National Healthcare Group
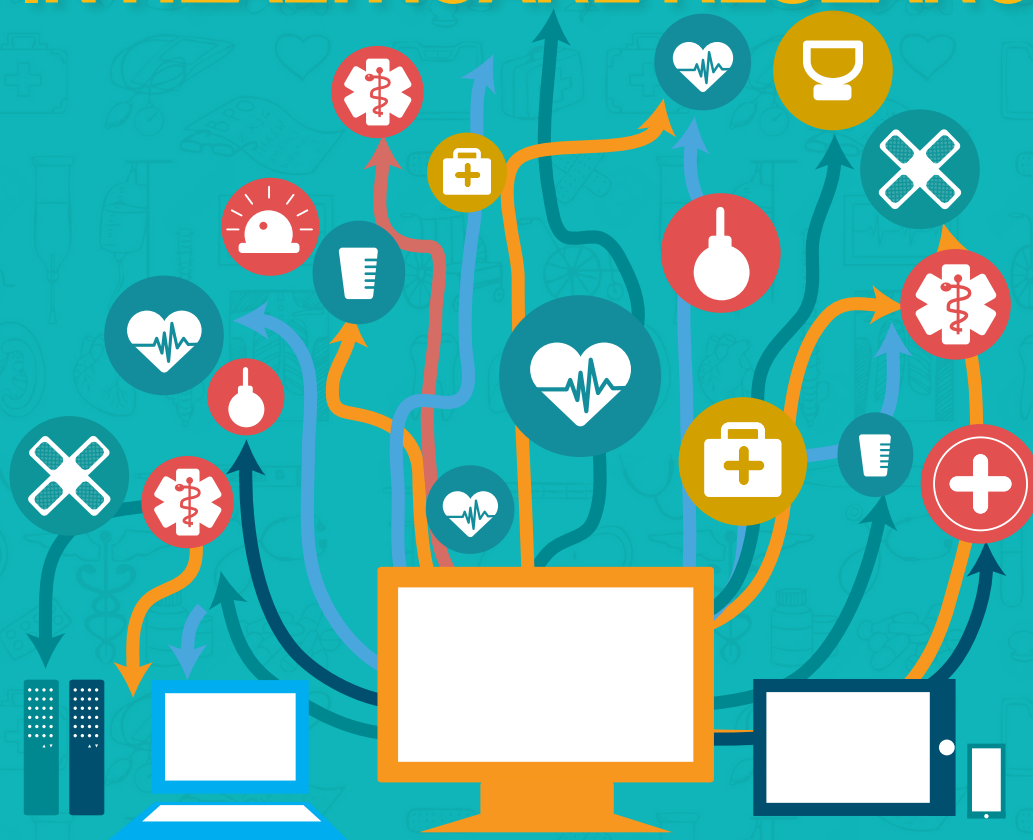*Adding years of healthy life*

e-catalyst
ACCELERATING RESEARCH

BIG DATA
IN HEALTHCARE RESEARCH

Big Data in Healthcare

The Value of a Population Healthcare Database

Big Data Analytics to guide Antibiotic Usage

RESEARCH NEWS

Congratulations to the NHG Research Career Development Schemes FY2015 Awardees

Mental Health Medications: What Does the Evidence Say?

RESEARCHERS' FEATURE

Dr Tan Bhing Leet
Occupation Therapist, IMH

Prof Annelies Wilder-Smith
Professor, LKCMedicine & Consultant, TTSH

Mr Alex You
Statistician, NHG HSOR

EDUCATION

Pursuing a Masters
Dr Yew Yik Weng
Associate Consultant, NSC
&
Ms Goh Ling Jia
Senior Staff Nurse, NHGP

Qualité

Big Data in Healthcare

"Data! Data! Data!" he cried impatiently. "I can't make bricks without clay."
AC Doyle (in Sherlock Holmes: The Adventure of the Copper Beeches)

What is big data?

The term "Big Data" seems to be on everyone's lips these days, and it is believed to be able to provide solutions to our current and future healthcare problems.

Big Data refers to "electronic health data sets so large and complex that they are difficult (or impossible) to manage with traditional software and/or hardware; nor can they be easily managed with traditional or common data management tools and methods".

