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Behind the Scenes PHARMACY @NCIS

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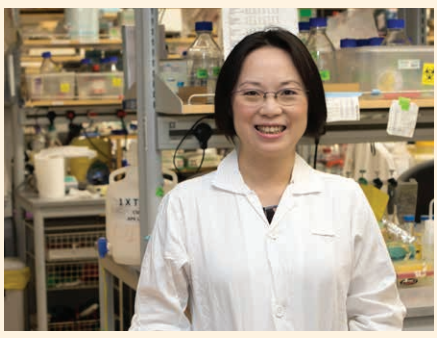


EDITOR'S NOTE

Dear friends and colleagues,

We are now mid-way through 2017 and SPARK, a biannual magazine by the National University Cancer Institute, Singapore (NCIS) is now in its fourth publication. In this issue, we go behind-the-scenes at the Pharmacy@NCIS, one of the key services of the NCIS. It serves all outpatients at the Cancer Centre as well as patients who have been warded in the National University Hospital (NUH), including both adult and paediatric haematology-oncology patients, blood and marrow transplant patients, patients on clinical trials at the NCIS and also patients suffering from rheumatology and renal diseases who require immunosuppressant therapy.

In this issue, we also introduce a new section, "CSI Showcase", which will highlight research teams and their work at the Cancer Science Institute (CSI) of Singapore in the National University of Singapore (NUS). The CSI is dedicated to investigating the pathogenesis of cancer and creating innovative, safer methods of diagnosis and treatment. Many of us at the NCIS work closely with researchers at the CSI, and some of us even have labs there. The collaborative efforts between the NCIS and CSI truly embrace the term, "from bench-to-bedside."

Continuing on the research front, our Radiation Oncology team looks into heart shielding for radiation in left breast cancer and we also gain insight into the Asian Myeloma Network, a collaborative platform for myeloma research in Asia, led by Centre Director of the NCIS, Professor Chng Wee Joo.

One of the unique aspects of the NCIS is that we are the only cancer centre in Singapore providing treatment and care for both adult and paediatric patients with cancer. We have an active Division of Paediatric Haematology-Oncology and in this issue, we look into the training and life of a Paediatric Oncology Fellow at the NCIS.

Although we are mid-way through 2017, there are many more exciting events and updates planned for the second half of 2017 within the NCIS and with our community and institutional partners. More importantly, the NCIS celebrates its 10-year anniversary in 2018 so, save the date!

Dr Chee Cheng Ean
Consultant
Chief Medical Editor

FEATURE STORY

Behind the Scenes
PHARMACY @NCIS

There are many unsung heroes at the NCIS. One such team is our Pharmacy@NCIS, which works quietly in the background to support the medication needs of our cancer patients. This feature talks about their work and the challenges they face.

What do we do?

The Pharmacy@NCIS is located on Level 9 of the National University Hospital (NUH) Medical Centre, conveniently positioned next to the Chemotherapy Centre. It is made up of a team of oncology pharmacists, pharmacy technicians and senior pharmacy assistants. Together, we serve the medication needs of our patients with cancer who receive care at the National University Cancer Institute, Singapore (NCIS)'s Cancer Centre, VIVA-University Children's Cancer Centre and inpatient wards.

Our vision is to become a centre of excellence for oncology pharmacy practice as well as in the training and education of oncology pharmacists and pharmacy technicians.

At the Pharmacy@NCIS, there are dozens of systems and processes in place to ensure that our patients receive their medicine in a safe and efficient manner.

THE DRUG MAKING PROCESS

1 ***5 mins***
Drug order is received and transcribed into the system

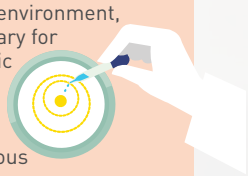
2 ***12 mins***
Drug order is reviewed by two pharmacists to ensure accuracy and appropriateness of the treatment

3 ***2 mins***
Drug order charges are billed in the system

4A ***1 min***
Pre-medications are packed and sent to the patient in the infusion bay

4B ***2 mins***
Cytotoxic drugs are packed and sent to the cleanroom to be prepared

5 ***15-20 mins*** *(but can take up to an hour depending on the level of complexity)*
Drugs are prepared in the cleanroom, which is a sterile environment, necessary for cytotoxic drugs which are hazardous



6 ***5 mins***
Quality checks are performed on the drugs and ambulatory devices before they are sent to the patient at the chemotherapy centre

The above timeline is an estimate and does not include activities such as clinical discussions with doctors, attending to queries or other activities that punctuate the entire process.

Our day-to-day operations

Dispensing is often the face of any pharmacy and remains an essential function of it. Our pharmacy technicians ensure that the correct medications are picked and packed according to prescriptions. Our pharmacists draw on a huge reservoir of clinical knowledge to ensure that the medications prescribed are the right dose, for the right indication and are devoid of any harmful interactions. They also provide advice on medicine administration, side-effects and answer medication-related queries from patients and caregivers. Detailed counselling is provided for patients on their first-cycle of chemotherapy, with emphasis on side effects, symptoms management and other supportive care issues.

Our pharmacy team is responsible for ensuring that chemotherapy and other supportive therapy orders are appropriate for our patients. This includes reviews of the patient's clinical laboratory parameters, medication history along with careful evaluation of medication properties. The pharmacy handles chemotherapy orders for all outpatient and inpatient patients with cancer. It is also responsible for cytotoxic drug orders for patients in the NUH with non-cancer diagnoses.

The Pharmacy@NCIS is the only site for the compounding and preparation of cytotoxic agents in the NUH. This is an arduous, highly laborious and infrastructure-intensive process requiring specialised facilities and highly-skilled operators.

Oncology Pharmacy - Beyond compounding and dispensing

Our Oncology Pharmacy on-call team is on standby 24/7 to attend to any oncology-related queries. The team is also equipped to be activated on the ground should there be a need for emergency cytotoxic drug preparation or direct intervention and troubleshooting.

Apart from these, our oncology pharmacists are also involved in a plethora of projects and responsibilities that span the length and breadth of healthcare delivery, technology and innovation.

Head to the end of this feature to read more about what some of our staff are involved in!

Convenience for our patients

The Pharmacy@NCIS also has plans to reach patients outside of the hospital boundaries as increasingly, with more research and innovation, treatments, transactions and information can be facilitated off-site as opposed to solely in the pharmacy premises. In partnership with the NCIS Home Care team and as part of the "NCIS on the Go" programme*, more treatments can be delivered to patients outside of hospital grounds. The pharmacy is involved in reviewing all drug orders and ensures the accuracy and timely delivery of products. We also work closely with a multi-disciplinary team of healthcare professionals to expand the list of medicines that can be supplied through this programme.

World-class facility

An aspiring world-class institute like the NCIS deserves a world-class oncology pharmacy as one of its key pillars. Pharmacists, pharmacy technicians and pharmacy assistants here at the Pharmacy@NCIS will not stop striving to make that a reality.

*Please visit www.ncis.com.sg for more information about this programme.

READ MORE ABOUT OUR DAY-TO-DAY TASKS AND SPECIAL PROJECTS

Compounding chemotherapy drugs

As part of the team at the Pharmacy@NCIS, I am responsible for the compounding of chemotherapy drugs and other cytotoxic agents for our patients. A combination of rigorous training in aseptic preparation, safe-handling and cleanroom maintenance allows me to ensure that our patients receive safe and quality medicine. Appropriate medication storage information and administration guidelines are provided to our nursing colleagues for each and every preparation that leaves the pharmacy.

- Mr Willie Chong Wei Yi, Pharmacy Assistant Supervisor

Frontline of clinical trials

I am part of the team handling close to a hundred clinical trials at the Pharmacy@NCIS. Our daily tasks include the packing and dispensing of investigational products (i.e. the drug or medication being tested in the trial). We hold pre-site initiation meetings to resolve any issues before the site is selected. At study initiation meetings, we work with the study team to establish the workflow and conduct trainings for other pharmacists. Essentially, we aim for dispensing errors and protocol deviations to be kept to a minimum by implementing a system-oriented approach.

- Ms Foo Mi Chelle, Senior Pharmacist (Clinical)

From market to formulary

The Pharmacy and Therapeutics (P&T) Committee is responsible for an institution's formulary (a list of all the medications available in the hospital). A sub-committee at the Pharmacy@NCIS was formed to focus on haematology/oncology. In addition to managing the formulary, it looks into various reports, practice trends, and other factors surrounding the effective, safe, and cost-efficient use of medications. We create summary monographs to give voting members an unbiased understanding of the proposed medications.

- Dr Patrick Thomas Wong, Principal Pharmacist (Clinical)

Eye on the future

Technology is at the core of any big pharmacy operation and the Pharmacy@NCIS is continually pushing the boundaries of technology applications. In the last couple of years, the CIMR or (Cytotoxic Immunosuppressive Medication Record) has been rolled-out, largely replacing the dated practice of handwritten orders. As our technology team continues to enhance the CIMR's capabilities, they concurrently develop interfaces between the CIMR and future developments such as bar-coded medication vials and automated compounding.

- Mr Robin Lee Jia Guang, Pharmacist

Improving patient convenience the smart way

The NUH myMed application is a game changer and it helps patients take ownership of their medications. The Pharmacy@NCIS will process partially collected orders that are sent in advance by patients via the app or email. Pharmacists will review the orders and ensure appropriate checks are done before medication collection. Patients can either collect their medications in person at the pharmacy or opt to receive it at home for a nominal fee. Apart from contributing significantly to patients' convenience and shorter waiting times at the pharmacy, the application also reminds them to take their medications.

- Ms Chong Zai Qin, Pharmacist

EDUCATION AND TRAINING

Our pharmacy staff are our resource. We invest heavily in the training and development of our pharmacists and pharmacy technicians. It is essential to equip our people with the right skill sets and knowledge to best serve our patients.

The Clinical Pharmacist Preparatory Programme (CPPP) is a platform that provides evidence-based, patient-centred medication therapy management training with inter-disciplinary teams. The programme has allowed me to work and learn with pharmacists who specialise in a myriad of disciplines. The CPPP has further strengthened and broadened my clinical foundation.

- Mr Lee Huwai Ern, Pharmacist

The Certified Pharmacy Technician Course (CPTC) provided me with a strong foundation in the essentials of pharmacology, aseptic preparation, and oncology practice. It has also equipped me with tools to take on supervisory roles. The educational experience has taught me how to operate in synergy with the pharmacists so that we can together achieve better outcomes for our patients.

- Ms Jastina Osman, Pharmacy Technician 1

The Ministry of Health National Pharmacy Residency Programme provides the opportunity for me to learn from skilled preceptors and a wide array of clinical mentors who are equipped with a wealth of specialist knowledge and experience. The various rotations have immersed me in diverse patient care settings and empowered me to achieve a higher level of professional and clinical competence.

