedite the patients’ care by arranging for the appropriate tests based on their symptoms prior to consultation. The tests are ordered by our designated consultant, after which our team of nurses will inform the patients about the preparations for the relevant tests. By giving them the choice of doing their test first before seeing the doctor, we help them save a visit to NHCS.

### DR CHEE FANG YEE

*Associate Consultant,  
Dept of Cardiology*

As part of this project, I order the appropriate tests for patients, such as exercise treadmill ECGs, heart ultrasound scans and myocardial perfusion scans. I have heard from several of my fellow cardiologists that they are able to discharge more patients with symptoms of chest pain on their first clinic visit, as their symptoms had been resolved and the results for the function stress tests done beforehand turned out normal.



### AMBER YEONG

*Director,  
Operations  
(Management Information & Performance)*

This was a break from the conventional workflow. The workflow is now leaner and more patient-centric, which is what we are all working towards across the SingHealth cluster. I am a numbers person, so I am happy to see quantifiable results of the initiative, such as the number of clinic slots saved and more patients getting discharged at their first visit after front-loading.





**ASST PROF TAN TEING EE**

*Deputy Head and Senior Consultant,  
Dept of Cardiothoracic Surgery*

Our medical records will soon be fully electronic. We will be able to view complete patient records, including medical images, across SingHealth online, anywhere, anytime. This will facilitate collaboration and continuity of care between healthcare professionals, specialties and institutions. No more misplaced case notes, messy stacks of paper and illegible handwriting. Whenever I can, I strongly champion the use of IT to increase the efficiency of our workflows and free our nurses of these administrative tasks, allowing them to focus on patient care.

**ASSOC PROF CAROLYN LAM**

*Senior Consultant,  
Dept of Cardiology*

I am the Principal Investigator of the Asian Sudden Cardiac Death in Heart Failure study which gathers, for the first time, real world data on the demographics and risk factors of heart failure patients from 11 Asian regions. The study reveals the scale of the problem in Asia, the diversity of Asian patients, the impact of ethnicity and regional income level on patient characteristics, and public health implications for our region.



**ASSOC PROF CHING CHI KEONG**

*Senior Consultant,  
Dept of Cardiology*

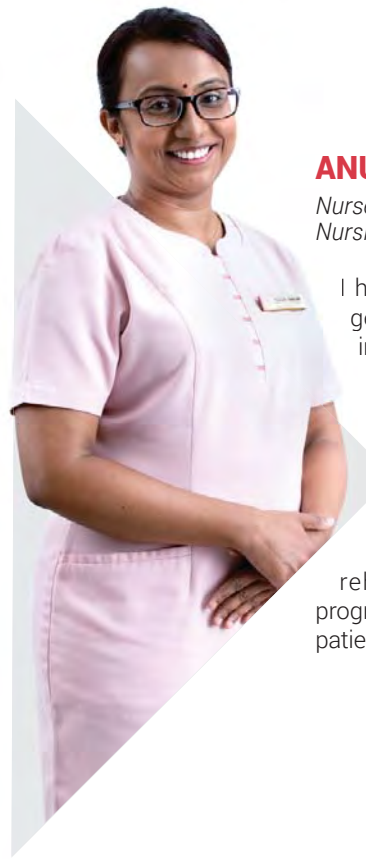
In my subspecialty where I implant pacemakers and internal defibrillators, I foresee the use of point-of-care technology, where patients use hand-held wireless devices to perform regular pacemaker and internal defibrillator checks on themselves. The information will be remotely transmitted, which will be received and read by allied health professionals. These patients can thus have their follow-ups from the comfort of their homes. Similarly, patients with palpitations will be able to utilise off-the-shelf devices to record their abnormal heart rhythms for diagnosis and monitoring.



**ANURADHA D/O RAMASAMY**

*Nurse Educator,  
Nursing Development Unit*

I have a passion for teaching in the field of geriatric nursing and I was very happy to be involved in developing the Geriatric Nursing course curriculum for cardiac nurses. The aim of the course is to equip nurses to care for geriatric patients with complex conditions in a variety of clinical settings. Since the course started in 2015, it has progressed to include sessions by allied health professionals on nutrition, rehabilitation and pharmacotherapy. The programme empowers nurses to deliver holistic, patient-centric care to the elderly.



**ZHANG XIAOXIA**

*Assistant Nurse Clinician,  
Ward 56*

As nurses take on greater responsibilities, our roles have expanded and many of us undergo advanced training in order to excel in various areas, giving rise to roles such as Advanced Practice Nurses, Patient Navigators, nurses specialising in heart failure, diabetic education and others. In future, nurses may lead the management of certain diseases while collaborating with doctors and other healthcare professionals. I would like to continue learning and go for cross-training opportunities in order to have greater exposure.



**OH SEOW FONG**

*Manager, Training & Education,  
Office of Training & Education*

Given that the new generation of trainees is more tech-savvy, there will be a shift in the way teaching is delivered. We are working closely with the various programme directors to identify and introduce different models of blended learning that best suit the trainees' needs. We hope this will enhance the trainees' learning experience.



**RAHMAN BIN OMAR**

*Healthcare Assistant,  
Cardiac Catheterisation Lab*

My job is to transfer patients from the wards to the cardiac catheterisation laboratories and back using the hospital trolleys. Each trip takes about 20 minutes on average, so it can get very busy when we have many procedures going on at the same time. Most patients I come across in the laboratories are undergoing the procedure for the first time, and will naturally be quite anxious. I always try to reassure them. I do what I do because I love my job.



**SITI ZULAIKHA ZOLKARNAIN**

*Radiographer,  
Nuclear Cardiac Imaging*

I was given the opportunity to cross-train in the field of Cardiac Magnetic Resonance (CMR). CMR is an advanced cardiac imaging modality with no radiation. It is challenging, and acquiring images of optimal diagnostic quality is crucial for accurate diagnosis and treatment for patients. I have gained much experience being involved in both nuclear cardiac and CMR imaging, and am excited to do my part in improving service delivery.



# HEALTHCARE IT

## Patient Services



### AdmissionBuddy as a Financial Counselling Patient Portal

- Patients and caregivers can go through financial counselling, before admission, online
- Able to compare costs, choose ward class and see estimated bill size
- Give patients more time to think and discuss with their family



### Prescription In Locker Box (PILBOX)

- Patients with chronic conditions and their caregivers can collect repeat medication any time of the day
- Singapore's first 24 x 7 automated locker system

## Electronic Medical Records



### Integrated Emergency Care Implementation

Seamless sharing of patient data within SingHealth and with the National Electronic Health Records (NEHR).

## Improving IT Services



### SingHealth H-Cloud implementation

With a central hosting environment at H-Cloud, we can achieve a consistent and higher service level.

#### Measures to prevent cyber attacks

- On-going monitoring and controls at the workplace
- Network access controls for all public-facing e-services and websites
- Web-application vulnerability scanning and penetration tests

## Clinical Support Services



### Building Capacity in SingHealth Cluster

- Extended 15 cluster application systems to Sengkang Health @ Alexandra
- Built and extended IT infrastructure and cluster application systems to new and renovated premises the Diabetes and Metabolism Centre (DMC), the reopening of the Marine Parade Polyclinic, and three new SGH wards

### Automated Scheduling and Optimisation Systems

Replaces the manual and manpower intensive process of staff rostering at SGH and KKH.

### Enabling Clinicians with IT

#### SingHealth Cluster eClinical Documentation

- Access digital clinical notes within hospital/polyclinic and remotely

#### SingHealth Surveillance Dashboard

- Clinicians at the SGH Department of Infectious Disease can track anomalies in hospital acquired infections, monitor and be alerted earlier for anomalies in infection rates

#### Medical Device Integration with SCM

- Access to patients' vital signs and medical readings which are captured automatically from existing and new medical devices and interfaced into SCM

#### Clinical Measurement Reporting

- Replaces paper record by allowing technologists to enter results directly into the new system
- Reduces the turnaround time from ordering to result reporting
- Seamless integration from the point of doctor order/assessment entry till resulting

### SingHealth Doctor On Call Mobile Application

Enables direct publishing of existing information on "Doctor On Call Roster" onto SingHealth Intranet and mobile platform by respective departments.

All staff now have convenient access to this information anytime, anywhere. It has helped to free up Call Centre resources to handle more patient and public enquiries.



*This is the first step towards precision medicine, which is medicine tailored specifically to the patient, instead of a one-size-fits-all approach.”*

### ASSOC PROF ANG BENG TI

Head and Senior Consultant,  
Department of Neurosurgery (SGH Campus),  
National Neuroscience Institute (NNI)

## LEADING THE WAY IN BRAIN TUMOUR RESEARCH

The NNI team has identified a gene, known as *ST3GAL1*, which triggers tumour cells to aggressively spread throughout the brain. The molecular signature consists of a set of genes which predicts patient survival better than current clinical methods. The team was able to use the molecular signature to measure the increase in *ST3GAL1* activity in poorly surviving patients and this provides insight into understanding the tumour behaviour. This is the first step towards precision medicine, where the focus is on understanding the molecular content of each patient's tumour so as to assign specific therapies.

### IDENTIFYING GENETIC PATTERNS IN BRAIN TUMOURS



Discovery of gene, *ST3GAL1*, which triggers tumour cells to aggressively spread throughout the brain.



Discovery may alter treatment of brain tumours.



Using a molecular signature as a biomarker and prognostic tool, the increase in *ST3GAL1* activity in patients can be measured and this helps in the understanding of the tumour behaviour.



The use of molecular signature as a method of diagnosis is more reliable than the traditional means of relying on tumour characteristics seen under the microscope.



By targeting individual tumours based on their susceptibility to specific drugs, patients could be spared from the side effects and financial costs of certain chemotherapy treatment when their molecular information indicates poor response to it.



Improve patients' quality of life.



*I remember a patient with glioblastoma of the brain stem. It was inoperable, so all we could offer was chemotherapy and radiation. It was frustrating seeing this young man with a son wilt away slowly, despite the availability of modern medicine. I felt the pressing need to find a better way. These patients give me the motivation to keep persevering.”*

— Assoc Prof Ang Beng Ti

For all the advancements we have witnessed in modern medicine, little progress has been made in the area of glioblastoma, the most aggressive form of brain tumour. The standard treatment has been surgery to remove as much of the tumour as possible, followed by chemotherapy and radiation. Even then, the prognosis is often bleak, with a low survival rate.