While the healthcare sector is traditionally associated with large amounts of data, obtained from 3 broad sources – patient data from health systems (e.g. electronic medical records (EMRs)), research datasets, and end-users (e.g. social media, apps, wearables), the introduction of technology has led to exponentially increasing volumes. In 2011, the volume of healthcare-related data generated within the U.S. alone reached 150 exabytes (150,000,000 terabytes).

Big data analytics have been demonstrated to benefit the healthcare system as a whole, especially in disease prevention. A recent article in the Today newspaper discusses its impact on Singaporean hospitals' operations – reduced waiting times and cost savings from better resource management. Ambitious large scale projects involving population-based data are also being planned, with the ultimate aim of progressing from acute to 'proactive' care.

Challenges

Could big data lead to big problems? Here's how:

(i) Accuracy – Google Flu Trends was developed by Google in 2008 to provide estimates of influenza activity in different countries. However, it overestimated the prevalence of flu in the 2011-12 and 2012-13 season.

(ii) Privacy/confidentiality – institutions will face many logistical and ethical challenges maintaining and protecting large patient databases.

(iii) Cost – may limit scalability of technologies like EMR.

(iv) Lack of interoperability – may limit meaningful analyses of diverse datasets.

(v) Changing behaviour and mindsets – the healthcare industry has traditionally been slow to implement new technologies into its workflow and processes.

(vi) Achieving real-time analytics – the time lag between data collection and analysis can sometimes be too large to yield meaningful information in healthcare's "high-intensity, high turnover" environment.

Conclusion

With increasing IT sophistication, we believe that big data analytics has the potential to transform the way healthcare is practiced and delivered in the future, through disease prevention, improving population health and reducing healthcare costs. However, potential limitations and obstacles need to be recognised and overcome.

A/Prof Wong Teck Yee
Assistant Dean, Family Medicine
LKCMedicine

Consultant
Department of Continuing & Community Care
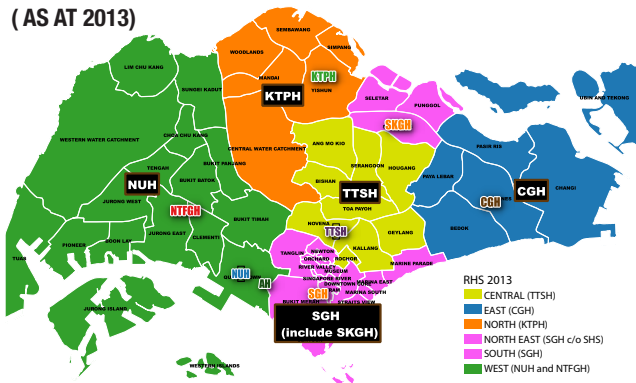*Tan Tock Seng Hospital*

Dr Ravinder Singh Sachdev
Dy Chief Medical Informatics Officer
Associate Consultant
Department of Continuing & Community Care
Tan Tock Seng Hospital

The Value of a Population Health Database

CURRENT "REGIONS" BY PLANNING AREA & POPULATION (AS AT 2013)

RHS 2013
- CENTRAL (TTSH)
- EAST (CGH)
- NORTH (KTPH)
- NORTH EAST (SGH c/o SHS)
- SOUTH (SGH)
- WEST (NUH and NTFGH)

"Population health" redraws the perspective that the population is the patient and the provider is a regional health system (RHS) with a geographical area of responsibility. National strides are being made to link patients' data of health utilisation, diseases, demographics and service cost for better patient point of care and potentially population health analysis.

The National Healthcare Group (NHG) is responsible for the health of about 1.4 million people living in the Central Region. As a RHS, we ask "Who is our population?". Does it include those who live in our region and have not used our healthcare services, or would it be anyone who had used our services but could be residing outside our region?

As patients are free to choose any healthcare institution, only 56% of Tan Tock Seng Hospital's (TTSH) patients come from the Central Region. The RHS has an obligation to serve anyone who seeks its care but is also responsible for the health of those who stay in its region.

In 2014, the Health Services & Outcomes Research (HSOR) unit at NHG, assembled a database to support data research for population health initiatives. The database included 6 years of data from all NHG institutions. It facilitates objective studies of what had happened with past initiatives and projects what may happen with new ones.