- Mr Chan Zhi Yao, Senior Pharmacist

Article by
Ms Lim Siew Woon
Head, Division of Pharmacy Oncology, NCIS

Ms Lim Siew Woon received her undergraduate pharmacy degree from the National University of Singapore (NUS) followed by her postgraduate Masters of Science degree in clinical pharmacy from the Queen's University of Belfast, UK. She successfully met the requirements for certification with the Board of Pharmaceutical Specialties (USA) as an Oncology Pharmacy Specialist. Upon completion of a 12-month oncology pharmacy training at the Johns Hopkins Hospital, Baltimore, USA, she returned to Singapore and successfully obtained her certificate of specialist registration in oncology pharmacy. Siew Woon is a consultant pharmacist with the Pharmacy Department at the National University Hospital and heads the Pharmacy@NCIS. As the Programme Director of Pharmacy Residency Post-graduate Year 1 (PGY1), she also holds an adjunct assistant professorship position at the Department of Pharmacy, NUS. Her clinical interests lie in blood and marrow transplantation and supportive care management in oncology. Her other pharmacy areas of interest include pharmacy education, pharmacy automation and medication safety in oncology.

and

Mr Aaron Jason Martin
Pharmacist, Pharmacy@NCIS

Mr Aaron Jason Martin graduated from the NUS with a bachelor's degree (Honours) in Pharmacy under the National University Health System (NUHS) Pharmacy scholarship. Upon graduation, he completed his pre-registration training at the National University Hospital (NUH). Following his registration with the Singapore Pharmacy Council, he joined NUH and is currently a practising pharmacist with the National University Cancer Institute, Singapore (NCIS). He has a keen interest in clinical innovation, informatics and the optimisation of healthcare systems to improve accessibility, safety and efficiency. In his free time, he can be found either engaged in some form of sporting activity or curled up with a good book.

Figure 1- Active Breathing Coordinator used for deep inspiratory breath hold. It consists of a nasal clamp, mouth bite, respiratory monitoring device and a patient controlled valve.

Cardiac Protection for Patients Undergoing LEFT BREAST RADIATION THERAPY

Breast cancer is the leading cancer amongst women in Singapore and up to 80 per cent of women will require adjuvant breast radiation therapy as part of their treatment and management of breast cancer. Interestingly enough, there is a slight preponderance (1.02-1.2 relative risk) for left-sided breast cancers based on published literature, but the cause remains unknown. Out of all patients with breast cancers, an estimated 44 per cent will have left-sided breast cancer and require radiation treatment. The laterality poses challenges for the radiation oncologist because of the heart's location (behind the left chest wall) and how radiation is delivered to the chest wall and/or breast.

Radiation to the chest wall/breast is delivered optimally through two radiation fields, one medially and one laterally, at a tangent to the ventral surface of the body. This allows all breast tissue/bed of the breast to be treated completely with minimal radiation dose to other tissues. There are two organs which will receive significant dosage, other than our intended target – the lungs, and in the case of the left-sided breast tumour, and the heart (Figure 2). The amount of treated lung is usually under five percent, and this poses minimal toxicities for the patient.

In the case of the heart, the situation is slightly more complicated. Every organ has a tolerance dose (TD) for radiation and this is defined by TD 5/5 which is the dose that will result in five per cent of problems at five years. The endpoint that was used traditionally for the heart was pericarditis, and it is not common in the doses we use for breast radiation. However, as radiation science advanced, we discovered an excess of incidence of ischemic cardiac disease due to the radiation. The additional incidence was quantified to be 7.4 per cent per additional Gray (Gy - unit for radiation) of mean cardiac dose and started from about five years post-treatment with no apparent threshold. The Early Breast Cancer Trialist Group also concluded that the relative risk was 1.7 times at 15 years for a patient who had adjuvant radiation therapy for left breast cancer compared to right breast cancer. However, this additional incidence of ischemic cardiac disease did not increase the mortality rates of patients.

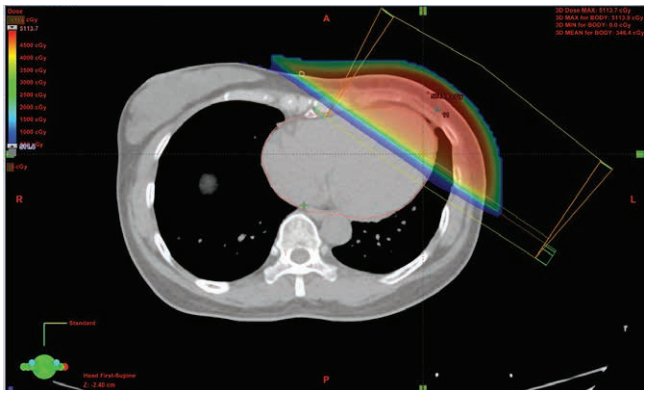


Figure 2 - Dosimetric plan for a left-sided breast cancer radiation treatment. Note the close apposition of the heart to the chest wall and the large amount of heart in the radiation fields.

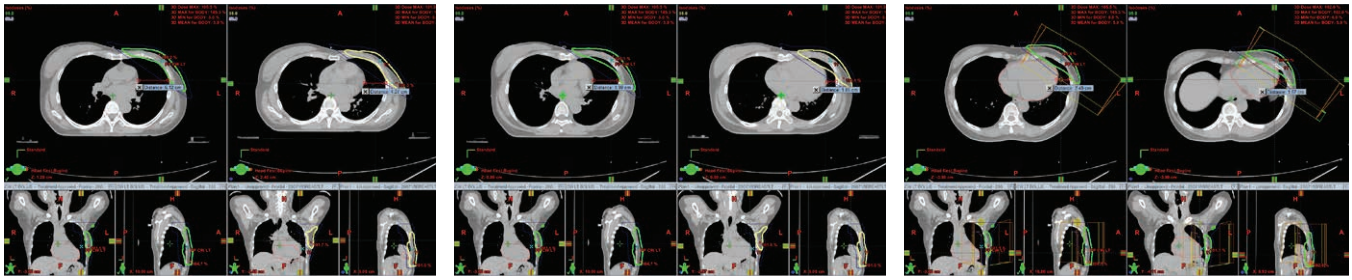


Figure 3 - Dosimetric plans to demonstrate the reduction in cardiac doses at similar CT cuts through the chest wall for DIBH (left-sided images) vs free-breathing (right-sided images) patients with left breast cancer.

As breast oncologists, we feel that any dose, however minimal, to the heart is too much. As part of the solution to this aspect of breast treatment, the Department of Radiation Oncology at the National University Cancer Institute, Singapore (NCIS), has invested in an Active Breathing Coordinator (ABC) which is a patient-controlled, ventilation control tool to achieve deep inspiratory breath hold (DIBH). Simply put, the tool features a clamp that is applied to the nostril, and a mouthpiece over which the patient has to form a seal with her mouth. This mouthpiece is connected to a respiratory monitoring device which detects the respiratory phase and has a valve which is controlled by the patient via a hand-held device (Figure 1). The patient is coached to breathe regularly and when she is in full inspiration, to activate the device which blocks the valve and prevents expiration. The idea is to treat the chest wall/breast with the patient in full inspiration reliably, as when one is in full inspiration, the chest wall is furthest from the heart.

The mean dose reduction with the use of the ABC (or deep inspiratory breast hold, DIBH) is well published showing dosimetric benefits with regards to cardiac mean doses. One publication demonstrated an almost 50 per cent reduction in mean cardiac dose from 5.9Gy to 3Gy. Our data supports a similar amount of benefit for most patients.

Since we introduced this new technique in 2014, we have since treated about 300 patients with left-sided breast cancers (Figure 3). There was a steep learning curve with this technique, and it also increased the mean time on the CT simulator from 23 minutes (for a right breast cancer simulation), to 103 minutes. We performed a comprehensive permanent improvement plan (CPIP) to address the time challenges with the technique and as a result, have reduced mean time on the simulator by 50 per cent. On analysing the results of the CPIP with the breast team and the Head of Department, a decision was made last year to purchase more equipment to allow us to make ABC the standard of care for all patients with left-sided breast cancer undergoing radiation treatment at the NCIS.

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and

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Dr Choo Bok Ai obtained his medical degree from the University of Aberdeen in the United Kingdom. He completed his internal medicine and advanced specialist training in clinical oncology in the UK and hold postgraduate qualifications from the Royal College of Physicians (MRCP) and the Royal College of Radiologists (FRCR). He was awarded the Certificate of Completion of Specialist Training in Birmingham, United Kingdom.

THE ASIAN MYELOMA NETWORK

A Platform for Collaborative Research on Myeloma Centred on Asia

Multiple myeloma is a type of bone marrow cancer resulting from the expansion of clonal post-germinal centre B-cells. It is the second most common blood cancer in the world and results in a significant burden on the patient's health due to the rising prevalence resulting from better diagnosis, better treatment with longer survival for the patient and the high cost of treatment.

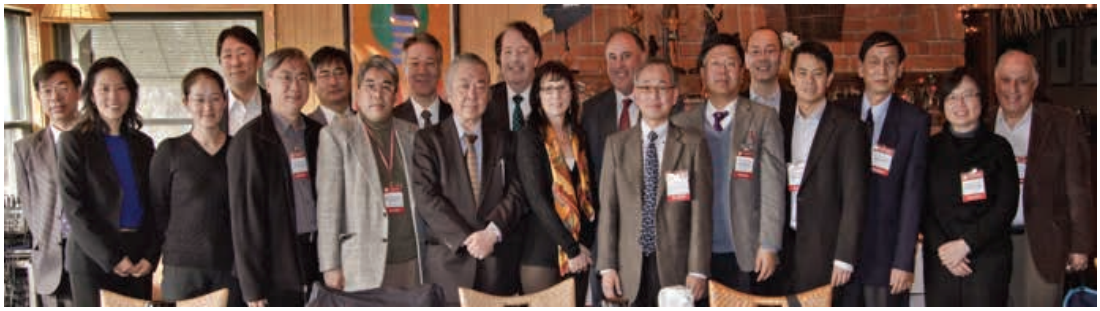
At the centre of tremendous progress in the last 10 years has been the success of drug development in myeloma with close to 10 new drugs approved during this time. This has more than doubled the survival of myeloma patients from an average of approximately four years to approximately 10 years now. However, these advances present a number of problems to practising physicians in Asia.

1) These new drugs are extremely costly. The cost of treatment per month ranges from S$5,000 to S$10,000.
2) Access to drugs is a challenge. The drugs are usually available only after a number of years after approval in the United States (US) and Europe. Even when it is available, it is very expensive and hence not affordable to the majority of patients.
3) With the large variety of therapeutic choices, the treatment of myeloma is becoming complex. Therefore it is necessary and important, that physicians are constantly updated and educated on the various options of treatment.
4) The resources available to different countries in Asia are highly varied. Often, recommendations from the West are not practical and irrelevant to many Asian countries.
5) Most of the large trials that led to the approval of these new drugs included few Asian patients. It is often unclear if these drugs can cause unique side effects in Asian patients.
6) Most of the drug combinations tested in the US or Europe utilise combinations that include two or more of these expensive novel agents. These combinations are almost impossible to deliver in Asia due to the exorbitant cost. As a result, we need to have more data on combinations that are more feasible for Asia.

Based on the above, it is clear that we need a platform in Asia to do the following:

1) Provide early access to promising novel drugs at no cost.
2) Study drug combinations that are relevant to Asia and also provide safety data pertaining to Asians using these new drugs and combinations.
3) Educate physicians.
4) Provide guidelines and expert opinions on myeloma management that cater for countries with different resources.
5) Study unique features of myeloma in Asia.

It is with the above in mind that the Asian Myeloma Network (AMN) was established in 2011, after a meeting in Singapore. It was formed under the auspices of the International Myeloma Foundation and involves key opinion leaders from China, Japan, South Korea, Singapore, Taiwan, Hong Kong and Thailand.



Picture taken at the inaugural AMN meeting.