However, there is now a glimmer of hope on the horizon, thanks to a new discovery by NNI. Led by Assoc Prof Ang Beng Ti and Dr Carol Tang, a team of researchers from the Neuro-Oncology Programme has identified a gene that triggers tumour cells to spread throughout the brain. “This helps us better understand the molecular characteristics of a tumour,” explained Assoc Prof Ang. “Unlike the traditional method of looking at the tumour under the microscope and making a diagnosis based on appearance, knowing the molecular characteristics of a tumour means we can analyse the tissue to find out its gene expression pattern and hence develop biomarkers. This is the first step towards precision medicine,

which is medicine tailored specifically to the patient, instead of a one-size-fits-all approach.”

A clinical trial will be launched to determine if patients can be classified into specific groups based on their gene expression patterns. “My dream is to one day be able to track for specific biomarkers using just simple blood tests and scans,” said Assoc Prof Ang. “With molecular information from tumour tissue, we can then know whether to treat the tumour with Drug A, B or C for optimal results.”

Right from when he was in medical school, Assoc Prof Ang knew he wanted to pursue an academic medical career — “Besides being appealing to me, research can make a real difference to people’s lives. Even building upon what others have discovered is fulfilling. I remember a patient with glioblastoma of the brain stem. It was inoperable, so all we could offer was chemotherapy and radiation. It was frustrating seeing this young man with a son wilt away slowly, despite the availability of modern medicine. I felt the pressing need to find a better way. These patients give me the motivation to keep persevering.”

### DR CAROL TANG

Senior Research Scientist



The single greatest impact of precision medicine-based efforts is the improvement of patient survival outcomes through targeted therapeutic intervention. This means that we are moving away from current clinical diagnostic methods, such as histology, to treat patients. Bench biology takes time; robust scientific experimentation takes even longer. We also need to balance what is affordable to the patient and if the diagnostic tests present significantly improved and definitive methods of treatment decision over current clinical practices. Our motivation is passion for our work and patients. When your focus is grounded on quality work, you will do everything to maintain those high standards.

### DR NICOLAS KON KAM KING

Consultant,  
Dept of Neurosurgery (SGH Campus)

Precision medicine opens up possibilities for targeted cancer treatments. However, there is no shortcut in research. It will still take years for such targeted therapy to be developed. What motivates all of us is the belief that we are doing this in the service of our patients, and to create a better tomorrow for all. We believe that in the long term, this exciting development in the field of neuro-oncology will have transformative effects.



### ASSOC PROF NG WAI HOE

Medical Director, NNI  
Senior Consultant, Dept of Neurosurgery



Molecular typing offers more precise insights into brain tumours compared to traditional methods and can lead to better understanding of the factors that influence prognosis and treatment options. Research really takes perseverance and tenacity. Besides the scientific rigour, what keeps the research going is the partnership between the scientist and the clinician. The unique and complementary perspectives are key to driving innovative research.





**DR TAY KAY YAW**

Senior Consultant,  
Dept of Neurology (TTSH Campus)

In the NNI Parkinson Disease and Movement Disorders Centre, we have been harnessing technology to improve treatments. We are collaborating with York University to analyse a glove device which can potentially differentiate between a Parkinson Disease patient with or without dementia. We're also working with NUS on a device to overcome freezing in the gait of Parkinson Disease patients. It is inevitable that medical and technology come together for the good of the patients and productivity.



**HO THYE SIN**

Principal Radiographer,  
Dept of Neuroradiology

Back in 1997 when I first started working as a radiographer, most things were done manually, such as the processing of x-ray images. Everything is done digitally now. CT scanners have evolved in terms of image processing speed and detector coverage. Nowadays, we can scan the whole brain and have all the images ready in a matter of seconds, allowing diagnoses to be made faster. I'm currently working on a project to produce high quality CT images with low radiation doses.

**DR ZENG LI**

Senior Research Scientist

The drawback in neurological disease study is the limit of access to patient samples. Diagnosis is often made and confirmed by a patient's autopsy samples. However, recent technological development has allowed patient's specific induced pluripotent stem cells (iPSCs) to be derived from blood. The iPSCs can serve as a platform to model the neurological diseases, so that we can better understand the disease's characteristics and design the drugs for screening and testing.



**LI WEI**

Nurse Clinician (Advanced Practice Nurse),  
Dept of Neurology (TTSH Campus)

As our population ages, the number of cases of neurodegenerative diseases is expected to rise. The treatments for neurodegenerative diseases are still very limited. I often find it very difficult to tell patients and their families that there is no cure for the disease. Nevertheless, there are many things that can be done to improve a patient's quality of life. We shall remain positive and exude the spirit of never giving up hope.



**EMILY ANG**

Nurse Clinician (Advanced Practice Nurse),  
Dept of Neurosurgery (TTSH Campus)

Now, nurses can choose career tracks such as clinical, education, IT and research. Clinical nurses like Advanced Practice Nurses (APNs) and Resident Nurses are actively involved in the clinical management of patients. With proper training, I believe APNs will be able to perform procedures like tracheostomy tube changes for outpatient, freeing up ENT doctors' time to attend to other patients.



**ASSOC PROF DEIDRE DE SILVA**

Senior Consultant,  
Dept of Neurology (SGH Campus)

The stroke research programme mentors many young researchers across various medical professions. We need to study stroke from different angles so that we can provide better care for our patients, in particular to better understand the pattern of stroke in Asians and their response to stroke treatments. Mentees often realise that research isn't difficult and can be stimulating. All it takes is someone who is passionate and willing to put in thought, time and effort.

**DR VINCENT NG YEW POH**

Consultant,  
Dept of Neurosurgery

Despite modern medicine, an aneurysm rupture remains a fairly life-threatening disease with high morbidity and mortality rates. More neuroscience research is still needed in stroke and brain injury to allow for better recovery from subarachnoid haemorrhage. Science progresses in small but definite steps. Hopefully one day, all patients of brain haemorrhage can fully recover with no functional or cognitive impairment.



**ROHANA BINTE BASRI**

Nurse Manager,  
Neuroscience Clinic

The Neuroscience clinic sees more than 350 patients every day. Majority of the patients are the elderly with conditions such as movement disorder, stroke and neuromuscular disorders who are prone to falls. To improve patient safety and reduce occurrence of falls in the clinic, we have developed a falls assessment tool to identify those aged 65 and above who are at risk of falls. Patients found to be at risk are recognised with an orange sticker when they are in the clinic. Nurses then share with them fall prevention tips while they are waiting to see the doctor, and keep an extra lookout for them.

# SINGHEALTH CAREER ADVANCEMENT TASKFORCE

The SingHealth Career Advancement Taskforce (CATF) partners Administrators & Ancillary staff in their career development and growth in SingHealth. Through a series of initiatives launched in July 2016, it aims to:

- Develop a career path for administrative and ancillary staff by defining and identifying requirements for career development and progression
- Equip staff and supervisors with tools and resources for performance planning, evaluation and career conversations
- Create a vibrant internal job market and facilitate developmental opportunities
- Increase awareness and visibility of career development and enrichment initiatives

## CATF: Initiatives, Tools & Resources

### CAREER DEVELOPMENT PATH & COMPETENCY FRAMEWORK



Job titles across SingHealth have been harmonised for staff of similar grade. Staff will have the same job title as another staff of the same level across the cluster to facilitate rotations and transfers.



Structured and transparent career progression with harmonised career path to allow staff to plan their career development.



Defined generic, leadership and domain competency framework for a clear career development path.

### APPRAISAL AND CAREER CONVERSATIONS



Training to equip staff with knowledge and skills to have meaningful career conversations with their supervisors during and out of appraisal sessions.

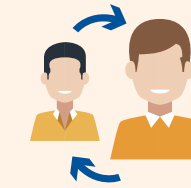


Empowering staff to take ownership of their career development based on their aspirations.

### INTERNAL CAREER MOVES



Retaining staff in SingHealth by providing quick access to job portal listing and encouraging them to apply for vacancies across SingHealth institutions.



Structured job rotation programme for executives' skills development and knowledge expansion.

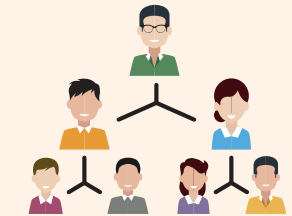


Grooming administrator leaders through SingHealth Healthcare Management Executive Programme.

### CAREER COACHING AND MENTORING



Empowering staff to make informed decisions about their career development through facilitated conversations with career coaches or mentors.



Building a mentoring culture across SingHealth by expanding current pool of mentors.

**Through these initiatives, Administrators and Ancillary staff can better chart their career path to forge an enriching and rewarding career in SingHealth!**



*What I'm also proud of is that we can enable non-physicians to develop skills that are reliable, of high quality and make a big difference in the lives of others."*

### ASST PROF GAVIN TAN

Consultant, Surgical Retina Department,  
Singapore National Eye Centre (SNEC)

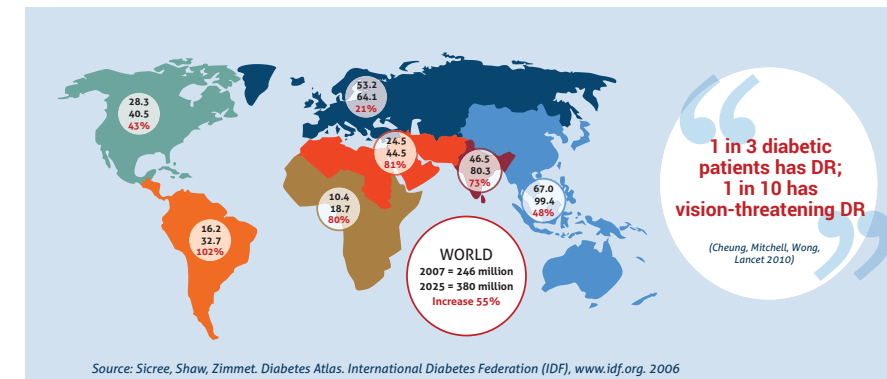
Clinical Director,  
SNEC Ocular Reading Centre



## A VISION-ARY PLAN TO CURB BLINDNESS

The Singapore Integrated Diabetic Retinopathy Programme (SiDRP) aims to improve on conventional Diabetic Retinopathy (DR) screening with the establishment of a comprehensive screening programme based on 'real time' assessment of DR from photographs by a centralised team of trained and accredited technicians, supported by a national tele-ophthalmology IT infrastructure. Patients' retinal photographs are graded within an hour, allowing immediate feedback on DR status to be given during the same primary care visit together with, if necessary, a referral to an ophthalmologist.