About 323,000 patients living in the Central Region have sought care at TTSH or at Toa Payoh, Ang Mo Kio and Hougang polyclinics in 2013. More than 500,000 patients have sought care with NHG at least once over the last 3 years. While the database does not fully capture the 1.4 million people as others may have sought care at other RHS or with private primary care, this provides a profile of the patients who have sought care with NHG and a base for further study.

Of the 323,000 patients, 4,000 (1.3%) had ≥3 admissions in 2013. Described as 'frequent admitters', efforts are underway in all RHS to reduce avoidable admissions through cost-effective home and primary care interventions. Historical data from the database shows that 'frequent admitters' do not remain as persistent admitters the following year even without any intervention. They average about 1.2 admissions the following year, as some would have died or have no admissions in the next year. A prediction model showed that the odds were higher if they are older, male, have historical admissions, or have heart failure or stroke.

The RHS database has continued to be information resource. Apart from saving the need to merge data for individual studies, it has standardised data storage and extraction principles, definitions, data structures and formats which have helped to streamline analysis and production of results. Visualisation, large data handling and machine learning algorithms have complemented retrospective studies. Ongoing studies include a relook at population segmentation using disease states instead of utilisation, cost of end-of-life healthcare and others.

Mr Palvannan R.K.
Operations Research Specialist
Health Services & Outcomes Research
National Healthcare Group

Big Data Analytics to Enhance Computerised Decision Support for Antibiotic Use

Electronic medical records (EMRs) are a treasure trove of high quality data for epidemiological and clinical research. Efficient linkage of data across multiple administrative and clinical databases is crucial to fully optimise the potential of these data sources in addressing important clinical and public health questions for the benefit of patients and the community.

The Antimicrobial Resistance Utilisation and Surveillance Control system (ARUSC) is Tan Tock Seng Hospital's (TTSH) home-grown antibiotic computerised decision support system (CDSS) that provides patient-specific evidence-based antibiotic recommendations at the point of prescription. Antibiotic CDSSs are developed to guide antibiotic decisions, yet prescriptions of CDSS-recommended antibiotics have remained low worldwide. Hence, we conducted a prospective cohort study to assess patient and physician factors associated with patients' receipt of empiric antibiotic therapies recommended by ARUSC and to identify targets for improvement.

We followed up with a cohort of hospitalised patients longitudinally from the initiation of an electronic antibiotic prescription up to 30 days post-discharge from hospital. The unique patient identification and admission episode numbers allowed for electronic linkages across medical and pharmacy records, and administrative databases. As such, all data were electronically collated and any measurement error and misclassification of exposures was likely to be minimal. To account for the patients' co-morbidities, we derived the Charlson's co-morbidity index from the ICD codes in administrative databases. Unlike most other studies which involved study investigators manually reviewing prescriptions that were error-prone and challenged with inter-rater reliability issues, our study electronically matched antibiotics prescribed on the electronic inpatient medication record system with ARUSC recommendations to determine patient receipt of ARUSC-recommended antibiotic therapies. Hence, our outcome measure was not subject to measurement error or differential misclassification. Additionally, data on the prescribing and attending physicians' designation and ethnicity were obtained from TTSH's human resource database and matched to the identity and clinical specialty data in ARUSC.

Our study provided important insights into predictors of patients' receipt of empiric antibiotic therapies recommended by ARUSC. While the attending physician and clinical specialty were not associated with patients' receipt of ARUSC-recommended antibiotic therapies, patients admitted to the intensive care unit or who had renal impairment were less likely to receive ARUSC-recommended antibiotics. Enhancements to ARUSC can help address some of the unique needs of these complex patients.

Big data analytics enabled the unbiased assessment of the associations between patient and physician factors and patients' receipt of ARUSC-recommended antibiotic therapies, guiding decisions on ARUSC enhancements to improve patient care.

A/Prof Angela Chow
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Tan Tock Seng Hospital

NHGP CRU – Fostering Research that Improves the Health of Our Community

As part of the ongoing "NHG's Research Journey" series, National Healthcare Group Polyclinics' Clinical Research Unit shares in this issue about their efforts in fostering research.

The National Healthcare Group Polyclinics' Clinical Research Unit (NHGP CRU) was started in 2007 as a small unit to promote research awareness and coordinate research activities within NHGP. Currently a unit within the Family Medicine Development Division, the CRU team has since grown in terms of staff strength and capabilities. NHGP CRU's mission is to build up research capacity within NHGP and provide administrative support for research activities within NHGP. To this end, NHGP CRU works with NHGP researchers and the various departments in NHGP to refine research questions, plan logistics and coordinate operational and administrative support for research in NHGP.