Our first project was to study the clinical spectrum of myeloma in Asia. This study shows that essentially, the characteristics of myeloma in Asia are the same as in the West[1]. However, the incidence of myeloma is significantly lower than those in the West. This suggests that factors relating to genetics may perhaps be protecting Asians. A genetic study to identify such factors will be initiated by the AMN this year.

Next, we published a guideline that proposes optimal management of myeloma based on available resources[2]. This is a unique guideline that is very useful in Asia due to the wide heterogeneity in the social economic status of the different countries. This guideline will be updated this year to take into account the new developments in myeloma diagnosis, prognosis and treatment.

The education of physicians was led by colleagues from China and will be expanded into the Inaugural Asian Myeloma Workshop this year.

The most challenging project, the setting-up of an Asian trial network for myeloma, was led by Professor Chng Wee Joo, Director of the National University Cancer Institute, Singapore (NCIS). The AMN initiated its first trial in December 2014 and completed the recruitment of 136 patients in February 2017. An interim report of this trial, utilising pomalidomide and dexamethasone, in relapsed myeloma, was recently presented in December 2016 at the American Society of Hematology Annual Meeting. This trial allowed 136 patients in Asia to get early access to pomalidomide for free, and about 50 per cent of the patients, who did not have effective treatment options, responded to the treatment and survived way beyond what was expected with no significant toxicity. As a result of this success, other pharmaceutical companies have approached the AMN to conduct other clinical trials. Indeed, six more trials will be initiated in the coming one to two years (Table 1).

For more information on the AMN, please visit:
http://bit.ly/asianmyelomanetwork

Code	Regimen	New/ Relapse	Numbers	Remarks
AMN002	KTD	Relapse	50	ALLG Collab
AMN003	PCD vs PD	Relapse	60 ea arm	
AMN004	Dara-TD	Relapse	100	
AMN005	Dara-VD	New NTE	60	
AMN006	Duvulumab - PCD	Relapse	40	Collab with Australia

Table 1 - Upcoming AMN Trials.

Legend:
K = Carfilzomib, **T** = Thalidomide, **D** = Dexamethasone,
P = Pomalidomide, **C** = Cyclophosphamide,
Dara = Daratumumab, **V** = Velcade,
NTE = Non-transplant Eligible,
ALLG = Australasian Leukaemia and Lymphoma Group

Article by
Prof Chng Wee Joo
Director & Senior Consultant, NCIS

Prof Chng obtained his medical degree from the University of Leeds, and did his internal medicine residency in the United Kingdom. His fellowship training in haematology was completed in Singapore before he obtained an A*STAR international fellowship in 2004 for a research fellowship at the Mayo Clinic, in multiple myeloma genetics. His current research is very translational and involves the use of high-resolution global genomic techniques to understand biology, identify drug targets, understand drug resistance and improve disease prognosis in haematological malignancies, with the ultimate aim of improving patient outcomes and personalising treatment.

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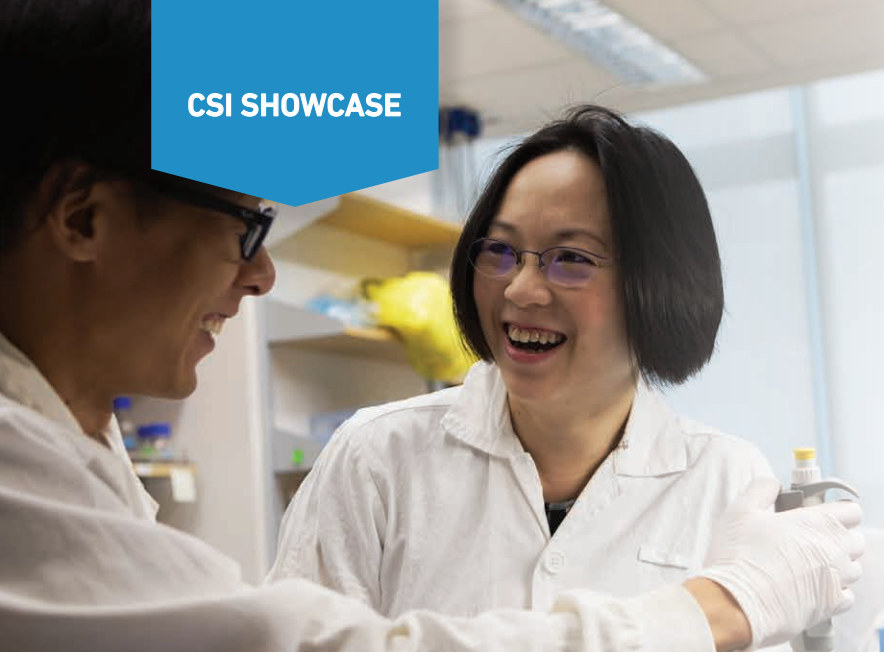

OVARIAN CANCER RESEARCH

Molecular Subtype Specific Management for Ovarian Cancer

Diagnostic Stratification and Novel Therapeutic Targets

Principal Investigator: **Dr Ruby Huang Yun-Ju**

Epithelial Ovarian Cancer (EOC) is the most lethal gynaecological malignancy in the world. In Singapore, EOC is the fifth most common cancer in women and carries the highest mortality rate among gynaecological cancers. From three longitudinal registries of EOC patients during the period from 1980 to 2004, the overall survival rate of EOC patients in the United States, Australia, and Canada has not improved and remained unchanged. This stagnation of the overall survival outcomes of EOC patients can be attributed to the lack of better strategies in overcoming chemotherapy resistance and the slow innovation in targeted and personalised therapeutics for high-risk EOC patients. Therefore, there is an urgent need to develop better therapeutic strategies to improve the disease outcome. EOC, in particular, high-grade serous carcinoma (HGSC), has been shown to exhibit diverse molecular heterogeneity based on gene expression profiling by the Australian and the TCGA cohorts. This molecular heterogeneity has been demonstrated to be very robust and reproducible by a large-scale meta-analysis study consisting of 1,538 samples from our group. At least five distinct gene-expression based molecular subtypes (GEMS) of EOC have been identified. The C1 and C5 subtype from the Australian dataset corresponds to the Mesenchymal and Proliferative subtype from the TCGA dataset and the Mes and Stem-A subtype from the 1,538 meta-analysis dataset. These GEMS have been correlated with patient survival. The C1/Mesenchymal/Mes and C5/Proliferative/Stem-A GEMS are associated with poorer survival outcomes. These GEMS may also be relevant to therapeutic stratification such as anti-angiogenesis or anti-microtubule agents.

The vision of my group is to set up a translational programme with the aim of developing molecular subtype specific therapeutic strategies for EOC patients. To achieve this vision, the goal is to establish pre-clinical pipelines for the development of novel therapeutic targets to particular molecular subtypes, C1/Mesenchymal/Mes and C5/Proliferative/Stem-A. To date, we have identified relevant pathways that could be targeted as therapeutic options for these two GEMS. AXL, a receptor tyrosine kinase, is the therapeutic conduit for the C1/Mesenchymal/Mes subtype. C5/Proliferative/Stem-A subtype displays preferential chemotherapy sensitivity towards microtubule depolymerising agents such as vincristine and vinorelbine.

Through a collaboration with Dr David Tan, a consultant at the National University Cancer Institute, Singapore (NCIS), specialising in gynaecologic cancers, we have further brought this concept into reality by designing an international multicentre Phase II single arm clinical trial. This trial will stratify EOC patients who are resistant to the platinum-based chemotherapy by testing their archival tumour samples for the GEMS features. Patients being subtyped as C5/Proliferative/Stem-A will be enrolled into the trial for the treatment of oral vinorelbine.

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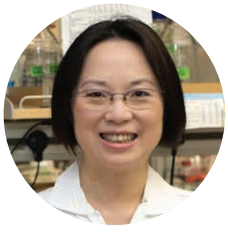

Dr Ruby Huang Yun-Ju
Principal Investigator
Cancer Science Institute of Singapore

Dr Ruby Huang is a clinician scientist in the Department of Obstetrics & Gynaecology at the NUH and also a Principal Investigator at the Cancer Science Institute of Singapore (CSI Singapore) in NUS, where she leads a team focusing on research in the roles of Epithelial-Mesenchymal Transition (EMT) in gynaecological cancers, particularly ovarian cancer. The overall aim of her research is to develop novel therapeutics for ovarian cancer through a better understanding of the specific driving mechanisms for each molecular subtype.

SPECIAL FEATURE

AN IN-DEPTH LOOK INTO TREATING HEAD & NECK CANCERS

A World Head & Neck Day Special

Cancer in the head and neck region constitutes about 10 per cent of all cancers in Singapore. At the National University Cancer Institute, Singapore (NCIS), the most commonly seen head and neck cancer is nasopharyngeal carcinoma (NPC). The other common head and neck cancers are thyroid, oral cavity and laryngeal cancers (Table 1).

NUMBER OF CASES 1998 - 2007 BY SITES

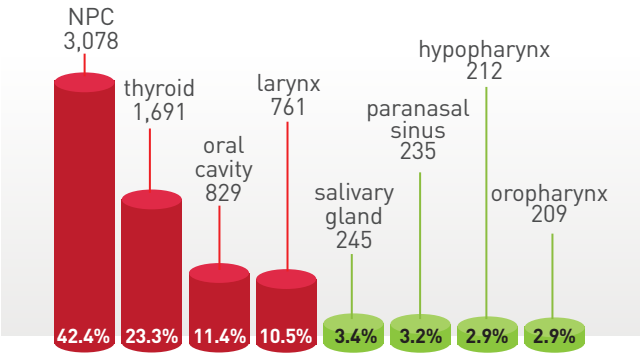

Table 1 - Frequency of head and neck cancers in Singapore. (Singapore Cancer Registry data, consolidated by A/Prof Thomas Loh)

OROPHARYNGEAL CANCER

Surgical Advancements through Trans-Oral Robotic Surgery

Oropharyngeal cancers are becoming increasingly more common. This may in part be due to the human papillomavirus (HPV) associations. It usually consists of the sub-sites of tonsils and the base of the tongue (Figure 1). Treatment of these areas is often associated with significant morbidity, especially if the tumours are large. Regardless of whether treatment is by radiation (RT), combined chemotherapy-RT, or by surgery, the risks to impaired speech and swallowing can be significant. If surgery is performed, it often requires an open approach such as a mandibulotomy, which requires the splitting of the jaw bone. Free flaps or pedicled flaps are required to cover the defects. The patient therefore undergoes a major operation.

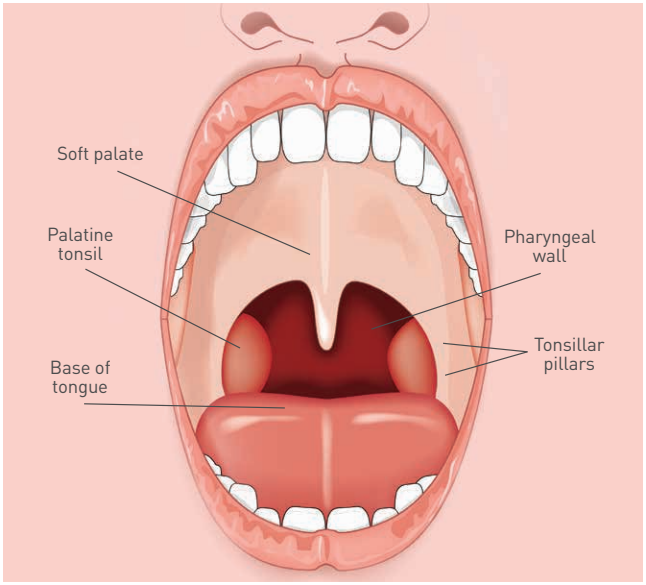

Figure 1 – Diagram illustrating the mouth and jaw area.