### GLOBAL PROJECTIONS FOR DIABETES



**DR screening is the main method used to identify patients suffering from DR at an early stage.**

#### Limitations of Conventional DR Screening:

- Delay in diagnosis and referral of patients with DR
- Inconsistencies in the grading outcomes with no standardised protocol
- Evidence of high over-referral rate to tertiary eye care
- Cost-ineffective as primary care doctors are made to assess DR when this can be performed by trained technicians
- Large proportion of patients with diabetes who visit private general practitioners and endocrinologists may be excluded

### WORKFLOW OF SINGAPORE INTEGRATED DIABETIC RETINOPATHY PROGRAMME (SiDRP):



#### Benefits of SiDRP:

- Enhances the current system via the use of dedicated trained and accredited technicians who have shown to produce grading quality which is at least equivalent to that of ophthalmologists
- Significantly reduce excessive referrals to tertiary eye centres
- Reduction in false positive results improves waiting time at the tertiary eye centres
- Improved grading turnaround time saves patients one additional visit to the primary care centre
- Allows for faster referral to tertiary eye care, if needed
- Translates to savings in cost, time and resources
- System has demonstrated effectiveness in early detection of DR and resulted in better clinical management of DR



**D**iabetic eye disease is the number one cause of blindness within the working age group. This makes it an urgent priority, in light of a growing number of cases of diabetes, especially among the young. "What makes diabetic eye disease particularly perilous is that it is asymptomatic at the early stages," explained Asst Prof Gavin Tan. "By the time the patient exhibits symptoms, it's often too late to save his or her vision."

Previously, basic screening of eye disease was done at polyclinics for all diabetics. A Polaroid photograph would be taken and the patient would need to revisit the polyclinic after one to three weeks to receive a diagnosis and be briefed on the follow-up action.

This process was far from satisfactory according to Asst Prof Tan. Apart from the delay in diagnosis during which some patients' conditions would have deteriorated, there were also inconsistencies in the grading outcomes as the assessments were not done according to a standard protocol and compounded by the poor quality of the Polaroid photos.

Spurred to action, Prof Wong Tien Yin, Medical Director, SNEC and then Executive Director, Singapore Eye Research Institute (SERI) and his team (which included Asst Prof Tan) started the Singapore Integrated Diabetic Retinopathy Programme (SiDRP).

"The aim was to have a comprehensive diabetic eye screening programme where a centralised team of trained and accredited technicians would grade patients' retinal photographs based on a standard set of guidelines."

More impressively, the assessment is done within an hour. "Thanks to telemedicine, digital photos taken at the polyclinics can be sent immediately to the reading centre where they are graded in real time. By the time the patient completes some of his other tests at the polyclinic, the grading would be ready and the doctor can discuss what action he needs to take, all within that same visit." Such a fast turnaround time also means that referrals of urgent cases to an ophthalmologist can be sped up to even on the same day.

"The programme was first rolled out at Outram Polyclinic in 2010," said Asst Prof Tan. "Since then, the other healthcare clusters have also come on board and today, it's been implemented to polyclinics islandwide." The initiative has even picked up a National Health IT Excellence Award. "We embarked on this project to mainly reduce the cases of vision loss. Patients appreciate the faster diagnosis and referrals, and the more structured readings even allow for other eye diseases to be identified early. What I'm proud of is that we are able to train technicians with no healthcare training to develop skills that can make a big difference in the lives of others. That's highly satisfying to me."

Clockwise from top left: Haslina Hamzah, Asst Prof Gavin Tan, Prof Ecosse Lamoureux, Soundaram Jaganathan



### PROF ECOSSE LAMOUREUX

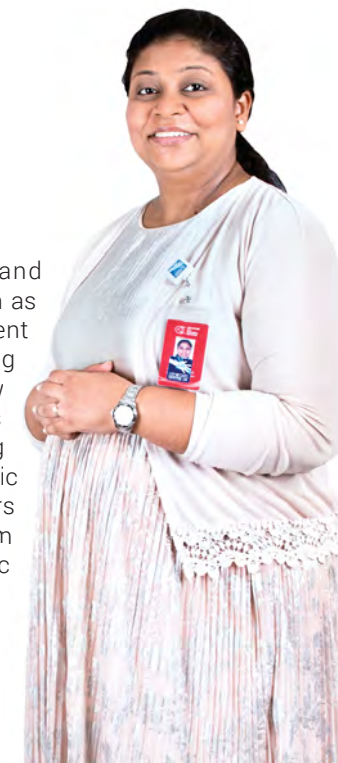
Head, Health Services Research Group,  
Director, Population Health, SERI

To date, some of the research we have done related to SiDRP include the efficiency and accuracy of our new model, the economic benefits of SiDRP at the patient and government levels, and the adherence rate to SiDRP screening at the polyclinics. Our patient satisfaction surveys revealed that SiDRP is a resounding success based on all the indices that we tested. The fact that patients can get the reliable results of their annual eye screening in less than one hour is well appreciated.

### SOUNDARAM JAGANATHAN

Assistant Manager,  
SNEC Ocular Reading Centre

I am involved in the operational and administrative aspects of SiDRP, such as budget and reporting issues. We spent many years working on synchronising protocol, referral criteria and workflow before the national system was implemented. We have been receiving very positive feedback from the polyclinic staff and patients, as well as visitors from local and foreign institutions. I am extremely proud to be part of a dynamic team behind the success of SiDRP.



### HASLINA HAMZAH

Senior Manager,  
SNEC Ocular Reading Centre

A set of ocular images were extracted to be read by a family physician, an ophthalmologist and a technician. It was found that the technician could achieve as high as standard of assessment as any other profession. This helped to debunk any misconceptions about technicians, proving that we could provide high quality reports within a short time frame.

### DR DANIEL TING

Associate Consultant,  
General Cataract and Comprehensive  
Ophthalmology Dept

My main focus is on the clinical development of the Singapore Eye Lesion Analyser (SELENA), an automated Diabetic Retinopathy (DR) screening software. It is a novel artificial intelligence software that employs deep learning technique using the 'convolutional neural network' (like a human brain). This aims to alleviate the growing manpower load for retinal image grading, due to a rising prevalence of diabetes worldwide. We are currently performing various research to evaluate the clinical and cost-effectiveness of SELENA for DR detection in the SiDRP setting. This is an exciting area for medical technology innovation that could potentially have a major public health significance in Singapore and internationally.





**ASSOC PROF LEE SHU YEN**

*Deputy Head and Senior Consultant,  
Surgical Retina Dept  
Clinical Director,  
Retina Centre at Diabetes & Metabolism Centre (DMC)*

I'm working to enhance retinal services and patient care flow so that they provide more integrated and holistic care for diabetic patients at the DMC. We're witnessing increasing patient loads with an ageing population. The demand for eye care for age-related eye conditions will continue to rise, putting demands on limited resources. The integration of services at the DMC can help alleviate these demands and improve the patient journey.

**ASSOC PROF HO CHING LIN**

*Head (Clinical Service) and Senior Consultant,  
Glaucoma Dept  
Director,  
Strategic Development and Philanthropy,  
SingHealth Duke-NUS Ophthalmology & Visual  
Sciences Academic Clinical Programme*

Healthcare philanthropy is becoming an increasingly important means towards enhancing healthcare delivery endeavours. We started the VisionSave campaign at SNEC in hopes of increasing public awareness of our efforts to provide better eye care for our patients. The funds raised will propel our research and education endeavours, provide assistance for our needy patients, and also in building sound infrastructure for the future. Being in a leadership position allows me to help foster a culture of philanthropy and enable its growth over time.

**ASSOC PROF RAHAT HUSAIN**

*Senior Consultant,  
Glaucoma Dept  
Head of Dept,  
Ophthalmology Division, SNEC Eye Clinic @ CGH*

My current project is reducing the number of post-cataract surgery visits to the hospital. With appropriate follow-up and patient education, we can maintain high standards in healthcare. What surprises me most about healthcare is the flexibility of the system despite its complexity. When urgent care is needed, all the teams work together to ensure a good outcome and experience for the patient.



**LOH HUEY PENG**

*Assistant Director of Nursing,  
Operating Theatre*

I'm researching various segments of the human factor (especially situational awareness) in a high turnaround theatre, and how we can incorporate human factor elements into training using computer simulation programmes. By integrating technology into healthcare, we can improve patient care. We can also use data to improve safety and quality, such as in risk management, forecasting and strategy development.



**ASST PROF RANJANA MATHUR**

*Senior Consultant,  
Medical Retina Dept  
Clinical Director,  
Primary Eyecare Clinic*

Ground breaking research in ophthalmology has led to novel treatment options for eye conditions, which have reduced incidences of blindness in Singapore. However, with an increasingly ageing population, common chronic eye diseases like cataract, refractive error, age-related macular degeneration (AMD), glaucoma and diabetic retinopathy, if not treated in time, will result in significant visual morbidity. I am currently working on a new Primary Eye Care model to facilitate better availability, accessibility and affordability of quality comprehensive eye care at the community level which aims to right site patients with these chronic eye conditions.



**AW AI TEE**

*Assistant Director of Nursing,  
Day Ward & Dept of Nursing Administration*

For ophthalmology, we need nurses to provide education on age-related eye conditions such as Diabetic Retinopathy and Glaucoma. We have seen more nurse-led clinics and nurses who are developing evidence-based practice. I'm currently working on understanding the provision of care for patients with low vision. I strongly believe that a Diabetic Retinopathy patient's journey is different from that of a Glaucoma patient or one with a Corneal eye disease, for example. I'm passionate about improving patients' experiences and their journey to recovery.



**ASST PROF DESMOND QUEK**

*Consultant,  
Glaucoma Dept  
Director,  
Medical Informatics*

By providing user-friendly, responsive and reliable technological solutions, we can make daily work and life easier, more efficient and safer. I'm working on developing and implementing electronic medical records. Hopefully, healthcare workers will be convinced that the transition from paper to a paperless workplace is worth their time and effort. I wish to continue to drive changes in culture and practices, and to incorporate technological solutions in healthcare.