Research in NHGP aims to answer questions about health-related matters and diseases in primary care, and places emphasis on health services research in chronic disease management. The CRU team is constantly honing its skills in the areas of research methodologies, research ethics and project management, so as to improve the support offered to NHGP researchers.

Besides working closely with NHGP researchers to formulate research questions and see their projects come to fruition, CRU also organises forums for staff to showcase their research, and roundtable discussions to improve upon their research ideas. NHGP is also involved in research collaborations with established researchers from across Singapore. Our research partners include Tan Tock Seng Hospital, the Institute of Mental Health, Khoo Teck Puat Hospital, Ministry of Health, Health Promotion Board, Singapore Clinical Research Institute, Nanyang Technological University Lee Kong Chian School of Medicine and the National University Health System. CRU and NHGP researchers are truly privileged to have opportunities to work and learn alongside experienced researchers and various stakeholders.

In this rapidly evolving healthcare landscape, CRU aims to inspire stronger curiosity and foster more research that will improve the effectiveness and quality of primary healthcare services in Singapore. As NHGP celebrates its 15th anniversary this year, CRU is honoured to be part of NHGP's quest in advancing family medicine and transforming primary healthcare in Singapore.

NHGP CRU would like to express gratitude to NHGP CEO, Adjunct Associate Professor Chong Phui-Nah, for her support and strategic guidance in spurring CRU on in its research endeavours and to past and present colleagues for their contributions to building up research in NHGP.

Article contributed by
NHGP CRU

Grant Enhancement Training Workshop 2014 - co-organised by NHGP CRU and SCRI

# Health Technology Assessment in Major Depression and Schizophrenia

> Major depression and schizophrenia are two of the most common and disabling psychiatric disorders, contributing significantly to the burden of disease in Singapore and globally. Numerous medications have demonstrated efficacy but also presented safety and cost concerns. These updated meta-analyses and economic evaluations can serve as useful guides to our clinicians' and health services' prescribing patterns, particularly since they are based on local treatment approaches and healthcare costs.
>
> **Adjunct Assistant Prof Gwee Kok Peng**
> *Senior Consultant*
> *Department of General Psychiatry*
> *Institute of Mental Health*

The National Healthcare Group (NHG) Pharmacy and Therapeutics (P&T) Office, in collaboration with the Institute of Mental Health (IMH), conducted health technology assessment (HTA) to provide evidence-based information on the acute treatment of major depression and maintenance treatment of schizophrenia in 2014/15.

A total of 16,389 participants from 76 randomised controlled trials (RCTs) on 10 antidepressants (Fig A), and 10,177 participants from 56 RCTs evaluating 18 antipsychotics (Fig B) were analysed. We performed systematic reviews and network meta-analyses that combine evidence from direct and indirect comparisons to generate more precise treatment effect estimates to evaluate their comparative efficacy and tolerability.

Figure A

Figure B
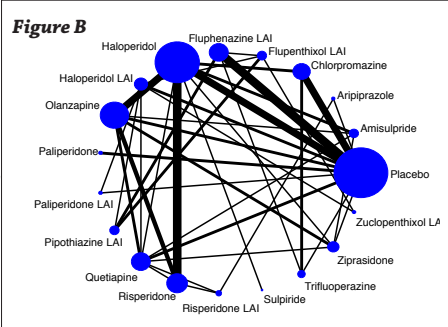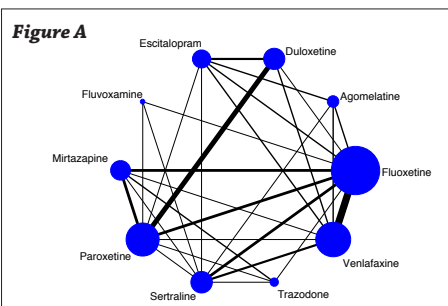
Evidence network of direct comparisons for antidepressants and antipsychotics

The P&T Office HTA team from left: Dr Brendon Zhou, Dr Khoo Ai Leng, Ms Lin Liang, Dr Zhao Ying Jiao, Ms Monica Teng, Mr Lim Boon Peng.