More recently, we have approached these tumours using trans-oral robotic surgery. Previously, the major difficulties of accessing the tumour trans-orally was the inability to dissect around the three-dimensional planes. With the robot, we are able to operate with a three-dimensional view and achieve maximal dexterity with the wristed actions despite the confined space.

Advantages of trans-oral robotic surgery for oropharynx tumours
Efficacious, likely to be greater than 90 per cent five-year overall survival for T1 lesions (early stage cancers)
Length of stay in hospital shorter than mandibulotomy free flap approaches
Risk of impaired swallowing is reduced
Tumour recurrence may be treated with further RT or another trans-oral surgery

Advantages of trans-oral laser surgery for laryngeal tumours
Efficacious, likely to be greater than 90 per cent five year overall survival for T1 lesions (early stage cancers)
Short hospitalisation stay of one to two days
Swallowing often not impaired
Tumour recurrences may be treated by further RT or another trans-oral laser surgery

LARYNGEAL CANCER

New Developments with Trans-Oral Laser Surgery

Laryngeal cancers are the fourth most common cancers of the head and neck in the NCIS. The majority of these cancers occur in the vocal cords (Figure 2). The ideal management of these cancers involve elimination of the tumour with preservation of laryngeal functions – namely breathing, speaking and protection of the airway while swallowing.

Laser laryngeal microsurgery has been described as early as in the 1970s. Over the past 20 years, further development in laser and microscope technology has allowed controlled application of laser via the mouth. With a magnified view, pinpoint precision and excellent haemostasis, transoral laser surgery has quickly superseded previous open partial laryngectomy approaches. In the vast majority of patients, this translates to lesser morbidity, short hospitalisation and improved voice outcomes compared to traditional surgical approaches.

Figure 2 - Largyngeal carcinoma - Left glottic squamous cell carcinoma.

Article by
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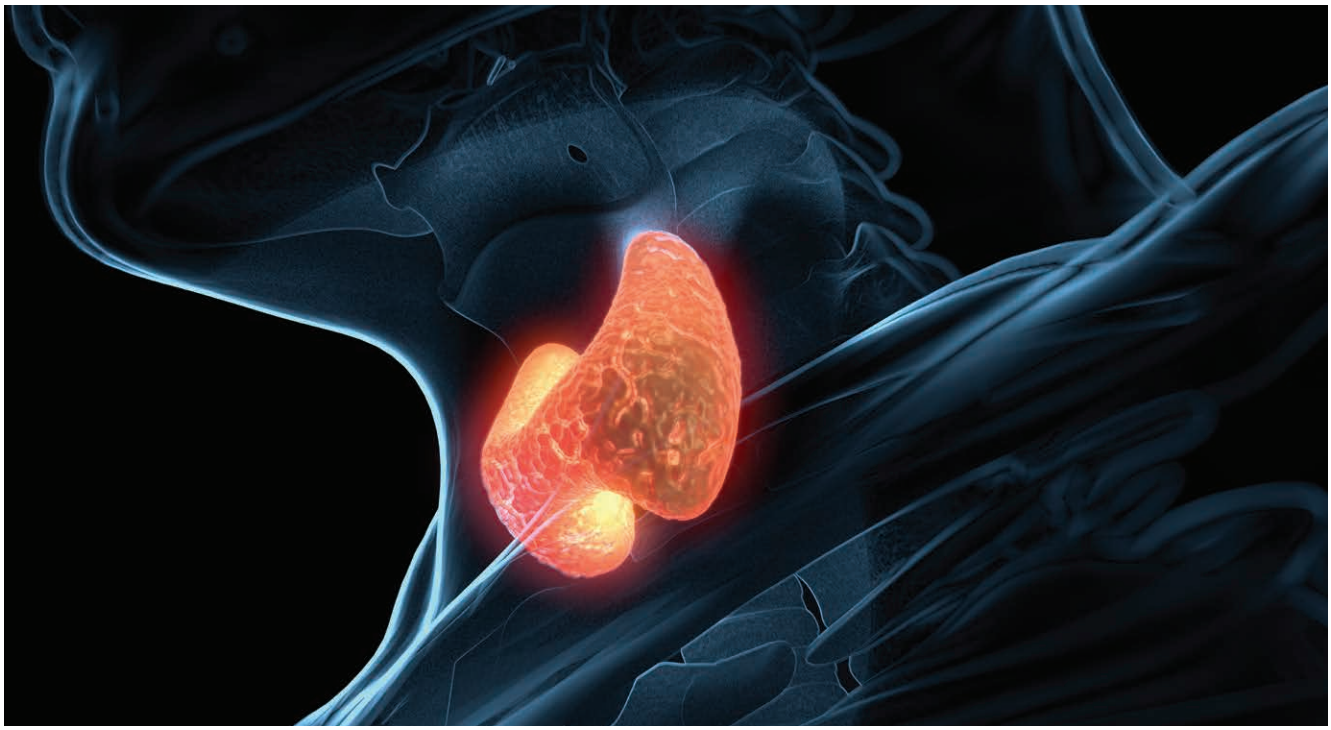
Senior Resident
Department of Otolaryngology - Head & Neck Surgery, NUH

Dr Donovan Eu graduated from the School of Medicine, NUS. He is a Senior Resident with the Department of Otolaryngology - Head & Neck Surgery at the NUH. He has just completed his residency and aims to pursue head and neck surgical oncology.

and

A/Prof Thomas Loh
Deputy Director (Clinical) and Senior Consultant
Division of Surgical Oncology (Head & Neck Surgery), NCIS

A/Prof Thomas Loh graduated from the Faculty of Medicine, NUS. He underwent residency in Otolaryngology at the NUH and subsequently trained in Head and Neck Cancer Surgery at the Princess Margaret Hospital and Toronto General Hospital in Canada. A/Prof Loh's practice is concentrated only on patients with head and neck cancers. He performs surgery of the thyroid gland, parotid/salivary glands and other major complicated surgery to treat cancers of the oral cavity, pharynx and larynx. He also treats cancer of the larynx using laser surgery. He also performs highly complicated surgery for tumours of the anterior skull base, or tumours at the junction just below the brain.



THYROID CANCER

A Treatment Update for Doctors

The 2015 American Thyroid Association (ATA) thyroid cancer guidelines have recommended a paradigm shift in the extent of thyroid surgery for selected patients, modified risk stratification for recurrence, selective use of radioactive iodine therapy, surveillance of the disease, and the role of systemic therapy in the management of the radioiodine-refractory progressive disease.

The surgical option of either total thyroidectomy or lobectomy has been expanded to include thyroid cancer between one centimetre (cm) and four cm in size, without extra-thyroidal extension or clinically apparent lymph node metastases, in addition to thyroid cancers smaller than one cm. The basis for this recommendation is the similar survival and recurrence rates reported in several studies, and the higher surgical complication rates reported with more extensive surgery.

The 2015 modified initial risk stratification after surgery, to estimate the risk of recurrence, has taken into account the risk associated with specific thyroid cancer histology, multifocality, genotype, the extent of vascular invasion, and the extent of metastatic lymph node involvement (Figure 1). This highlights the importance of having pertinent details in histology reports including the number of lymph nodes involved, the size of largest metastatic focus in involved lymph node, the number of vascular invasion foci in follicular thyroid cancer, and whether follicular variant papillary thyroid cancer is encapsulated or infiltrative. Ongoing evaluation changes the risk stratification and guides the intensity/ frequency of surveillance for disease, and the degree of TSH (thyroid stimulating hormone) suppression.

The 2015 ATA guidelines continue to recommend selective use of radioactive iodine (RAI) therapy in patients with thyroid cancer one to four cm in size, only in the setting of aggressive histology or vascular invasion. The recommended dose of I-131 for remnant ablation has been shifted from "30-100mCi" to "30mCi" for T3 disease (size more than four cm or with minimal extra-thyroidal extension). In the presence of cervical lymph node metastases, "30-150mCi" of I-131 therapy can be administered depending on the extent of lymph node disease and associated tumour histological features; lower doses are recommended without extensive lymph node metastases. In the setting of T4 disease (gross extrathyroidal extension) or distant metastases, the recommended I-131 dose remains at 100-200mCi. However, if the patient is elderly or has renal impairment, I-131 dose of 100-150mCi should be considered.

There have been numerous clinical trials evaluating the treatment response of radioiodine refractory progressive metastatic thyroid cancer to systemic therapies. The two FDA-approved tyrosine kinase inhibitors that have shown progression-free survival (PFS) benefits are sorafenib and lenvatinib with PFS of 10.8 months and 18.3 months respectively.

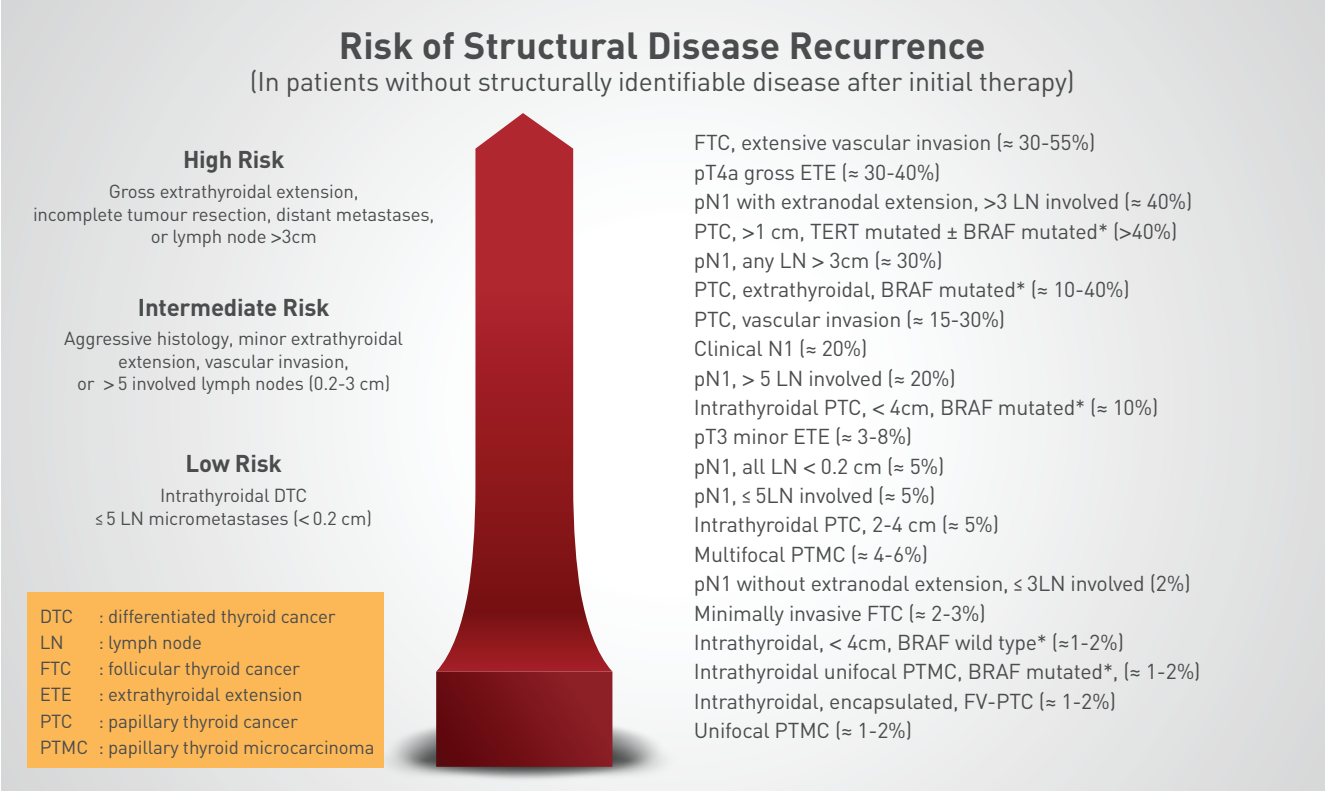


Figure 1 - Risk of structural disease recurrence in thyroid cancer patients after initial therapy (1).