**ASST PROF KHOR WEI BOON**

*Consultant,  
Corneal and External Eye Diseases Dept & Refractive  
Surgery Dept  
Head,  
SNEC Eye Service @ Sengkang Health –  
Alexandra Hospital*

I'm excited about building our SNEC branch at Alexandra Hospital, which will eventually become our satellite clinic in Sengkang Hospital. I will be leading a team of doctors, nurses and allied health colleagues in bringing SNEC's expertise in ophthalmology to where our patients are. Patients seen at Sengkang Health will receive the same standard of medical and surgical care as our main centre, and only the most complex cases will need to be managed at the SGH Campus.



# RESEARCH

## Staffing

**Number of clinician scientists (CSs)**  
SingHealth & Duke-NUS  
(as at 30 December 2015)

**56** National CSs

- 11 Singapore Translational Research (STaR) Investigator Award winners
- 19 Clinician Scientist Award winners
- 23 Transition Award winners
- 3 lead principal investigators of Translational & Clinical Research (TCR) Flagship Programmes

**26** Cluster CSs

**10** Faculty CSs

**182** Clinician investigators

**382** Principal investigators leading ongoing research

## Research Achievements

**Publication in international peer-reviewed journals** (FY07 – CY15)

SingHealth:



**8,000**  
(CY07 – CY15)

Duke-NUS:



**>2,800** from faculty members since 2006, and >240 from students since 2010

### Competitive funding

SingHealth & Duke-NUS (FY07 – CY15)



**\$1.042B**  
Competitive funding

**\$185.6M**  
Pharma/Industry funding

### National awards

SingHealth & Duke-NUS (to date)



- 1 President's Science & Technology Medal
- 1 President's Science Award (PSA)
- 2 PSA (Team)
- 2 President's Technology Award (Team)
- 1 National Research Foundation Investigatorship Award

## Allied Health Professionals

**200**



Allied Health Researchers involved in active research, of which:

**48** PhDs | **30** PharmDs

**574**  
Total papers published

FY15	134
FY14	94
FY13	78
FY12	104
FY11	90
FY10	74

**\$10.24M**  
Total grants received

FY15	\$633,550
FY14	\$1,747,385
FY13	\$4,067,866
FY12	\$1,626,909
FY11	\$1,350,219
FY10	\$816,911

## Nursing



**Number of presentations**

CY15	FY14	FY13
<b>82</b>	<b>103</b>	<b>87</b>



**Number of publications**

CY15	FY14	FY13
<b>27</b>	<b>17</b>	<b>21</b>



**Number of research projects with nurses as principal investigators**

CY15	FY14	FY13
<b>46</b>	<b>26</b>	<b>31</b>



**Number of grants**

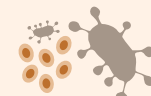
CY15	FY14	FY13
<b>8</b>	<b>6</b>	<b>6</b>

**Quantum of grants awarded**

CY15	FY14	FY13
<b>\$109,163</b>	<b>\$195,782</b>	<b>\$116,346</b>

Research is the key to discovery and finding solutions to better prevent, treat and care for patients. The SingHealth Duke-NUS Academic Medical Centre does basic, clinical, translational and health services research that focuses on strategic disease and health areas that affect Singaporeans and the Asian population. Here are some developments in our research focus areas that hold promise to improve tomorrow's healthcare.

### Cancer



- **Cancer research trio wins 2015 President's Science Award**
- **Breakthrough discovery in breast cancer diagnosis**

Improved diagnostic accuracy and enhanced clinical intervention for patients with breast tumours may soon be possible, thanks to the discovery by a team of scientists from SGH, NCCS and Duke-NUS. The team uncovered the culprit genes behind a distinct breast tumour group, revealing how they progress from benign to being cancerous.

Three members from the team — Prof Teh Bin Tean (NCCS), Prof Patrick Tan (Duke-NUS), and Prof Steve Rozen (Duke-NUS) — also won the prestigious President's Science Award in 2015 for their outstanding work on common Asian cancers such as stomach, biliary tract, urinary tract and breast. They were able to identify the genetic causes and mutations of the cancer, then map how these mutations contribute to the disease.

### Cardiometabolic Diseases

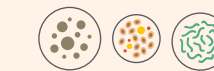


- **Faster, cheaper test-kit for inherited heart conditions**

With almost 100% accuracy and at 20 times cheaper, a new test developed by NHCS with Imperial College London is a big improvement for patients needing to be checked for inherited heart conditions.

The test processes patients' genetic information and allows for earlier clinical intervention. More importantly, family members only need to be tested once to find out if they carry similar genetic mutations.

### Infectious Diseases, Inflammation & Immunology



- **Duke-NUS teams observes detailed architecture of Zika virus**

The infamous Zika virus hit the world by storm, causing panic among the population of affected countries. A Duke-NUS research team made an important contribution to the worldwide efforts to combat the virus by solving the structure of the virus particle. The high-resolution image of the Zika virus allowed scientists from the global community to study it alongside other viruses from the same family in an attempt to unravel its mystery.

### Eye Diseases



- **Linking myopia to glaucoma for faster diagnosis**
- **Discovery of five new genes associated with common glaucoma type**

Primary open angle glaucoma (POAG) affects three in 200 adults in Singapore and makes up two-thirds of all glaucoma patients in Asia. Scientists from SNEC and SERI found out that people with moderate to high myopia as well as high eye pressure were four times more likely to develop POAG. Regular screenings of these patients could lead to faster diagnosis and earlier treatment.

Another research team also discovered five new genes associated with POAG, providing scientists a deeper understanding of the disease development pathways which might lead to the development of new drugs to treat it.

### Health Services Research



- **New institute focuses on care delivery improvement with national relevance**

The formation of the SingHealth Duke-NUS Health Services Research Institute (HSRI) marks our commitment to improve healthcare delivery to meet the increasing demands in Singapore. The institute galvanises the health services research strengths of Duke-NUS and SingHealth institutions, focusing on issues with direct relevance to our population such as ageing and models of care.

### Neurosciences



- **Scientists now able to grow 'mini brains' for research**

Scientists from NNI, Duke-NUS and Agency for Science, Technology and Research's (A\*STAR) Genome Institute of Singapore (GIS) have made a big leap in studying the human brain by growing "mini brains" for research.

These advanced mini versions of the human midbrain will allow them to develop treatments and conduct studies into age-related diseases such as Parkinson's disease.



“*The Prescription in Locker Box Service is an example of how service innovation and technology can improve patient satisfaction and experience at the pharmacy.*”

### CHRISTINA LIM

Pharmacy Manager,  
SingHealth Polyclinics (SHP)



## THINKING OUT OF THE PILBOX

The Prescription in Locker Box (PILBOX) service is a new service model which allows patients or their caregivers to self-collect their repeat medication at any time of the day (including weekends and public holidays) from an automated locker facility. It has been rolled out at Marine Parade Polyclinic since February 2016.

### BEFORE PILBOX WAS IMPLEMENTED



- Patient drops prescription at the pharmacy
- Patient waits to be called by the pharmacist to collect their repeat medication



Waiting time



Pharmacy staff dispenses the medication to the patient.



Waiting time



Patient pays for medication at the cashier or the self-service payment kiosk.

### AFTER PILBOX WAS IMPLEMENTED



- Patient signs up for PILBOX service (one-time) after pharmacy staff has verified the patient's eligibility
- Patient drops the prescription at the pharmacy
- Patient selects a preferred date to collect the repeat medication



**An SMS reminder will be sent when the medication is ready for collection at the PILBOX station**

### 24/7 SELF-SERVICE COLLECTION WITH NO WAITING TIME



- Patient pays for medication at the self-service payment kiosk at the PILBOX facility
- Patient can also pay online or via GIRO
- Patient scans the QR code printed on the payment receipt and enters his mobile number at the station console to open the locker to collect the medication
- Pharmacy staff will contact the patient after each collection to close the loop

In the past, when polyclinic patients needed a refill of their regular medication, they would have to go to the polyclinic, take a number and join the queue at the pharmacy. This added on to patients' waiting time, and contributed to overcrowding at the polyclinic.

Seeking to improve patient experience at the pharmacy, SingHealth Polyclinics (SHP) Pharmacy brainstormed and looked beyond the healthcare industry for ideas. "We conceptualised a self-service model for medication collection 24/7 outside of the pharmacy, and designed a prototype which was shown to a sample of patients to gather their feedback," shared Ms Christina Lim. "The response from our patients was encouraging and this spurred us on to bring the idea to fruition."

The new Prescription in Locker Box (PILBOX) Service was thus conceived. This innovative service, which is the first of its kind in Singapore, allows patients or their caregivers to collect their prescription refills at any time of the day on a pre-scheduled date from an automated locker facility located at the polyclinic. After paying for the medication online or at the self-service payment kiosk on-site, patients only need to scan their unique access code on the payment receipt and enter their mobile number to collect their medication from the locker box.

Special care had to be taken to ensure patient safety. "Unlike parcels, there can be no mistakes with medication," said Ms Lim. "The right package has to go to the right patient." As a safeguard, a two-factor authentication is required when depositing and collecting packages at the locker facility.

In addition, the project team had to design a locker facility which could maintain the proper temperature and humidity conditions for storage of medication packages. "We conducted a series of temperature and humidity mapping tests for the station lockers," Ms Lim elaborated. "We also put in safety measures such that the locker station would shut down if the storage temperature limits were breached."

During the initial launch period, pharmacy staff guided first-time users on how to use the PILBOX step-by-step. "This is important as many of our patients are the elderly who tend to be less comfortable with technology and automation," explained Ms Lim.

Since its implementation on 22 February 2016, feedback on PILBOX has been overwhelmingly positive. "This project is an example of how service innovation and technology can improve patient satisfaction and experience at the pharmacy. It's something I'm very proud to be part of," said Ms Lim.

Having garnered interest from patients, staff and the media, Mrs Pauline Lo, Director of Pharmacy, SHP, is encouraged by the outcome. "We will strive to extend this value-added service to the rest of the polyclinics for the benefit of our patients."

From left to right: Goh Boon Kwang, Agnes Wong, Christina Lim, Vivian Chee

### GOH BOON KWANG

Assistant Director,  
Pharmacy, SHP

Proper planning and execution is important to ensure successful implementation of the PILBOX project. We will apply the learning points from this project to future initiatives for better patient care and experience.

### VIVIAN CHEE

Clinic Pharmacy Manager,  
SHP – Marine Parade

As the pharmacist who holds the licence to operate this new service at Marine Parade Polyclinic, I was heavily involved in the planning of the infrastructure and operation of the new service model. It was a wonderful experience bringing this project to fruition and I look forward to be involved in other new services that will benefit patients.