We also conducted decision-analytic modeling to calculate the benefits and costs associated with each treatment.

Our findings from this HTA have been incorporated into the treatment guidelines for the management of depression in IMH. Given the finite resources, our healthcare system cannot afford to provide unlimited services to everyone without considering the cost impact. This HTA provided a basis for and enabled IMH pharmacy to better negotiate with the pharmaceutical industry to review the pricing for selected drugs.

This collaborative work between NHG P&T Office and IMH has provided us comprehensive insights into the clinical and cost-effectiveness evidence among the antidepressants and antipsychotics on the acute treatment of major depression and maintenance treatment of schizophrenia.

Dr Zhao Ying Jiao
Senior Research Analyst

Dr Khoo Ai Leng
Principal Research Analyst
Pharmacy and Therapeutics (P&T) Office
Group Corporate Development
*National Healthcare Group*

Towards Socio- and Neuro-feedback Treatments for Schizophrenia

"Towards Socio- and Neuro-feedback Treatments for Schizophrenia" is a study that explores whether the effectiveness of Cognitive Remediation Therapy (CRT) can be assessed and enhanced through the use of objective biomarkers, namely the cortical electrophysiological activity extracted from electroencephalograph (EEG) and verbal and non-verbal expressions extracted from audio/video signals. The study also investigates the ability of these objective measures at baseline to prognosticate Cognitive Remediation Therapy (CRT) outcomes.

The study involves 100 participants - 50 IMH patients who are undergoing CRT as part of their standard clinical care and 50 matched controls who are not receiving CRT. They are evaluated at recruitment, 2 weeks after commencement and after completion of CRT. Clinical, cognitive and functional scales are implemented and the participants undergo an EEG recording when engaging in attention and working memory tasks. They also engage in a social responsivity task, during which audio and/or video signals are recorded. In the social responsivity task, speech of the patient on different channels via lapel microphones will be recorded and analysed. Evaluating the objective verbal and non-verbal changes, including cognitive and functioning aspects, will be helpful in gauging participant's improvement after CRT. The findings of the study will aid in the identification of cognitive and sociological biomarkers to gauge an individual's response to CRT. Data collected will serve as a good foundation for future in-depth research on stratification and tailoring of CRT for patients.

This initiative is a collaborative effort between the Institute of Mental Health (IMH), the
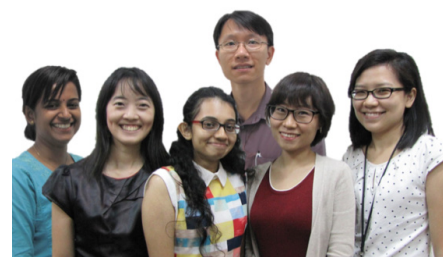
The study team from IMH in clockwise from back: Dr Jimmy Lee, Ms See Yuen Mei, Ms Yang Zixu, Ms Kameshwari Rajakrishnan, Dr Tan Bhing Leet, Ms Yogeswary Maniam

Agency for Science, Technology and Research (A*STAR), and the Nanyang Technological University (NTU). The principal investigator is Dr Tan Bhing Leet (IMH), and the co-investigators are Dr Jimmy Lee (IMH), Dr Justin Dauwels (NTU) and Dr Guan Cuntai (I²R, A*STAR).

Dr Tan Bhing Leet
Head & Principal Occupational Therapist
Department of Occupational Therapy
Institute of Mental Health

Dr Jimmy Lee Chee Keong
Consultant & Deputy Chief
Department of General Psychiatry 1 / Research Division
Institute of Mental Health

Dengue and International Travel

The World Tourism Organisation forecasts that international arrivals are expected to reach nearly 1.6 billion by the year 2020. Particular growth is expected from East Asia and South East Asia, both highly dengue endemic regions. In parallel to the exponential increase in air travel, there has also been an exponential increase in dengue cases. So what is the role of travel in dengue?

First of all, travellers are at individual risk. Secondly, travellers contribute to the geographic expansion of dengue. Thirdly, travellers can act as sentinel. In the past 5 years, my team conducted research related to these three areas.