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Article by
Dr Samantha Yang
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Dr Yang obtained her medical degrees from the National University of Singapore (MBBS), the Royal College of Physicians, United Kingdom and the Masters of Medicine (S'pore). She later completed her advanced specialist training in Endocrinology at the NUH. She then completed a fellowship at the Memorial Sloan Kettering Cancer Centre in New York where she was involved in clinical research and clinical work pertaining to thyroid nodule and thyroid cancer.

Her interests are in the evaluation of patients with thyroid nodules and the treatment of thyroid cancer patients. She is involved in genetic studies for the evaluation of patients with thyroid nodules. She also has a keen interest in the treatment of metabolic bone disease.

NASOPHARYNGEAL CANCER

Improving Outcomes through Radiation Therapy

Nasopharyngeal cancer (NPC) is an endemic cancer in Singapore, and has one of the highest survival rates amongst the common cancers here. Even patients with locally advanced Stage IV NPC can expect a survival rate of more than 80 per cent at three years. However, many of our long-term survivors can suffer from long-term side-effects such as dry mouth, poor dentition or low hormone levels. Knowing that most of our NPC patients have a good survival outcome, our challenge is to cure them without leaving them with the burden of unnecessary long-term toxicity.

Since 2006, we have adopted intensity modulated radiation therapy (IMRT) as the standard of care for our NPC patients. We have seen improved tumour control with much diminished side effect profile. Moist desquamation and skin necrosis in patients have become a rarity because the dose painting in IMRT allows for the skin radiation dose to be reduced significantly. In the same vein, IMRT allows dose sparing to the parotid glands, allowing patients to regain saliva output and revert to a normal diet more quickly after radiation treatment.

To ensure a uniformly high quality patient experience and outcome, all our processes undergo rigorous quality assurance. We utilise image-guidance during the radiation sessions which ensures the accuracy of the radiation delivery to within 2mm.

We have also implemented a comprehensive team approach to our NPC protocol, working closely with our multidisciplinary team, including medical oncologists, dental surgeons, speech therapists, dietitians, nurses and social workers. Our NPC protocol includes a comprehensive dental clearance to reduce the risk of osteoradionecrosis (ORN) after radiation. Our patients are also reviewed by dietitians to ensure their weight loss during treatment is kept to a minimal.

Our Head and Neck team is constantly looking to further improve the supportive care of our NPC patients through upcoming clinical trials. This includes investigating the use of topical silicone based gel to further reduce rates of radiation dermatitis. Another trial aims to look at the role of L-glutamine, an amino acid to reduce rates of radiation mucositis. We are also currently looking at correlating PET/MRI with tumour signal during radiation therapy to see how we can further tailor the radiation treatment regime to tumour characteristics.

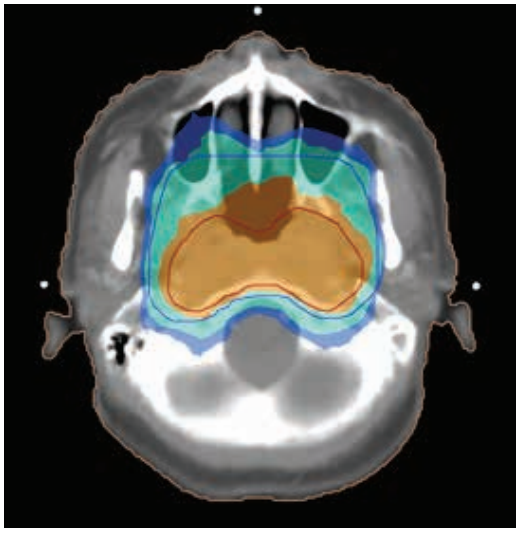

Figure 1 - An IMRT plan demonstrating dose painting where radiation dose matches tumour volume.

Article by
Dr Francis Ho
Consultant
Department of Radiation Oncology, NCIS

Dr Francis Ho's practice interests include hepatobiliary cancer, ophthalmic cancer, head and neck cancer particularly nasopharyngeal cancer, and general oncology. He is currently the radiation oncology champion for the NUH Hepatobiliary Tumour Group and the Upper Gastrointestinal Tumour Group.

Dr Ho has published scientific papers in respected peer-reviewed medical journals and has contributed a chapter on the management of nasopharyngeal cancer in an international nasopharyngeal cancer textbook. He is active in teaching radiotherapy diploma students, medical students and radiation oncology residents, and is an Assistant Professor at the Yong Loo Lin School of Medicine, NUS.

The NPC oneHeart Support Group during one of their Chinese New Year gatherings. Many support group members also make time to be a Befriender.

COPING WITH CANCER

The Befriender's Programme for NPC patients

Head and neck cancers are highly curable with radiation therapy. Despite the use of intensity modulated radiation therapy (IMRT), acute and long-term side effects of radiation therapy are common. Almost all patients will experience weight loss, acute dermatitis, mucositis and dysphagia of varying degrees.

The extent to which doctors can help in this area is limited to providing advice on treatment, side effects and lifestyle changes. As they do not have the personal experience of going through cancer, they are unable to fully understand what patients, survivors and caregivers go through.

The Befriender's Programme was created to provide cancer patients and their caregivers continuous support beyond their regular consultations and treatment in the hospital. It began in 2012 as a simple study to determine if peer-to-peer support can help to provide emotional relief and improve patients' coping strategies. NPC cancer survivors who underwent the same treatment modalities were introduced to newly diagnosed patients to provide one-to-one support in self-care, in addition to providing a listening ear. The programme starts within three weeks of the patient's first radiation treatment session, allowing survivors to help the newly diagnosed cope with the initial acute emotional stress of being diagnosed with cancer. Many of the cancer survivor volunteers work full time and take leave to meet newly diagnosed patients at the Radiation Therapy Centre where the patients undergo daily radiation. Over the last five years, this programme has received numerous positive feedback from cancer patients and caregivers.

Based on the success of the Befriender's Programme, a further clinical study will be conducted to survey the impact of peer-to-peer support in NPC patients undergoing radiation treatment with or without chemotherapy. The study is seeking grant approval at this point and will be the first study within this region to understand the impact of peer-to-peer support in cancer.

Article by
Dr Choo Bok Ai
Senior Consultant
Department of Radiation Oncology, NCIS

Dr Choo Bok Ai obtained his medical degree from the University of Aberdeen in the United Kingdom. He completed his internal medicine and advanced specialist training in clinical oncology in the UK and hold postgraduate qualifications from the Royal College of Physicians (MRCP) and the Royal College of Radiologists (FRCR). He was awarded the Certificate of Completion of Specialist Training in Birmingham, United Kingdom.

Dr Choo is passionate about the emotional well-being of his patients. He has pioneered several programmes and initiatives in this area, one of them being the Befriender's Programme. He has also helped establish and develop two cancer support groups.

TRAINING IN PAEDIATRIC ONCOLOGY

at the National University Health System

Motivation for an excellent training programme in Paediatric Oncology

"The good physician treats the disease; the great physician treats the patient who has the disease" - Sir William Osler.

It is our hope and mission to train and nurture great physicians. On this premise, we recognise that paediatricians are first to be well-grounded in the general practice before he/she is a specialist in Oncology. Emeritus Professor Wong Hock Boon (1923 to 2008), Singapore's Father of Paediatrics, role modelled this in his lifetime work as a great paediatrician and teacher; he is also the Father of Paediatric, Oncology and Bone Marrow Transplant in Singapore.

Tradition of teaching – Forging new frontiers

Between 1965 and 1970, Emeritus Professor Wong, the Founder Director of the School of Postgraduate Medical Studies (now Division of Graduate Medical Studies) at the National University of Singapore (NUS), set up the Master of Medicine Course and paved the way for the Master of Medicine Examinations.

He began a tradition of grooming local specialists to serve the nation. In the last 50 years, new frontiers continued to be forged leading to a diversity of training programmes (Table 1) designed to meet the needs of learners, locally and from the region; for undergraduates and postgraduates.

In 1999, we saw the birth of clinical fellowship in Paediatric Oncology in Singapore. We trained our first foreign medical graduate (FMG) from the Philippines, Dr Mae Concepcion Dolendo (1999 to 2003). Dr Dolendo returned to Davao, Mindanao, the Philippines in 2004 and pioneered the practice of Paediatric Oncology there, improving cure rates of childhood leukaemia from zero per cent to approximately 50 to 60 per cent.

Many others followed suit. We have since trained 11 FMGs (the Philippines, 6; Brunei, 1; Myanmar, 1; India, 3) and successfully groomed two resident physicians.

Currently, there are two clinical fellowships offered to FMGs: Paediatric Oncology and Paediatric Blood/Marrow Transplant. Since 2011, we have also established a Diploma in Paediatric Cancer Care, an extension of the clinical fellowship, offered to outstanding clinical fellows who wish to deepen their skills in the practice. In 2017, an ACGME-I affiliated senior residency programme in paediatric haematology/oncology, one of six paediatric sub-specialty training programmes (neonatology, nephrology, intensive care, gastroenterology/hepatology, cardiology), leading to a dual specialist certification in Paediatric Medicine and Paediatric Haematology-Oncology specialist accreditation was established.

For outstanding and interested residents, there are opportunities to pursue research training through the Master of Clinical Investigation (MCI), NUS and PhD programmes.

Globalisation – An amalgamation of pedagogies

As a centre of excellence, the programme attracts and manages patients from a variety of racial, ethnic, social and cultural backgrounds; other than local patients (residents), patients from these countries such as Malaysia, Indonesia, Vietnam, Philippines, India, Sri Lanka, East Timor, China, Middle East, America and the United Kingdom seek care with us. This provided great opportunities and a rich environment for teaching and learning. Clinical teachers who are experienced and adept in the knowledge of content, pedagogy and technology instruct and share experiences daily. This is especially useful for FMGs who will return to resource constrained practices in their home countries and in which strict protocol based management may serve them poorly.