### AGNES WONG

Pharmacy Technician,  
SHP – Marine Parade

Initially, we were prepared to face resistance from our elderly patients to the use of the service as it involved changing the way they collect repeat medication. To my surprise, I met elderly patients who were eager to try out the new technology. This project has taught me to keep an open mind to new ideas that can bring about improvements to the work process for the benefit of patients and staff.





**DR DEREK TSE**

*Family Physician & Senior Consultant,  
Clinical Services, SHP*

It is important to focus on and shift resources to primary care so that we can do more for patients in the community. Care integration means building bridges between polyclinics and specialists, social care partners, general practitioners (GPs), and most important of all, patients; so that together we can manage patients more holistically and in a more coordinated manner, especially those with complex issues. The connectedness also brings us closer to one another and forges greater mutual understanding so that we can create a seamless patient care journey.

**ALVIS LEON TIMOTHY CHARLES**

*Podiatrist,  
Clinical Services, SHP*

I developed a passion for podiatry when I was serving National Service. My flat feet and poor power limb biomechanics caused stress fractures in my shins. A podiatrist helped me with my problems and I was inspired to help others with similar conditions. In the future, I hope polyclinics can provide other podiatric services, such as in-grown toenail surgery.



**TEO LAM BEE**

*Senior Staff Nurse,  
SHP – Queenstown*

Telecare is a new way of interacting with patients, allowing for continuity of care beyond the clinic visit via tele-consulting. Typically, we check on our diabetic patients to make sure they are coping well with the insulin injections. Through Telecare, we reduce the need for clinic visits, so patients can save time and costs. It also helps us optimise the use of our clinic-based services.



**ADELINE TAY**

*Clinic Pharmacy Manager,  
SHP*

Increasingly, more new medications are introduced into SHP and these stocks need to be managed well and optimised. The SHP Logistics Hub, which stores supplies centrally, streamlines inventory management and facilitates stock planning for emergencies or quick deployment to a polyclinic. The improved process frees up time for frontline staff to focus on providing quality healthcare.



**DR SHAH MITESH**

*Family Physician & Consultant,  
SHP – Geylang*

I teach medical students from undergraduates to postgraduates. During the undergraduates' two-week attachment to polyclinics, they practise consultation, learn about chronic disease management and conduct health talks for patients. Such learning opportunities prepare the doctors of tomorrow to be advocates for health in the community.



**JESSIE NEO**

*Senior Manager,  
Operations & Planning, SHP*

We introduced an appointment system for consultation visits in March 2015 to reduce our patients' waiting time and improve patient experience. The system allows us to pace the arrival of patients more evenly throughout the day. Those without an appointment are given an estimated time slot to return to the clinic, so that they can better use their time to run their errands instead of waiting in the clinic. As a caregiver myself, I am motivated to search for new solutions to improve patient experience.



**HANNIEL LIM**

*Senior Physiotherapist,  
SHP – Tampines*

As our population ages, physiotherapy will play an increasingly important role to support the care of our patients. Our elderly patients will benefit from rehabilitation to help them gain strength, balance and mobility for better function and improved quality of life. I developed knee exercise classes for patients with knee osteoarthritis. It gives me great satisfaction to see that the participants enjoyed the classes. There was so much laughter at the roll-out of our inaugural exercise class. It felt really, really good!



**DR JASMINE LEW**

*Resident Physician,  
SHP – Pasir Ris*

I am currently working on a health services research project in the field of nephrology. By discovering the risk factors for chronic kidney disease, we can better manage our patients and reduce their risk of progression to end stage renal disease. As a primary care provider, I strongly believe that prevention is better than cure. Models of care, based on sound primary care research, can provide consistent first-world care in a cost-effective and timely manner.

# SINGHEALTH DUKE-NUS DISEASE CENTRES (SDDCs)

SDDCs are new models of care formed to give patients better outcomes and care experiences.

## SDDCs are for



Patients with diseases which require multidisciplinary care from many specialists, each contributing their expertise towards the treatment of the patient's condition.



Professionals who care for such patients, facilitating more effective collaboration and sharing of best practices.



In an SDDC, clinical care services, research and education work together in a virtuous cycle of improvement which results in better patient outcomes.

## SDDCs change the way we work

In conventional care, a General Practitioner might refer a patient with a nodule (growth of abnormal tissue) in his neck to a thyroid specialist or surgeon, who would then refer the patient for imaging tests. If the nodule is found to be a cyst, the patient is given an appointment for a biopsy.

By this time, the patient would have made at least three trips to the hospital.

At the SingHealth Duke-NUS Head & Neck Centre, patients can go through the whole process in one visit, saving them time and money and facilitating timely treatment.

It also translates to greater work efficiency for clinicians and other healthcare professionals.

## Benefits of SDDC care models



**Evidence-based care protocols**



**Improved care and resource utilisation**



**Measurement of outcomes across institutions**



**Harmonise training & accreditation**



**Databases for research, training**



**System based learning & improvement**

## SDDCs established so far

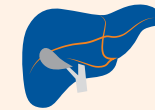
(Refer to page 107 for list of Key Appointment Holders)



**Head & Neck**



**Breast**



**Liver Transplant**



**Lung**

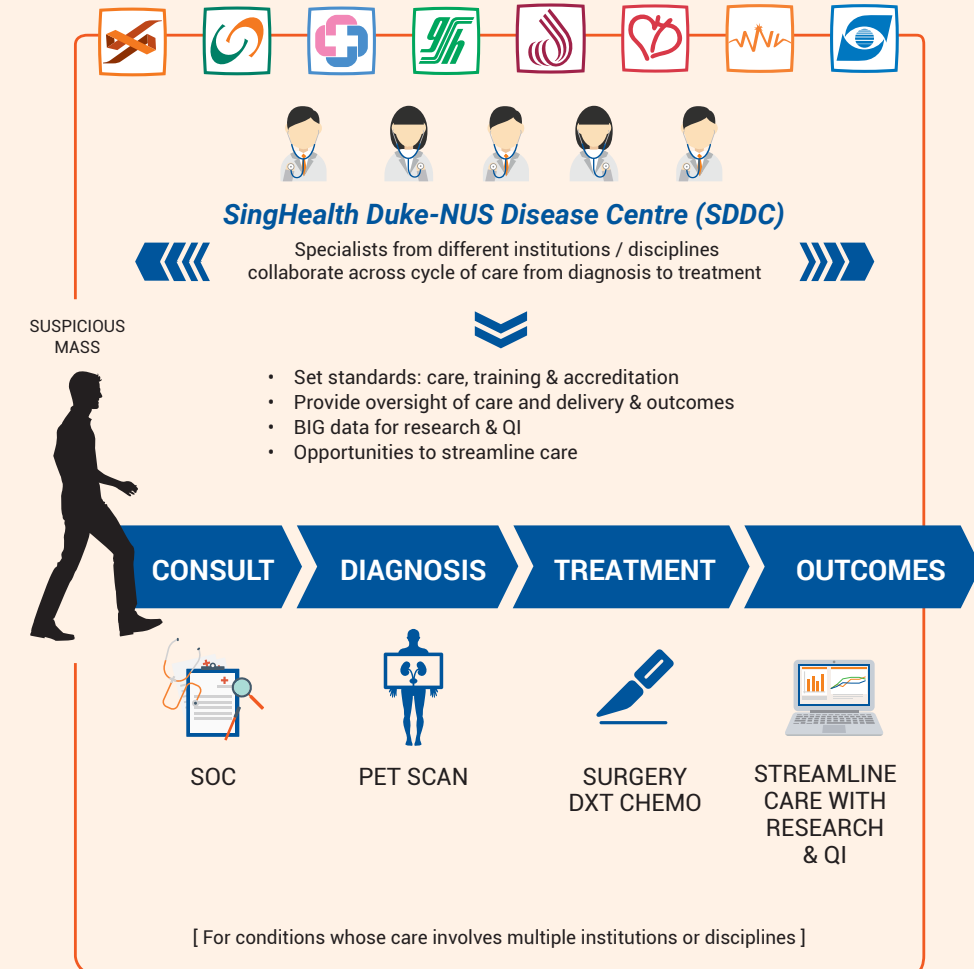
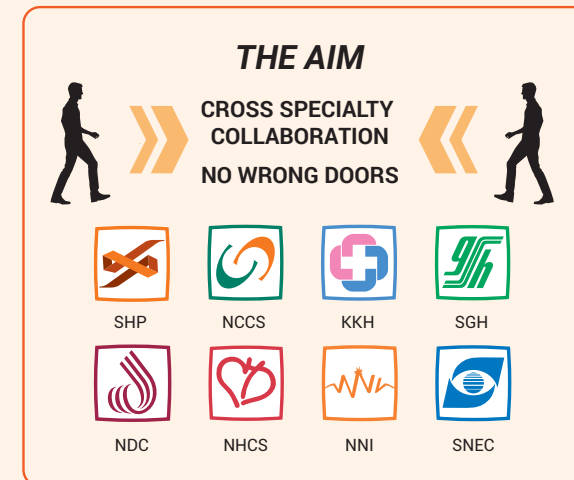
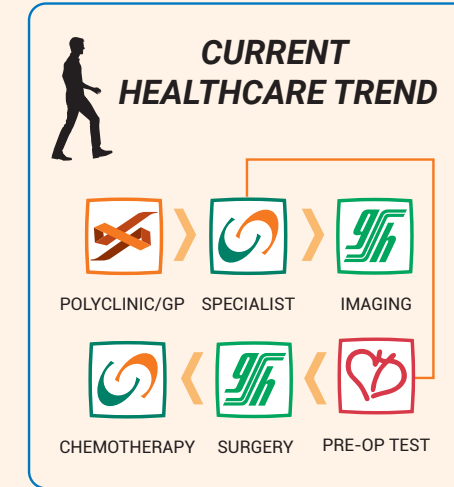


**Diabetes**



**Blood Cancer**

## How SDDCs work





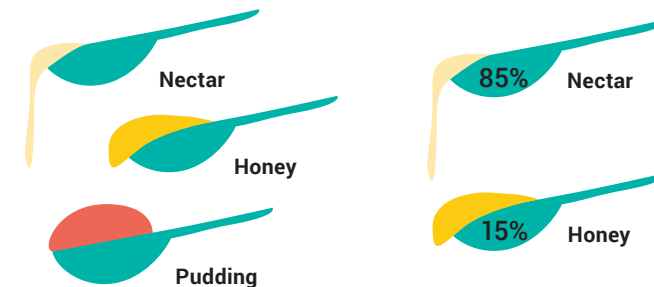
*Ultimately, we improve patient safety, which is the most important criterion of all.”*

### NARAYANASAMY SAKKARAVARTHY

Senior Staff Nurse,  
Bright Vision Hospital (BVH)

## MIXING THE RIGHT DRINK

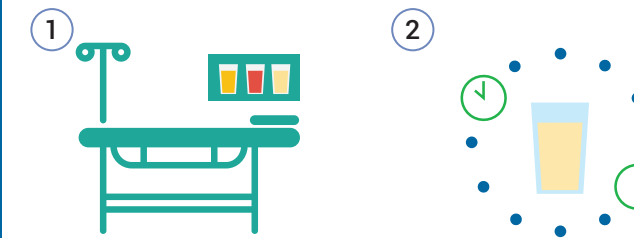
About 14 per cent of BVH's elderly and chronically ill patients have dysphagia (difficulty in swallowing). Dysphagia is common in patients whose nerves and throat muscles have been affected by stroke, head injuries or cancer treatment, such as radiotherapy. They cannot swallow clear fluids like water and need thickened fluids. For this group of patients, BVH has put in place a series of measures to improve the accuracy rate of fluid consistency.