Individual Risk of Dengue in Travellers
We developed a mathematical model to estimate the risk of dengue acquisition in non-immune travellers based on duration of travel season and year of travel. For instance, for a traveller who stays in Singapore for 1 week during the high dengue season in 2005, the risk of acquiring dengue was 0.17%, but it was only 0.00423% during the low season in a non-epidemic year such as 2002. Risk estimates based on mathematical modeling will help the travel medicine provider give better evidence-based advice for travellers to dengue endemic countries. We also calculated the risk for travellers to Thailand, and found an almost 10 fold higher risk than travellers to Singapore. In a study in collaboration with GeoSentinel, a global network of travel medicine providers, we documented the increasing trend of dengue in travellers over 10 years, but also the cyclical pattern with epidemic years. Travellers mirror the epidemiology of dengue in endemic populations where dengue appears to peak in 3-5 yearly cycles. South East Asia and South Asia are the regions where most of the dengue cases are acquired followed by the Caribbean. In terms of incidence, dengue is now estimated to be in third place after traveller's diarrhea and influenza. When applying the rationale for pre-travel vaccination indications for classical diseases such as hepatitis A, typhoid fever, influenza and dengue, dengue vaccination would certainly be indicated for travellers. However, an ideal dengue vaccine for travellers still does not exist.

Geographic Spread of Dengue Via International Travellers
In the United States, the first autochthonous outbreak of dengue occurred in 1980 in Texas and in 2005 in Hawaii, and in 2009-2011 in Florida Key West. Europe, so far, had been spared of autochthonous dengue cases, except for an outbreak in 1927/28 in Greece. However, this changed in 2010 when 2 autochthonous cases in Southern France were reported. But then in 2012, Europe was hit by its first major dengue outbreak. It occurred in Madeira, Portugal. The outbreak started in October 2012, and by February 2013, there were more than 2000 cases, with 80 importations from Madeira to Europe. So where did this outbreak originate from? Information on air traffic can be used to assess the risks of vector-borne disease importation.

We worked on the following premise: the risk of importation of dengue depends on the dengue activity in the source country and the volume of travellers from the source country to Madeira. To identify the origin of the imported dengue virus, we investigated the interconnectivity via air travel between dengue-endemic countries and Madeira, and created an importation index. We used the annual flight data from IATA. Calculating the importation index, Venezuela and Brazil were the two countries at highest risk of dengue exportation to Madeira. Indeed, we conducted dengue sequencing from samples obtained from Madeira and these supported the importation index that the outbreak in Madeira was the result of importation from Venezuela or Brazil.

Let's Move On To Travellers as Sentinels
Travellers can unmask dengue outbreaks that may go unnoticed in countries with poor surveillance. Africa does not have a well-established dengue surveillance system for example. In April 2013, 10 cases of dengue fever in travellers acquired in Angola were noted. These travellers had returned to 5 countries on 4 continents, all within a time span of a couple of weeks, thus making the world known about an ongoing dengue outbreak in Angola.

Prof Annelies Wilder-Smith
Professor of Infectious Diseases
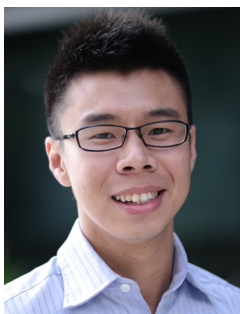*Lead, Global Health and Vaccinology Programme*
Lee Kong Chian School of Medicine
Nanyang Technological University
Consultant
Department of Infectious Diseases
Tan Tock Seng Hospital

When Data Science and Population Health Join Hands

Mr Alex You Xiaobin
Statistician
Health Services & Outcomes Research
National Healthcare Group

As an undergraduate, I have always been fascinated with statistics, because essentially that is how you know this world and interact with everything around you. During the course of my studies, I was exposed to various kinds of probability theories and statistical models. However, it was only during my Masters programme that I was able to apply what I learnt in real-life situations. As an intern with eBay's Shanghai office, I explored data science with the data warehouse team using text mining, parallel algorithms, and data visualisation techniques, which made me realise how important and useful a database can be in furthering statistical analyses.

Since joining the Health Services & Outcomes Research (HSOR) unit at the National Healthcare Group, I have been involved in work related to Population Health Management (PHM). As a statistics person, I am excited to contribute to this frontier research from a data and technical perspective. In this era of Big Data, different data science elements are constantly applied in PHM research to find the best care model – designing a PHM database to establish the ontological structure of patients' demographic information and utilisation records; using an advanced statistical model to excavate knowledge from these data; and employing data visualisation techniques to summarise and convey research findings.