Table 1: Training Programmes in Paediatric Oncology

Training Programmes (Year started)	Duration	Application eligibility	Requirements	Certification	Funding
Electives (Observership) (1999)	1 to 4 weeks	Physicians, dental surgeons, nurses, pharmacists, allied health, medical students	Testimonials, recommendations, statement of intent, others	NA	Nil
Clinical fellowships in Paediatric Oncology and Paediatric Blood/ Marrow Transplantation (1999)	1 to 2 years	Paediatricians	SMC registration	NUHS, Singapore	Available (competitive)
Diploma in Paediatric Cancer Care (Staff Registrar Scheme) (2011)	2 years	Paediatricians	SMC registration	AM and CPCH, Singapore	Available (competitive)
Senior Residency Programme in Paediatric Medicine and Paediatric Haematology/ Oncology (2017)	3 + 1 years	MMED (Paediatrics, Singapore), MRCPCH (UK)	SMC registration, RAC/ SSTC approval	SAB/ MOH, Singapore	Available (competitive)

SMC: Singapore Medical Council; NUHS: National University Health System; AM: Academy of Medicine; CPCH: College of Paediatrics and Child Health; MMED: Master of Medicine; MRCPCH Membership of the Royal College of Paediatrics and Child Health; RAC: Residency Advisory Committee; SSTC: Sub-Speciality Training Committee; SAB: Specialist Accreditation Board; MOH: Ministry of Health

Table 2: Continued Medical Education (CME) in Paediatric Oncology

Event	Timing	Duration	Participation
St Jude Viva Forum	Annual (March)	2 days	By registration
Viva-Asia Pre-Forum Workshop	Annual (March)	2 days	By registration
Viva-Asia Leukaemia Working Group	Annual (March)	1 day	Members only
Viva Asia Blood/ Marrow Transplantation (VABMT) Consortium Meeting/ School	Annual (March)	1 day	Members only
Viva-Asia Brain and Solid Tumour Working Group Meeting	Annual (March)	1 day	Members only
Viva-Asia Nursing Symposium	Annual (March)	1 day	Members only
Viva-CCF Learning Exchange	Annual (March)	Half day	By registration
South East Asia Retinoblastoma Symposium	Annual (March)	1 day	By registration
South East Asia Tumor Board on Cure4Kids platform	Weekly (Thursday)	1 hour (0900 – 1000h)	By registration
Paediatric Oncology Group (Singapore) Tumour Board	Monthly (3rd Friday)	1 hour (1230 – 1330h)	Members only
Peer Review Learning	Monthly	1 hour	Members only
Combined Leukaemia and Solid Tumour Meeting	Weekly (Wednesday)	1 hour (1500 – 1600h)	Members only
Paediatric BMT Meeting	Weekly (Friday)	1 hour (1400 – 1500h)	Members only

Quotes from alumni

"Fellowship in the National University Hospital (NUH) has equipped me to think outside the box. While uncompromising in its clinical standard of care, the flexibility given during the Fellowship allows us to truly experience a holistic and individualised programme, preparing me to tackle problems that can happen in resource-poor individuals/countries.

- Dr Mariflor S Villegas, Resident Physician, Paediatric Oncology/ BMT, NUHS

"Fellowship at the NUH 'gave me wings to fly'. This programme helped me progress and explore the new frontiers in the field of Paediatric Haematology and Oncology. Every moment that I spent in the division was a learning experience which has provided me with the skills to take better care of my patients in my country. Training at the NUH is a great experience which has a convergence of technology and Asian culture with the human touch.

- Dr Shweta Bansal, Clinical Fellowship, 2012 – 2013, India

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Article by
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Division of Paediatric Haematology-Oncology, NUH & NCIS

Associate Programme Director
Paediatric Residency, NUHS

A/Prof Tan Poh Lin is a Senior Consultant and Associate Professor in the Division of Paediatric Haematology and Oncology in the Khoo Teck Puat - National University Children's Medical Institute (KTP-NUCMI) at NUH. She attends on both the Paediatric BMT and Paediatric Haematology-Oncology services. She is currently the Medical Director in the Paediatric BMT Service which was established in 1983.

A Day in the Life of a

PAEDIATRIC ONCOLOGY FELLOW

Can you describe a typical day at work?

My typical day at work depends on whether I am posted to day care therapy or the wards.

At day care therapy, I start preparing for the day from the previous evening, by pre-ordering chemotherapy drugs, blood tests for our kids. It is common practice at our Division, to refer to "our paediatric patients" as kids/children. It is our way of making them part of our lives. In the morning, I tend to the patients listed for procedures such as intrathecal chemotherapy, bone marrow aspiration and chemotherapy by going through their medical records to understand them better. I then start performing procedures one by one and try to complete them in time.

Meanwhile, I also attend to walk-in patients, attending first to the sickest patient. When I have completed the procedures, I assist the consultants with their patients. This part of my day is especially valuable as I am able to observe and learn from the Division's experienced doctors.

If I am posted to the wards, I start my pre-rounds with the House Officers (HO) and Medical Officers (MO) at 8am, followed by rounds with the consultants. I do the scheduled procedures in the wards prior to the consultant rounds, so as to spare the kids the agony of fasting for a longer time.

In a typical day of the week on Wednesdays, I meet our medical social workers to understand our patients better, followed by participating in multi-disciplinary meetings to discuss new and difficult cases. I also attend or sometimes present at the Bone Marrow Transplant (BMT) meetings on Friday afternoons. The week then ends off with a handover to the weekend rounding team.

Was there any specific experience or patient that really affirmed your decision to work with paediatric cancer patients?

During my paediatric residency programme in India, I encountered many children with malignancies, and I referred them to the nearest cancer centre where they were taken care of by the adult cancer oncologists. The eventual outcomes of most childhood malignancies were very poor. At that time, I strongly felt that there is a need for specialised paediatric oncologists to take care of these paediatric cancer patients which prompted me to take up a fellowship in paediatric oncology, so as to be able to step up the level of care and in turn, work towards better outcomes for them.

What are some skills that you have acquired during this fellowship and how has this fellowship changed you as a doctor?

Over two years of my fellowship at the NCIS/NUH, a lot of my perceptions about the practice of medicine have changed. Some of the significant ones are:

- By making sure patients are the epicentre of all your efforts, everything will fall into place
- Accurate decision making capability is crucial given the plethora of information
- Team-based approach is vital
- Developing leadership qualities
- Standardisation of operating protocols for common clinical situations lessens the burden of the consultants and empowers the HO/MO/residents on the ground
- Developing clinical skills is still very important in this age of modern technology, to avoid unnecessary investigations which increase the healthcare expenditure burden
- Regularly audit, so that we can learn from our past mistakes
- No goal is impossible, small changes over time bring about a bigger change
- Develop a futuristic vision, so that we do not miss the next big thing

What are some personal goals and dreams that you hope to achieve?

- I want to establish a state-of-the-art paediatric oncology and BMT unit back in my home country

- Better risk stratification of children with acute leukaemia, so as to cure more children and minimise the use of chemotherapy
- Improve survival rate of children with solid tumours by early recognition and standardising care of treatment
- Implement the graft engineering techniques for BMT so as to decrease the mortality and morbidity due to graft versus host disease in transplant recipients

Any words of advice for others who are thinking of joining the Paediatric Oncology Fellowship Programme?

I definitely would recommend the NCIS/NUH for their fellowship programme, as it provides opportunities for the holistic growth of an individual, in an environment where advanced treatment modalities are available. It broadens the horizons of thinking, develops and enhances your compassion towards your patients. This Division has many stalwarts in their own ways and they all serve as role models. More importantly, every fellow in this Division is involved in the core think tank for making decisions, rather than just following a set of orders!

Dr Anand Kumar Krishnappa
Clinical Fellow
Advanced Paediatric BMT Fellowship, NUH

2ND NUH SINGAPORE
COLORECTAL CANCER SYMPOSIUM

Jointly organised by the National University Hospital (NUH), the National University Cancer Institute, Singapore (NCIS) and the National University of Singapore (NUS), the 2nd NUH Singapore Colorectal Cancer Symposium was held from 25 – 27 May. Over 30 colorectal experts (both local and foreign) were invited to discuss and deliver lectures centred on the theme "Management of Metastatic Colorectal Cancer". For the first time this year, the event also featured a pre-symposium cadaveric laparoscopic workshop. Over 90 participants attended both the two-day symposium and the pre-symposium workshop.

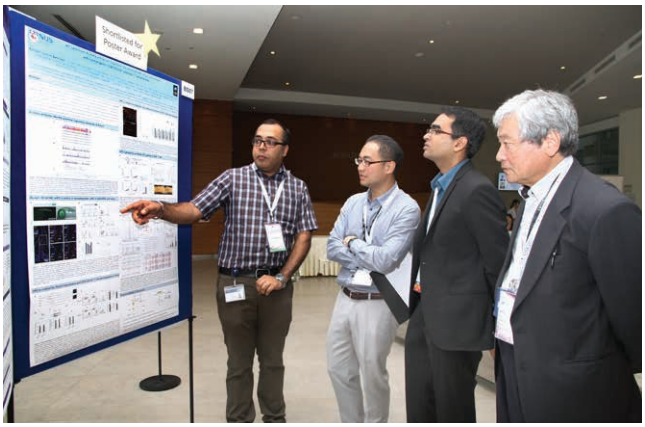
HAEMATOLOGY IN A NUTSHELL
PRACTICAL KNOWLEDGE FOR PRIMARY CARE PHYSICIANS

Targeted at primary care physicians, this General Practitioner (GP) CME talk was held on 11 March with the intent of equipping GPs with practical haematological knowledge. Specialists from the NCIS shared about the possible abnormalities in an initial full blood count, preliminary tests that GPs can perform and when a tertiary referral is necessary. Over 200 participants attended this event and participants provided feedback that the topics and the question and answer session were excellent, with active discussion between the speakers and the audience.

GRIEF AND THE QUEST FOR MEANING
A PALLIATIVE CARE PUBLIC FORUM

The very first palliative care public forum organised by the NCIS was held on 14 January. Associate Professor Amy Chow, a palliative care expert from Hong Kong, the invited guest speaker for the forum, covered topics such as end-of-life discussion with sensitivity to religion and culture, and understanding grief and loss. Participants also benefitted from the caregiver sharing session at the end of the talk. A total of 82 participants attended the forum and many gave positive feedback on the knowledgeable and experienced speaker as well as the inspirational caregiver sharing session.

4TH NCIS
ANNUAL RESEARCH MEETING



Hosted by the NCIS and co-organised by the Cancer Science Institute of Singapore (CSI), the 4th NCIS Annual Research Meeting (NCAM) was held on 30 June, with a mini symposium on Gynaecologic Oncology on 1 July. Renowned experts in the field, plenary speakers Professors Sir David Lane and Jack Gilbert spoke about molecular stratification in ovarian cancer and microbiome and cancer treatment. Over 270 clinicians, clinician-researchers and basic researchers attended the event. Participants enjoyed the conference and felt that the number of awards given out this year encouraged more people to submit abstracts and further promoted the culture of cancer research within the NCIS.

AWARDS

Congratulations to all our NMRC Award winners! Thank you for lifting the standards of healthcare and going above and beyond for our patients at the National University Cancer Institute, Singapore (NCIS)!

National Medical Research Council Awards 2017

The National Medical Research Council (NMRC) Awards is an annual ceremony and symposium organised by the Ministry of Health's NMRC. It recognises outstanding clinicians and researchers for their achievements and contributions to better healthcare outcomes. This year, the event was held on 7 and 8 March, and three of our doctors received awards.

PROFESSOR CHNG WEE JOO
Director and
Senior Consultant

Professor Chng Wee Joo, Director and Senior Consultant of the NCIS, was awarded the prestigious **Singapore Translational Research (STaR) Investigator Award**, for his outstanding work in cutting-edge translational and clinical research.

What does translational research mean to you?