3 most common consistencies of thickened fluids for patients with difficulty in swallowing, "Nectar", "Honey" and "Pudding" (in increasing viscosity or thickness).

Of the patients at BVH who require thickened fluids, 85 per cent require nectar grade and 15 per cent require honey grade.

### MEASUREMENTS PUT IN PLACE TO IMPROVE FLUID CONSISTENCY SO AS TO PREVENT CHOKING INCIDENTS



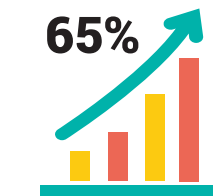
Bedside signages were installed to clearly indicate the thickness of fluid for each patient so that staff could see at one glance the consistency of fluid that the patient requires.

BVH instituted a routine where the pre-mixed thickened water was prepared twice a day, at 10am and 4pm. This gives patients and families immediate access to the thickened fluids.

3



BVH now only orders one brand of thickener to simplify the process.



The initiative has dramatically improved the fluid consistency by 65 per cent.



Narayanasamy Sakkaravarthy (middle) and Yin Nwe Nwe (right) were part of a team at BVH that came up with ways to effectively standardise the preparation of pre-thickened fluids.

**A**s a community hospital offering intermediate and long-term care services, Bright Vision Hospital (BVH) frequently sees patients recovering from stroke and chronic conditions. Many of these patients suffer from dysphagia (swallowing impairment) and require thickened fluids for swallowing safety.

What seems like a simple task – providing patients with thickened fluids – is far from simple. “There are three levels of thickness, in increasing order: ‘Nectar’, ‘Honey’ and ‘Pudding’. Different patients require different degrees of thickness,” explained Mr Narayanasamy Sakkaravarthy. “Because the fluids were mixed as and when the need arises, the mixing tends to be inconsistent. It was more challenging when time is limited. Some of the mixtures were lumpy and unappetising.

“Unknown to many,” he continued, “there were two different brands of thickeners and each required different amounts to be added to the liquid. This causes more confusion.”

One of the speech therapists, Ms Grace Yu, noticed the inconsistencies when she was making her rounds at meal times and saw the need to improve the fluid consistency to prevent choking incidents from happening. She initiated a project with the nursing team to improve the accuracy rate of fluid consistency.

A series of measures were quickly put in place. “The first thing we did was to install bedside signage that clearly indicated the thickness of fluid for each patient,” detailed Mr Sakkaravarthy. “Staff could see at one glance the consistency of fluid that the patient required.”

To resolve the problem of inconsistent mixing, the process was further streamlined. “Instead of mixing on demand, we instituted a routine where the fluids are prepared twice a day. Each patient is given a jug of liquid of the correct consistency that he or she can consume over the next few hours.” Mr Sakkaravarthy added, “We also worked with the pharmacy to order only one brand of thickener to simplify the process.”

The initiative has dramatically improved the fluid consistency by 65 per cent. Mr Sakkaravarthy was encouraged by the improvements made by the project. “This has resulted in time-saving for staff. Many patients also appreciate the more consistent quality and availability of the fluids. Ultimately, we improve patient safety, which is the most important criterion of all.”

## MERGIE LYN TINGUIL

*Staff Nurse*

This project has made a great difference in providing care to our patients. For staff, the bedside colour-coded signages and thickened fluid charts at nurses’ station are very helpful. Staff can easily refer and check when thickening soups and beverages for patients. Family members can also ask for assistance from nurses in getting the right fluid consistency for patients.



## YIN NWE NWE

*Enrolled Nurse*

Before the implementation of the project, we had to rush and prepare thickened fluids during meal times. Sometimes, patients were unable to wait for the thickened fluids to set and accidentally consumed fluids that were not ready. Now, they can take a drink any time they want and take in the correct fluid consistency. Their risk of infection due to aspiration is reduced. There is better time management for nurses as well.





**MAGHESHWARI D/O  
RK SABAPATHY**

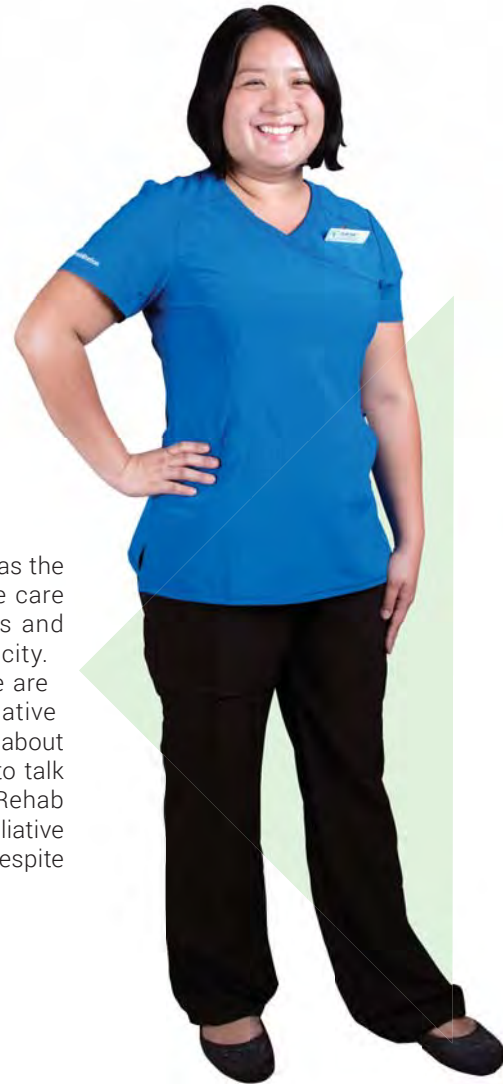
*Director of Nursing*

I foresee that we will need more chronic sick beds in the future as our population ages. Many of our patients are bedbound and require total assistance in daily activities. Some of them are on tracheostomy tubes and enteral feeding tubes. They cannot be discharged as their caregivers are unable to cope. I'm working on the improvement of the patient communication board with the allied health team to allow staff to understand patients' care needs at a glance. In the near future, we will also look at redesigning the layout of the wards to provide better care for our patients.

**CELINE YONG**

*Senior Occupational Therapist,  
Rehabilitation*

When I first started working here, BVH was the only community hospital with palliative care beds. Now, more community hospitals and hospices are increasing their bed capacity. I see this as a positive sign that people are starting to recognise the need for palliative care services and support. We talk a lot about an ageing population, yet nobody likes to talk about death! I'm currently working on Rehab on Wheels, a programme that enables palliative patients to participate in rehabilitation despite their limitations.



**RATNA INDRA PUTRI**

*Executive, CEO's Office*

I am very much looking forward to seeing the rollout of our Integrated Primary Care for At-risk Elderly project. This initiative aims to provide better intensive care for the elderly who have complex medical issues by integrating aspects of home care and other services from community hospitals. I'm heartened that society is slowly acknowledging the need to care for and value our elderly, ensuring that they can live a dignified life.



**LIEW LEE FOONG**

*Senior Staff Nurse (Wound Care Nurse)*

I conduct wound management workshops for all nurses at BVH. With the increasing demand for elderly care, the hospital-centric healthcare model will have to move towards community healthcare to be sustainable. As such, I foresee that more nurses will be trained in wound care to care for patients in their homes and within the community. This will allow patients to be discharged earlier and enjoy continuity of care at home even with complex wounds.





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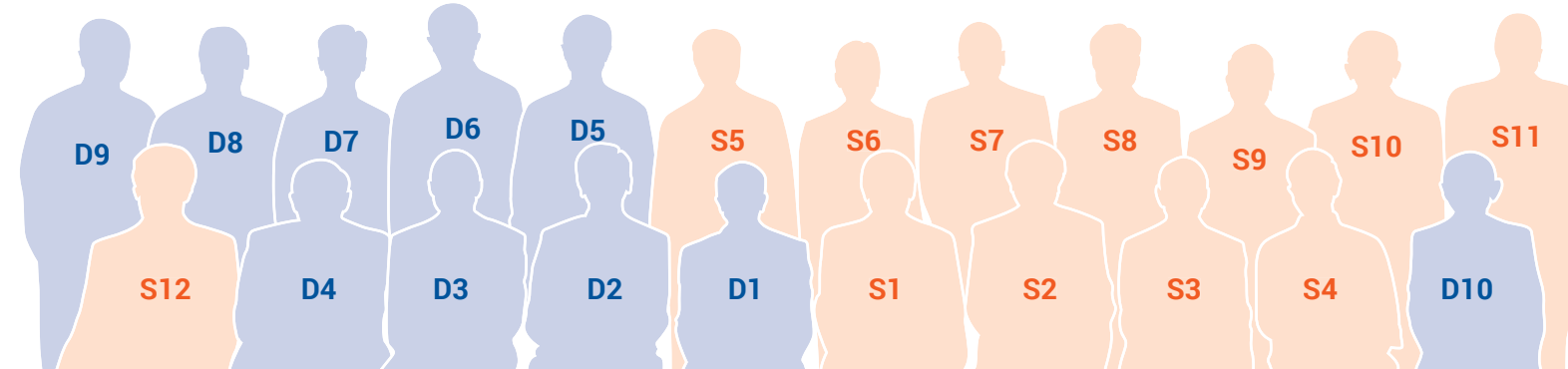
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Formed on 1 March 2014