Big data analytics in healthcare holds much promise when domain knowledge join hands with information technology. The IT and banking industries have successfully crystallised the wisdom of domain experts through statistical modelling and computational skills. In our PHM exploration, we seek to improve on methodologies (statistics, mathematics and computer science) that were based on existing public health research.

I enjoy my work in HSOR because of the support from my Director, Dr Heng, in allowing me to explore various approaches to PHM with different data science techniques. My colleagues have also been very helpful in educating me with the healthcare domain knowledge. I am thrilled to be a part of this team as we embark on a journey to harnessing data to improve population health.

Research - Diverse, Challenging, Enjoyable

> **Ms Goh Ling Jia is a Senior Staff Nurse from National Healthcare Group Polyclinics (NHGP) who is currently pursuing her Master of Clinical Research (MClin Res). In this issue, she shares with us on why she has decided to embark on the journey to further her education.**

I took a liking to research when I was introduced to the research module while studying in nursing school. It was enjoyable doing all the statistics as I have always liked numbers and analysis. I always feel a sense of achievement when I eventually have the solution to any question.

I was trained as an intensive care nurse and my research work previously focused on improving nursing practices in the intensive care unit. One of my interests was evaluating the effectiveness of normal saline in maintaining patency of arterial line, which was presented as a research paper in the Young Investigator's Award (Nursing) category at the 18th SGH Annual Scientific Meeting in 2009. The paper was published in Proceedings of Singapore Healthcare in 2011. In 2013, I joined the primary healthcare sector at NHGP, and my current research focuses on the use of telemedicine in wound nursing.

In 2014, I was informed of the Master of Clinical Research scholarship funded by the National Health Service (NHS) by my supervisors, who encouraged me to take up the scholarship. I was hesitant initially as I was not confident of dedicating myself to the programme due to heavy family commitments. However, my supervisors were very reassuring and I am now given protected time to do my studies, while working as a clinical nurse at Hougang Polyclinic. I am really grateful to my organisation, NHGP, for giving me the opportunity. I would also like to thank Ms Chen Yee Chui (Chief Nurse, Nursing Services), and Senior Nurse Manager Chew Geok Lan (Head Nurse, Hougang Polyclinic)for their recommendation and encouragement. Dr Lee Eng Sing (Head of Hougang Polyclinic and Deputy Head of Clinical Research Unit) has been very supportive and offers a lot of advice as well. I have also been assisting with research matters at Nursing Services under the guidance of Senior Nurse Manager Yan Chau Chain, and this has really helped me in applying theory to practice.

The Master of Clinical Research programme at University of Manchester is an extremely rewarding course, as students are exposed to a great variety of research methodologies and have many opportunities to network with people from different countries. We are also expected to present and share our research projects to professors and classmates. In addition to the routine online learning sessions, there is close supervision from the University too. Professor Ann Caress, my dissertation supervisor, ensures that she has a weekly or monthly meeting with me via Skype to be informed of the progress of my dissertation, and to promptly provide feedback and assist me with any queries.

With healthcare getting more complicated and the public becoming more knowledgeable, research is essential for nursing to advance. Nursing practice can no longer be based on traditional methods but should be guided by evidence-based practice.

Ms Goh and her supervisor Prof Ann Caress

Ms Goh Ling Jia
Senior Staff Nurse
National Healthcare Group Polyclinics

Making Sense of Databases and Numbers: My US Experience

I was enrolled at the Harvard School of Public Health (HSPH), Boston to pursue my Master of Public Health (Quantitative Methods) as part of my Health Manpower Development Plan (HMDP) training from 25 Aug 2014 to 28 May 2015. The objective of my Masters programme was to acquire specific skills, knowledge and expertise in the area of studies design and data analysis so that they can be applied to dermato-venereology research in Singapore. My training included: studies design, understanding basic statistical concepts; performing manual calculations as well as analysing datasets using statistical software such as STATA, SPSS and SAS.