"Translational research is the critical connection between discovery and mechanistic research in the laboratory and clinical research by the bedside. It is important for the advancement of medical treatment for patients. Translational researchers are those who study and show the relevance of basic scientific concepts to the clinics. This type of research may produce new ways of diagnosing patients, predicting outcomes and drug response, changing the treatment for diseases, changing the way we monitor treatment progress and so on. Clinician scientists are important agents in the translational research process."

How do you feel about winning the award?

"It is a real honour, and I am very proud to have won this award, especially to be in the same category as our most outstanding translational scientists, who are mostly from overseas (I am only one of a handful that is from Singapore and practising as a doctor to have won this award). I think with this award, I have proved that it is possible for Singapore to produce outstanding clinician scientists and that we have the environment and people to make this happen. I hope my achievement will inspire others to also follow their passion and not be afraid to take on this challenging but ultimately rewarding path."

Dr David Tan was awarded the **Clinician Scientist Award**, which is given to selected outstanding clinician scientists who have consistently demonstrated excellence in research and carried out internationally competitive translational and clinical research.

DR DAVID TAN
Consultant

What does being a clinician scientist mean to you?

"I have always felt that the label of "clinician scientist" is a rather unnecessary distinction. Everything we do as clinicians comes from a desire to improve the health and well-being of our patients and the only way of achieving this is from a rigorous study and expert application of medical scientific knowledge. Whether this is achieved by research into basic sciences, translational biomedical research, health services or even in the way in which we make daily clinical decisions for our patients, all clinicians who perform these tasks will be involved to a varying extent in the discovery, interpretation and implementation of scientific data. Essentially, being a clinician scientist is what my colleagues and I do every day and is an integral part of why a career in medicine remains exciting, interesting and intangibly rewarding. For this award, the most important thing here is not the label but rather the funding that comes with it, which will allow my colleagues and I to continue our research into developing better treatments for patients with gynaecological cancers."

How do you feel about winning this award?

"I am very grateful for the award and would like to thank all my colleagues in the Department of Haematology-Oncology, the Gynaecologic Oncology unit, the Haematology-Oncology Research Group at the NCIS, and the Cancer Science Institute at the National University of Singapore for their help and support. Thanks also to the NMRC for giving me the platform to carry out my work and to the leadership at the NCIS and NUH for creating the environment and putting the infrastructure in place for scientific endeavours to thrive."

DR ANAND JEYASEKHARAN
Associate Consultant

Dr Anand Jeyasekharan was awarded the **Transition Award**, which is given to budding clinician scientists who have demonstrated exceptional work in clinical research.

What does research and being a clinician scientist mean to you?

"I think of research as a trek - to boldly go where no one has gone before. For me, being a clinician scientist is about bringing together a clinician's method of identifying problems, with a scientist's approach to solving them."

How do you feel about winning this award?

"I'm happy they decided to fund my proposal. This is only the start - now comes the time to do the actual science."

DOCTORS' PROMOTIONS

Congratulations to our newly promoted doctors!

1 **DR LIM CHWEE MING**
Senior Consultant
Division of
Surgical Oncology
(Head & Neck Surgery)

2 **DR DAVID CHIA WEI TSAU**
Consultant
Department of
Radiation Oncology

3 **DR TANG SIAU-WEI**
Consultant
Division of
Surgical Oncology
(Breast Surgery)

4 **DR TUNG MOON LEY**
Consultant
Department of
Haematology-Oncology

5 **DR CHONG WAN QIN**
Associate Consultant
Department of
Haematology-Oncology

6 **DR HUANG YIQING**
Associate Consultant
Department of
Haematology-Oncology

7 **DR TAN HON LYN**
Associate Consultant
Department of
Haematology-Oncology

SPECIALIST AND TUMOUR GROUP LISTING

BLOOD CANCERS AND BLOOD DISORDERS

Bone Marrow and Stem Cell Transplant Programme

Haematology-Oncology
A/Prof Koh Liang Piu (Leader)
Dr Michelle Poon Li Mei
Dr Tan Lip Kun

Diagnostic Imaging
Dr Khor Lih Kin
Dr Loi Hoi Yin

Radiation Oncology
Asst Prof Bala Vellayappan

Coagulation

Haematology-Oncology
Dr Chee Yen Lin
Dr Liu Te Chih
Dr Lee Shir Ying
Dr Yap Eng Soo

General Haematology

Haematology-Oncology
Dr Liu Te Chih (Leader)
Dr Lee Shir Ying
Dr Ng Chin Hin
Dr Tung Moon Ley

Leukaemia, Myelodysplastic and Myeloproliferative Neoplasms (MDS/MPN)

Haematology-Oncology
Dr Ng Chin Hin (Leader)
A/Prof Koh Liang Piu
Adj Asst Prof Melissa Ooi Gaik Ming
Dr Esther Chan Hian Li
Dr Tan Lip Kun
Dr Tung Moon Ley

Diagnostic Imaging
Dr Khor Lih Kin
Dr Loi Hoi Yin

Pathology
A/Prof Ng Siok Bian
A/Prof Tan Soo Yong

Radiation Oncology
Asst Prof Bala Vellayappan

Lymphoma

Haematology-Oncology
Dr Michelle Poon Li Mei (Leader)
Dr Esther Chan Hian Li
Dr Chee Yen Lin
Dr Anand D Jeyasekharan
Dr Sanjay De Mel
Dr Joanne Lee
Dr Tan Lip Kun

Diagnostic Imaging
Dr Khor Lih Kin
Dr Loi Hoi Yin

Pathology
A/Prof Ng Siok Bian
A/Prof Tan Soo Yong

Radiation Oncology
Asst Prof Bala Vellayappan

Multiple Myeloma

Haematology-Oncology
Prof Chng Wee Joo (Leader)
Adj Asst Prof Melissa Ooi Gaik Ming
Dr Sanjay De Mel

Diagnostic Imaging
Asst Prof Arvind Kumar Sinha
Dr Khor Lih Kin
Dr Loi Hoi Yin

Pathology
A/Prof Ng Siok Bian
A/Prof Tan Soo Yong

Radiation Oncology
Asst Prof Bala Vellayappan

BREAST CANCER

Surgical Oncology
Asst Prof Chan Ching Wan (Leader)
A/Prof Philip Iau Tsau Choong
A/Prof Mikael Bo Anders Hartman
Dr Shaik Ahmad Bin Syed Buhari
Dr Tang Siau-Wei

Diagnostic Imaging
A/Prof Quek Swee Tian
Dr Eide Sterling Ellis
Dr Pooja Jagmohan
Dr Jeevesh Kapur
Dr Premilla Pillay
Dr Felicity Pool

Haematology-Oncology
Prof John Wong Eu-Li
A/Prof Lee Soo Chin
Dr Joline Lim Si Jing
Dr Lim Siew Eng
Dr Lim Yi Wan
Dr Samuel Ow
Dr Andrea Wong Li Ann

Pathology
A/Prof Thomas Choudary Putti

Plastic, Reconstructive & Aesthetic Surgery
Dr Jane Lim
Dr Ong Wei Chen
Dr Yap Yan Lin

Radiation Oncology
Asst Prof Choo Bok Ai
Asst Prof Koh Wee Yao
Asst Prof Vicky Koh Yaling
Asst Prof Johann Tang I-Hsiung

COLORECTAL CANCER

Surgical Oncology
Dr Cheong Wai Kit (Leader)
Asst Prof Chong Choon Seng
Asst Prof Tan Ker Kan
Dr Ridzuan Farouk
Dr Sharon Koh Zhiling
Dr Lee Kuok Chung
Dr Bettina Lieske
Dr Frances Lim Sheau Huei

Diagnostic Imaging
Dr Bertrand Ang Wei Leng
Dr Calvin Koh
Dr Thian Yee Liang
Dr Lynette Teo Li San

Haematology-Oncology
Dr Chee Cheng Ean
Dr Angela Pang
Dr Ho Jing Shan
Dr Raghav Sundar
Dr Tan Hon Lyn
Dr Yong Wei Peng

Pathology
Prof Teh Ming
Dr Brendan Pang Nghee Kheem

Radiation Oncology
Asst Prof Francis Ho
Asst Prof Leong Cheng Nang
Asst Prof Jeremy Tey Chee Seong
Asst Prof Bala Vellayappan

GYNAECOLOGIC CANCER

Gynaecologic Oncology
A/Prof Jeffrey Low Jen Hui (Leader)
A/Prof Arunachalam Ilancheran
Dr Ida Ismail-Pratt
Dr Joseph Ng Soon Yau
Dr Pearl Tong

Diagnostic Imaging
Prof Joseph Lee King-Tat
Dr Bertrand Ang Wei Leng
Dr Thian Yee Liang

Haematology-Oncology
Dr Lim Siew Eng
Dr Lim Yi Wan
Dr David Tan Shao Peng

Pathology
A/Prof Raju Gangaraju Changal
Dr Qasim Ahmed
Dr Diana Lim Gkeok Stzuan

Radiation Oncology
Asst Prof Vicky Koh
Asst Prof Johann Tang I-Hsiung
Dr Leong Yiat Horng

HEAD & NECK CANCER

Surgical Oncology
A/Prof Thomas Loh Kwok Seng (Leader)
Dr Jane Lim
Dr Lim Chwee Ming

Diagnostic Imaging
Prof Vincent Chong Fook Hin
Asst Prof Eric Ting
Dr Choong Chih Ching
Dr Tan Ai Peng
Dr Jocelyn Wong Yen Ling

Haematology-Oncology
Adj Prof Goh Boon Cher
Dr Chong Wan Qin
Dr Tan Chee Seng
Dr Nesaretnam Barr Kumarakulasinghe

Pathology
A/Prof Fredrik Bengt Petersson
Dr Qasim Ahmed

Radiation Oncology
Asst Prof Francis Ho
Asst Prof Vicky Koh
Asst Prof Ivan Tham Weng Keong
Asst Prof Wong Lea Choung
Dr Timothy Cheo

THYROID CANCER

Surgical Oncology
A/Prof Thomas Loh Kwok Seng (Leader)
Asst Prof Rajeev Parameswaran
Dr Lim Chwee Ming
Dr Ngiam Kee Yuan
Dr Tan Wee Boon

Diagnostic Imaging
Asst Prof Arvind Kumar Sinha
Dr Khor Lih Kin

Endocrinology
E/Prof Lim Pin
Asst Prof Samantha Yang
Dr Chionh Siok Bee
Dr Kao Shih Ling
Dr Eric Khoo Yin Hao
Dr Soh Lip Min

Haematology-Oncology
Adj Prof Goh Boon Cher

Pathology
A/Prof Nga Min En
A/Prof Fredrik Bengt Petersson
Dr Qasim Ahmed

LIVER, PANCREATIC AND BILARY (HPB) CANCER

Surgical Oncology
Dr Iyer Shridhar Ganpathi (Leader)
Prof Krishnakumar Madhavan
Dr Glenn Bonney
Dr Alfred Kow Wei Chieh