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**Dr Veronique Tan**  
Director, Research  
Consultant, Division of Surgical Oncology, NCCS

**Dr Yong Wei Sean**  
Director, Education  
Senior Consultant, Division of Surgical Oncology, NCCS

**Assoc Prof James Khoo**  
EXCO member  
Programme Director, Breast Screening Services  
Senior Consultant, Division of Oncologic Imaging, NCCS

**Dr Benita Tan**  
Service Chief @ SGH Campus,  
Senior Consultant, Dept of General Surgery, SGH

**Dr Lim Swee Ho**  
Service Chief @ KKH Campus,  
Head and Senior Consultant, Breast Dept, KKH

**SingHealth Duke-NUS Lung Centre**

Formed on 1 March 2015

**Assoc Prof Loo Chian Min**  
Head  
Head and Senior Consultant, Dept of Respiratory & Critical Care Medicine, SGH

**Dr Anantham Devanand**  
Deputy Head  
Senior Consultant, Dept of Respiratory & Critical Care Medicine, SGH

**Assoc Prof Darren Lim**  
Director, Research  
Senior Consultant, Division of Medical Oncology, NCCS

**Dr Low Su Ying**  
Director, Clinical Services  
Senior Consultant, Dept of Respiratory & Critical Care Medicine, SGH

**SingHealth Duke-NUS Liver Transplant Centre**

Formed on 1 June 2015

**Assoc Prof Prema Raj S/O C Jeyaraj**  
Head  
Director, Liver Transplant Programme, SGH

**Assoc Prof Brian Goh**  
Deputy Head  
Senior Consultant, Dept of Hepato-pancreato-biliary and Transplant Surgery, SGH

**Assoc Prof Tan Ban Hock**  
Director, Research & Quality Control  
Chief Quality Officer, SGH  
Senior Consultant, Dept of Infectious Diseases, SGH

**Assoc Prof Cheow Peng Chung**  
Director, Education  
Senior Consultant, Dept of Hepato-pancreato-biliary and Transplant Surgery, SGH

**Dr Tan Hiang Keat**  
Director, Clinical Services  
Consultant, Dept of Gastroenterology and Hepatology, SGH

**Dr Thinesh Lee Krishnamoorthy**  
Service Chief @ SGH Campus  
Consultant, Dept of Gastroenterology and Hepatology, SGH

**Adj Assoc Prof Low Yee**  
Service Chief @ KKH Campus  
Head and Senior Consultant, Dept of Paediatric Surgery, KKH

**SingHealth Duke-NUS Diabetes Centre**

Formed on 1 June 2015

**Dr Bee Yong Mong**  
Head  
Senior Consultant, Dept of Endocrinology, SGH

**Dr Tan Hong Chang**  
Director, Research  
Consultant, Dept of Endocrinology, SGH

**Dr Daphne Tan**  
Director, Education  
Consultant, Dept of Endocrinology, SGH

**Dr Goh Su-Yen**  
Director, Clinical Services  
Head and Senior Consultant, Dept of Endocrinology, SGH

**Dr Teh Ming Ming**  
Service Chief @ SGH Campus  
Senior Consultant, Dept of Endocrinology, SGH

**Assoc Prof Fabian Yap**  
Service Chief @ KKH Campus  
Head & Senior Consultant Endocrinology Service, Dept of Paediatrics, KKH

**Dr Gavin Tan**  
Service Chief @ SNEC  
Consultant, Surgical Retina Dept, SNEC

**Dr Swah Teck Sin**  
Service Chief @ SHP Campus  
Senior Consultant, SHP – Bedok

**SingHealth Duke-NUS Blood Cancer Centre**

Formed on 1 November 2015

**Assoc Prof William Hwang**  
Head  
Head and Senior Consultant, Dept of Haematology, SGH

**Assoc Prof Lim Soon Thye**  
Deputy Head  
Head and Senior Consultant, Division of Medical Oncology, NCCS

**Dr Charles Chuah**  
Director, Research  
Senior Consultant, Dept of Haematology, SGH

**Assoc Prof Ng Heng Joo**  
Director, Education  
Senior Consultant, Dept of Haematology, SGH

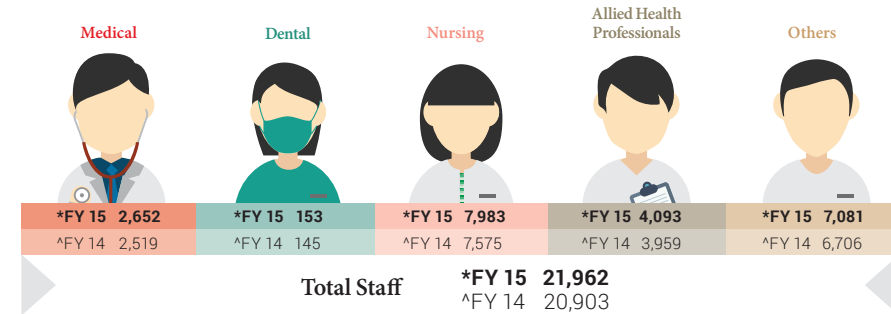
**Dr Aloysius Ho**  
Director, Clinical Services  
Senior Consultant, Dept of Haematology, SGH

**Dr Richard Yiu**  
Service Chief @ SGH Campus  
Senior Consultant, Dept of Haematology, SGH

**Assoc Prof Chan Mei Yoke**  
Service Chief @ KKH Campus  
Head and Senior Consultant, Haematology/Oncology Service, Dept of Paediatric Subspecialties, KKH







	Year ended 31 Mar 2016	Year ended 31 Mar 2015	Change
<b>Size</b>			
Beds (as at end Mar)	2,753	2,753	-
<b>Workload per annum</b>			
Bed Occupancy Rate	81.6%	81.2%	0.4%
Inpatients	163,225	160,026	2.0%
Total Patient Days	755,489	744,728	1.4%
Average Length of Stay (days)	4.6	4.7	-0.1 day
Day Surgeries	113,991	110,371	3.3%
Inpatient Surgeries	72,603	72,103	0.7%
Specialist Outpatient Clinic Attendances	1,901,430	1,855,664	2.5%
Accident & Emergency Attendances	318,953	309,163	3.2%
Dental Attendances	223,617	207,791	7.6%
Dental Procedures	325,043	292,933	11.0%
Polyclinic Attendances	1,786,933	1,719,896	3.9%

Staffing figures refer to filled posts, in terms of full-time equivalent, and may not add up to the total due to rounding. FY2015 figures include MOHH-funded positions.

\*Year ended 31 Mar 2016  
^Year ended 31 Mar 2015

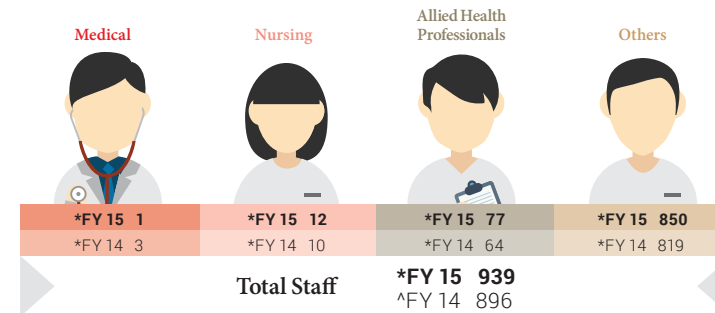
FINANCIAL INFORMATION

	Year ended 31 Mar 2016	Year ended 31 Mar 2015
	(S\$ million)	(S\$ million)
<b>Assets by Major Categories</b>		
Plant and Equipment	636	607
Trade and Other Receivables	558	534
Other Assets	1,367	1,111
<b>Total</b>	<b>2,561</b>	<b>2,252</b>
<b>Liabilities by Major Categories</b>		
Trade and Other Payables	1,134	900
Other Current Liabilities	120	108
Non Current Liabilities	554	493
<b>Total</b>	<b>1,808</b>	<b>1,501</b>
<b>TOTAL EQUITY</b>	<b>753</b>	<b>751</b>
<b>Revenue Breakdown by Major Categories</b>		
Clinical Revenue	1,351	1,275
Subvention	1,596	1,360
Other Revenue	609	477
<b>Total</b>	<b>3,556</b>	<b>3,112</b>
<b>Expenditure by Major Categories</b>		
Manpower	1,994	1,751
Supplies and Consumables	472	435
Other Operating Expenses	911	757
Depreciation and Amortisation	176	162
<b>Total</b>	<b>3,553</b>	<b>3,105</b>



31 Third Hospital Avenue, #03-03 Bowyer Block C, Singapore 168753  
Tel: 6225 0488 | www.singhealth.com.sg

SingHealth Headquarters



8 College Road, Singapore 169857  
Tel: 6516 7666 | www.duke-nus.edu.sg

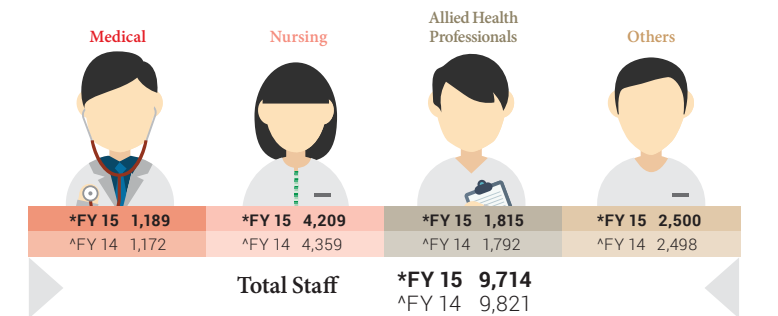
MD Students excluding graduates at Duke-NUS Medical School (as at end Mar 2016)	260
Full-time and Adjunct Faculty in Research and Education	> 1,000

Staffing figures refer to filled posts, in terms of full-time equivalent, and may not add up to the total due to rounding. FY2015 figures include MOHH-funded positions.