During my time there, I collaborated with someone at HSPH using databases to develop ideas and publish epidemiology studies in dermatology. Given the availability of databases such as NHANES (National Health and Nutrition Examination) database and VAERS (Vaccine adverse event reporting system) database of the US Centers for Disease Control and Prevention, they were important resources that I tapped on when coming up with research ideas. He also shared tips on handling large databases, data analysis as well as the importance of developing another perspective on re-analysing existing datasets. We worked on and published several projects on topics such as psoriasis, hand dermatitis, nutrition and melanoma as well as vaccines adverse reactions.

The availability and accessibility to these datasets definitely played an important role in encouraging epidemiology research. The quality of these data and their robust methodology in routine data collection would be something we can strive to emulate. With the advent of machine learning in the field of big data in US, we should definitely aim to enhance our biostatistical, data analysis capabilities to tap onto this trend and bring epidemiology research to the next level. I hope I could be part of this exciting development.

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NHG RESEARCH CAREER DEVELOPMENT PROGRAMMES
Results For FY2015 Call For Applications
Congratulations to the following FY2015 Awardees!

CLINICIAN-SCIENTIST CAREER SCHEME (CSCS)

Name	Institution	Department	Category
Dr Shawn Vasoo Sushilan	Tan Tock Seng Hospital	Infectious Diseases	
Dr Rupesh Agrawal	Tan Tock Seng Hospital	Ophthalmology	Junior
Dr Chuah Sai Yee	National Skin Centre	Dermatology	
Dr Ng Oon Tek	Tan Tock Seng Hospital	Infectious Diseases	
A/Prof Angela Chow Li Ping	Tan Tock Seng Hospital	Clinical Epidemiology	Mid
Dr Jimmy Lee Chee Keong	Institute of Mental Health	General Psychiatry 1	

NHG-NTU CLINICIAN-SCIENTIST FELLOWSHIP (CSF)

Name	Institution	Department
A/Prof Melvin Leow Khee Shing	Tan Tock Seng Hospital	Endocrinology

CLINICIAN INVESTIGATOR (CI) SCHEME

Name	Institution	Department
Prof Leo Yee Sin	Tan Tock Seng Hospital	Institute of Infectious Diseases and Epidemiology
A/Prof Lye Chien Boon David	Tan Tock Seng Hospital	Institute of Infectious Diseases and Epidemiology

RESEARCH SUPPORT SCHEME (RSS)

Name	Institution	Department
Dr Edimansyah Abdin	Institute of Mental Health	Research
Dr Chan Ee Yuee	Tan Tock Seng Hospital	Nursing
Dr Chan Mei Leng	Tan Tock Seng Hospital	Occupational Therapy

For more information, please visit www.research.nhg.com.sg
(Grants & Programmes → Research Career Development)

Qualité

(Issue 20, Sep 2015) – Education to facilitate high standards of research conduct.

DSRB Update: Revised Declaration Process for Financial Conflict of Interest
~Find out more about the new annual Financial Conflict of Interest declaration process.

Waiver of Documentation of Consent vs Waiver of Consent: The difference and what should be documented?
~Understand the types of consent waivers granted by DSRB and what study documentations should be available.

Click here to read your full issue of Qualité (Issue 20, Sep 2015) or visit www.research.nhg.com.sg (Resources ➤ Qualité Newsletter)

Research Training Events

Date	Training Programme	Course Provider
Ongoing	Proper Conduct of Research Online – Basic I, II & III (PC101, PC102 & PC103) Workshop	NHG Research & Development Office
Ongoing	Singapore Guideline for Good Clinical Practice (SGGCP) Course Online	
8 Oct 2015	Informed Consent and Documentation in a Clinical Trial Seminar	
15 Oct 2015	Grant Preparatory Seminar	
29 Oct 2015	Proper Conduct of Research - Advanced (PC301) Workshop	
16 Nov 2015	Proper Conduct of Research - Advanced (PC302) Workshop	
25 Nov 2015	Getting Your Manuscript Ready for Submission	Tan Tock Seng Hospital (TTSH) CRIO
18 – 19 Feb 2016	Singapore Guideline for Good Clinical Practice Course (Classroom)	NHG Research & Development Office

Dates are subject to changes without prior notice
For registration and full details on courses by:
~ NHG Research & Development Office, please visit www.research.nhg.com.sg (Training & Education ➤ Register for a Course)
~ TTSH CRIO, please contact Ms Jennifer Teo (Jennifer_hp_teo@ttsh.com.sg)

NHG Research Editorial Workgroup

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