Diagnostic Imaging
Dr Stanley Loh Eu Kuang
Dr Kamarjit Singh Mangat
Dr Neo Wee Thong
Dr Prapul Rajendran
Dr Pavel Singh
Dr Bernard Wee
Dr Yeong Kuan Yuen
Gastroenterology & Hepatology
Prof Lawrence Ho Khek Yu
Prof Lim Seng Gee
A/Prof Dan Yock Young
Asst Prof Lee Keat Hong
Dr Bhavesh Kishor Doshi
Dr Michelle Angela Gowans
Dr Leo Hartono Juanda
Dr Calvin Koh
Dr Lee Guan Huei
Dr Lee Yin Mei
Dr Kieron Lim Boon Leng
Dr Loo Wai Mun
Dr Low How Cheng
Dr Mark Muthiah
Dr Tan Poh Seng
Haematology-Oncology
Dr Chee Cheng Ean
Dr Ho Jing Shan
Dr Raghav Sundar
Dr Tan Hon Lyn
Dr Yong Wei Peng
Pathology
Prof Aileen Wee
Dr Pang Yin Huei
Dr Benjamin Wong Pak Kwong
Radiation Oncology
Asst Prof Francis Ho
Asst Prof Leong Cheng Nang
Asst Prof Jeremy Tey Chee Seong
Asst Prof Bala Vellayappan

LUNG/THORACIC CANCER

Haematology-Oncology
Dr Ross Soo (Leader)
Adj Prof Goh Boon Cher
Dr Huang Yiqing
Dr Tan Chee Seng
Surgical Oncology
A/Prof Thirugnanam Agasthian
A/Prof John Tam Kit Chung
Dr Harish Mithiran Muthiah
Diagnostic Imaging
Asst Prof Arvind Kumar Sinha
Asst Prof Anil Gopinathan
Dr Khor Lih Kin
Dr Stanley Loh Eu Kuang
Dr Loi Hoi Yin
Dr Lynette Teo Li San
Dr Bernard Wee
Pathology
Dr Seet Ju Ee
Radiation Oncology
Asst Prof Koh Wee Yao
Asst Prof Leong Cheng Nang
Asst Prof Ivan Tham Weng Keong
Respiratory & Critical Care Medicine
Prof Lim Tow Keang
A/Prof Lee Pyng
Asst Prof See Kay Choong
Dr Adrian Kee
Dr Khoo Kay Leong

PROSTATE/UROLOGIC CANCER

Surgical Oncology
Prof Kesavan Esuvaranathan (Leader)
A/Prof Edmund Chiong
Asst Prof Lincoln Tan Guan Lim
Asst Prof Tiong Ho Yee
Dr David Terrence Consigliere
Dr Wu Qing Hui
Diagnostic Imaging
Dr Bertrand Ang Wei Leng
Dr Wynne Chua Yuru
Dr Khor Lih Kin
Dr Stanley Loh Eu Kuang
Dr Edwin Siew Poh Yiew
Haematology-Oncology
Prof John Wong Eu-Li
Dr Alvin Wong Seng Cheong
Dr Nesaretnam Barr Kumarakulasinghe
Pathology
Prof Teh Ming
Dr Thomas Paulaj Thamboo
Radiation Oncology
Asst Prof Keith Lim Hsiu Chin
Asst Prof Jeremy Tey Chee Seong

UPPER GASTROINTESTINAL CANCER

Surgical Oncology
Prof Jimmy So Bok Yan (Leader)
E/Prof Ti Thiow Kong
Dr Asim Shabbir
Diagnostic Imaging
Dr Prapul Rajendran
Dr Pavel Singh
Dr Bernard Wee
Dr Yang Cunli
Dr Yeong Kuan Yuen
Gastroenterology & Hepatology
Prof Lawrence Ho Khek Yu
A/Prof Yeoh Khay Guan
Dr Calvin Koh
Dr Lim Li Lin
Dr Low How Cheng
Dr David Ong Eng Hui
Haematology-Oncology
Dr Chee Cheng Ean
Dr Ho Jing Shan
Dr Angela Pang
Dr Raghav Sundar
Dr Tan Hon Lyn
Dr Yong Wei Peng
Pathology
Prof Teh Ming
A/Prof Nga Min En
Dr Benjamin Wong Pak Kwong
Radiation Oncology
Asst Prof Francis Ho
Asst Prof Leong Cheng Nang
Asst Prof Jeremy Tey Chee Seong
Asst Prof Bala Vellayapan

PAEDIATRIC HAEMATOLOGICAL MALIGNANCIES

Paediatric Haematology - Oncology
A/Prof Allen Yeoh Eng Juh (Leader)
Prof Dario Campana
A/Prof Quah Thuan Chong
Asst Prof Tan Poh Lin
Dr Elaine Coustan-Smith
Dr Chetan Anil Dhamne
Dr Krista Francisco
Dr Miriam Kimpo
Dr Koh Pei Lin
Dr Mariflor Villegas
Dr Frances Yeap
Diagnostic Imaging
Dr Jeevesh Kapur
Pathology
A/Prof Tan Soo Yong
Radiation Oncology
Asst Prof Vicky Koh
Asst Prof Johann Tang I-Hsiung

BRAIN CANCER

Neurosurgery
A/Prof Yeo Tseng Tsai (Leader)
A/Prof Chou Ning
Dr Sein Lwin
Dr Vincent Nga
Dr Teo Kejia
Diagnostic Imaging
Asst Prof Eric Ting
Dr Choong Chih Ching
Dr Tan Ai Peng
Dr Jocelyn Wong Yen Ling
Haematology-Oncology
Dr Chong Wan Qin
Dr Andrea Wong
Pathology
Dr Tan Char Loo
Radiation Oncology
Asst Prof Koh Wee Yao
Asst Prof Bala Vellayappan
Dr David Chia

MUSCULOSKELETAL CANCER/SARCOMA

Hand & Reconstructive Microsurgery
Dr Mark Puhaindran (Leader)
E/Prof Robert Pho Wan Heng
Orthopaedic Surgery
Dr Gurpal Singh
Diagnostic Imaging
A/Prof Quek Swee Tian
Asst Prof Arvind Kumar Sinha
Dr Sachin Agrawal
Dr Louise Gartner
Dr James Hallinan
Dr David Sia
Dr Salil Singbal
Haematology-Oncology
Dr Angela Pang
Paediatric Haematology-Oncology
Dr Chetan Anil Dhamne
Pathology
Dr Victor Lee Kwan Min
Radiation Oncology
Asst Prof Wong Lea Choung
Asst Prof Choo Bok Ai
Dr Timothy Cheo

SUPPORTIVE AND PALLIATIVE CARE

Haematology-Oncology
Dr Noreen Chan Guek Cheng (Leader)
Dr Yong Woon Chai
Dr Jamie Zhou
Psychological Medicine
A/Prof Rathi Mahendran
Dr Terence Leong Sun Chee
Radiation Oncology
Dr Wong Lea Choung

DEVELOPMENTAL THERAPEUTICS UNIT (DTU)

Haematology-Oncology
Adj Prof Goh Boon Cher (Leader)
Prof Chng Wee Joo
A/Prof Lee Soo Chin
Dr Chee Cheng Ean
Dr Joline Lim
Dr Ross Soo
Dr David Tan Shao Peng
Dr Andrea Wong Li Ann
Dr Yong Wei Peng

RESEARCH PUBLICATIONS BY THE NCIS (JAN - JUN 2017)

The names of authors from the NCIS are underlined. Please visit **http://bit.ly/ncisresearchpublication** for more information.

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FEBRUARY

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UPCOMING EVENTS

NCIS EVENTS & PROGRAMMES (JUL - DEC 2017)

JULY

- Be in the PINK Education Series
  For NCIS patients / caregivers
- Caregivers in Cancer - Basic Homecare Skills Training Programme
  For NCIS patients / caregivers
- Colorectal Cancer Community Talk
  For the Public
- Expressive Art Studio
  For NCIS patients / caregivers
- July Oncology Grand Rounds - Health Service Research: Clinical Trials Or Observational Data
  For Healthcare Professionals
- July Oncology Grand Rounds - Intraperitoneal Chemotherapy for Peritoneal Metastases
  For Healthcare Professionals
- July Oncology Grand Rounds - ASH and ASTRO Updates
  For Healthcare Professionals
- MindCAN - Mindfulness for Wellness Workshop
  For NCIS patients / caregivers
- Relax Your Mind Yoga Class
  For NCIS patients / caregivers
- World Head & Neck Day - Stamping Out Head & Neck Cancer Public Forum
  For the Public

AUGUST

- August Oncology Grand Rounds - High Quality Control In Clinical Trials
  For Healthcare Professionals
- August Oncology Grand Rounds - Stereotactic Radiotherapy For Liver And Pancreatic Cancers
  For Healthcare Professionals
- August Oncology Grand Rounds - The Art of Treatment Sequencing for Optimal Outcome in Gynaecological Cancers
  For Healthcare Professionals
- August Oncology Grand Rounds - Value Driven Care
  For Healthcare Professionals
- Be in the PINK Education Series
  For NCIS patients / caregivers
- Caregivers in Cancer - Basic Homecare Skills Training Programme
  For NCIS patients / caregivers
- Expressive Art Studio
  For NCIS patients / caregivers
- Gastric Cancer Campaign - Nutrition Event
  For the Public
- Gastric Cancer Public Talk
  For the Public
- GP CME Talk - Gastrointestinal Cancers
  For GPs / Family Physicians
- Look Good Feel Better Workshop
  For NCIS patients / caregivers
- MindCAN - Mindfulness for Wellness Workshop
  For NCIS patients / caregivers
- Radiation Oncology Workshop - Target Delineation
  For Healthcare Professionals
- Relax Your Mind Yoga Class
  For NCIS patients / caregivers

SEPTEMBER

- Be in the PINK Education Series
  For NCIS patients / caregivers
- Breast Cancer Awareness Month Activities @ Westgate
  For the Public
- Caregivers in Cancer - Basic Homecare Skills Training Programme
  For NCIS patients / caregivers
- Expressive Art Studio
  For NCIS patients / caregivers
- September Oncology Grand Rounds - Management Of VTE In Special Oncology Populations
  For Healthcare Professionals
- Relax Your Mind Yoga Class
  For NCIS patients / caregivers

OCTOBER

- Be in the PINK Education Series
  For NCIS patients / caregivers
- Breast Cancer Awareness Month - Pink Ribbon Zumba Workout
  For Cancer Survivors
- Caregivers in Cancer - Basic Homecare Skills Training Programme
  For NCIS patients / caregivers
- Expressive Art Studio
  For NCIS patients / caregivers
- GP CME Talk
  For GPs / Family Physicians
- Look Good Feel Better Workshop
  For NCIS patients / caregivers
- Roadshow at Public Health Screening 2017
  For the Public

NOVEMBER

- Be in the PINK Education Series
  For NCIS patients / caregivers
- Caregivers in Cancer - Basic Homecare Skills Training Programme
  For NCIS patients / caregivers
- Breast, Colorectal and Prostate Cancer Community Talk
  For the Public
- Expressive Art Studio
  For NCIS patients / caregivers
- Winning Against Cancer Public Symposium
  For the Public
- November Oncology Grand Rounds
  For Healthcare Professionals

DECEMBER

- Be in the PINK Education Series
  For NCIS patients / caregivers
- Caregivers in Cancer - Basic Homecare Skills Training Programme
  For NCIS patients / caregivers
- Expressive Art Studio
  For NCIS patients / caregivers
- NCIS Celebrates Life - Combined Support Group Year End Party
  For NCIS support group members

The events and programmes listed above are subject to change, please check our website at www.ncis.com.sg for the most updated information.

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- Subcutaneous chemotherapy (selected treatments only)

LIST OF SATELLITE LOCATIONS

- Boon Lay Wellness Centre
- Chua Chu Kang Community Centre
- Jurong Green Community Club
- Jurong Medical Centre
- Punggol Community Club
- Woodlands Recreational Centre Zone 9

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