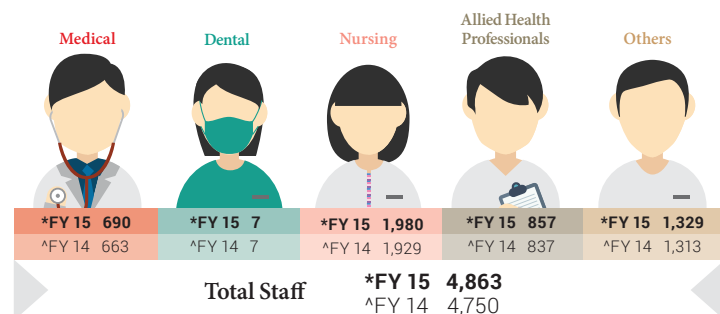
Singapore  
General Hospital

Outram Road, Singapore 169608  
Tel: 6222 3322 | www.sgh.com.sg



	Year ended 31 Mar 2016	Year ended 31 Mar 2015
<b>Size</b>		
Beds (as at end Mar)	1,725	1,731
<b>Workload per annum</b>		
Bed Occupancy Rate	83.9%	82.9%
Inpatients	82,260	79,842
Total Patient Days	493,965	481,938
Average Length of Stay (days)	6.0	6.0
Day Surgeries	44,525	43,729
Inpatient Surgeries	47,831	45,824
Specialist Outpatient Clinic Attendances	719,831	693,751
Accident & Emergency Attendances	136,014	136,119

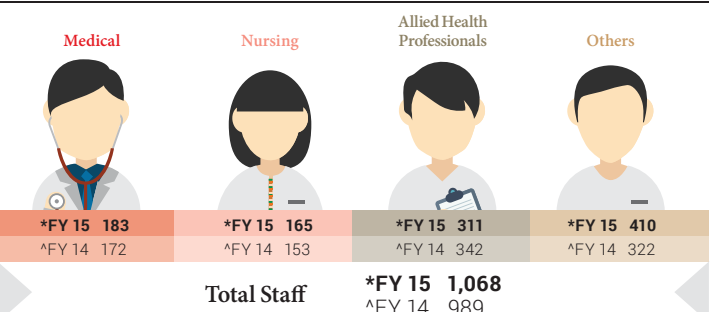
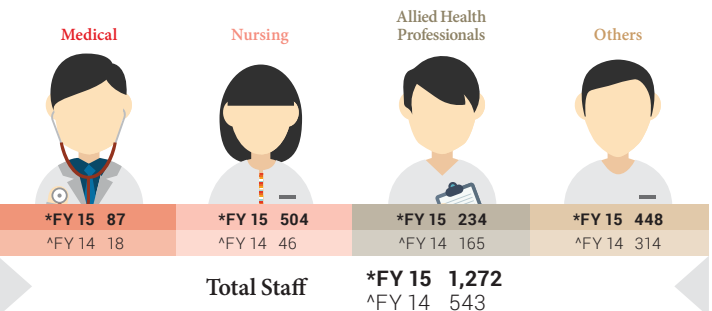
\*Year ended 31 Mar 2016  
^Year ended 31 Mar 2015



	Year ended 31 Mar 2016	Year ended 31 Mar 2015
<b>Size</b>		
Beds (as at end Mar)	843	837
<b>Workload per annum</b>		
Bed Occupancy Rate	79.3%	80.3%
Inpatients	71,902	71,227
Total Patient Days	213,211	215,861
Average Length of Stay (days)	3.0	3.0
Day Surgeries	12,595	13,130
Inpatient Surgeries	19,276	20,441
Specialist Outpatient Clinic Attendances	551,089	553,870
Accident & Emergency Attendances	182,939	173,044

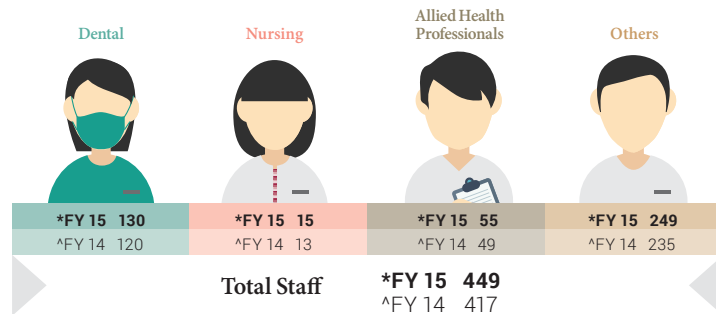
Staffing figures refer to filled posts, in terms of full-time equivalent, and may not add up to the total due to rounding. FY2015 figures include MOHH-funded positions.

Statistics not available as Sengkang General and Community Hospitals are not in operation yet and Alexandra Hospital which is managed by Sengkang Health is reopened in phases only from August 2015.



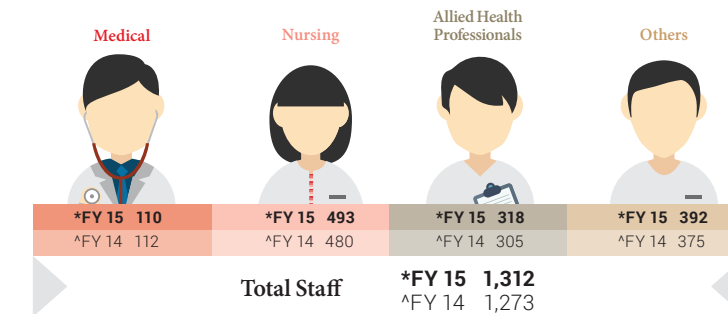
	Year ended 31 Mar 2016	Year ended 31 Mar 2015
<b>Workload per annum</b>		
Day Surgeries	9,850	10,535
Specialist Outpatient Clinic Attendances	147,559	140,219

\*Year ended 31 Mar 2016  
^Year ended 31 Mar 2015



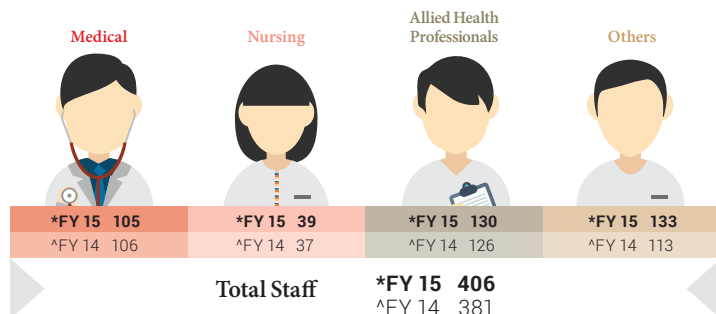
	Year ended 31 Mar 2016	Year ended 31 Mar 2015
<b>Workload per annum</b>		
Day Surgeries	7,483	7,291
Dental Attendances	176,878	165,250
Dental Procedures	199,071	187,961

Staffing figures refer to filled posts, in terms of full-time equivalent, and may not add up to the total due to rounding. FY2015 figures include MOHH-funded positions.

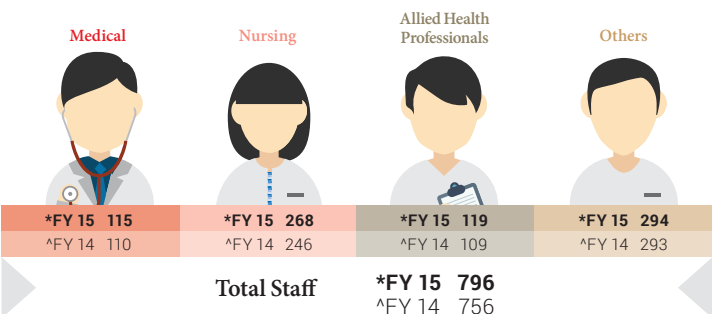


	Year ended 31 Mar 2016	Year ended 31 Mar 2015
<b>Size</b>		
Beds (as at end Mar)	185	185
<b>Workload per annum</b>		
Bed Occupancy Rate	71.4%	69.5%
Inpatients	9,063	8,957
Total Patient Days	48,313	46,929
Average Length of Stay (days)	5.3	5.2
Day Surgeries	1,967	962
Inpatient Surgeries	5,496	5,838
Specialist Outpatient Clinic Attendances	121,597	120,024

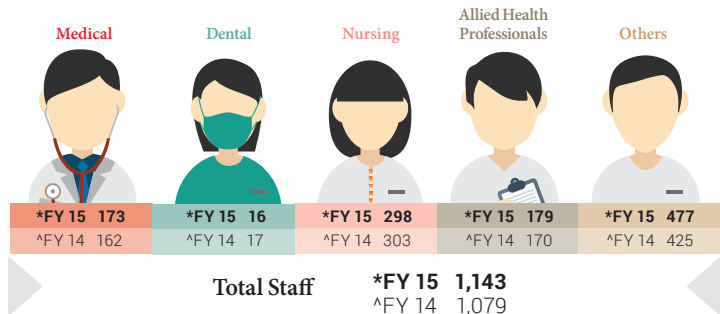
\*Year ended 31 Mar 2016  
^Year ended 31 Mar 2015



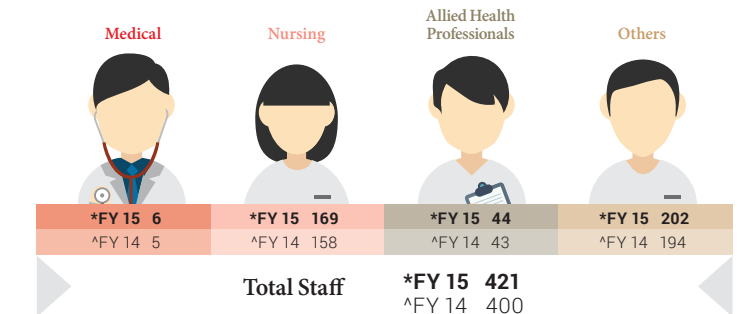
	Year ended 31 Mar 2016	Year ended 31 Mar 2015
<b>Workload per annum</b>		
Specialist Outpatient Clinic Attendances	44,699	41,735



	Year ended 31 Mar 2016	Year ended 31 Mar 2015
<b>Workload per annum</b>		
Day Surgeries	37,571	34,724
Specialist Outpatient Clinic Attendances	316,655	306,065



	Year ended 31 Mar 2016	Year ended 31 Mar 2015
<b>Workload per annum</b>		
Polyclinic Attendances	1,786,933	1,719,896
Dental Attendances	46,739	42,541
Dental Procedures	125,972	104,972



	Year ended 31 Mar 2016	Year ended 31 Mar 2015
<b>Size</b>		
Beds (as at end Mar)	318	318
<b>Workload per annum</b>		
Bed Occupancy Rate	82%	82%
Inpatients	1,857	1,497
Total Patient Days	78,040	80,741

