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Assessing vision with  
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USE OF TECHNOLOGY TO IMPROVE HEALTHCARE

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Dr Howe Hwee Siew  
- NHG Clinician Investigator

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## Functional Magnetic Resonance Imaging (fMRI) Study: Understanding the Therapeutic Effects of Brain-Computer Interface (BCI) Training Programme in Children with ADHD

Stemming from an earlier study in 2009, the Brain-Computer Interface (BCI) was adapted as a novel alternative treatment for children with Attention Deficit Hyperactivity Disorder (ADHD). **Parents of children who underwent the pilot trial reported significant improvements in both attentive and hyperactivity/impulsivity symptoms in their children.**

However, the study team is also mindful that some parents, in their enthusiasm, may have over-reported the improvements observed in their children at home. Hence, in order to address this concern, a Functional Magnetic Resonance Imaging (fMRI) component has been included in the current, larger, randomised controlled trial (RCT) of the training programme. Children who are undergoing the BCI training programme will now go through a total of 2 fMRI brain imaging; before and after their 24 sessions

of BCI training. The fMRI is to help elucidate the neural mechanism underlying the improvements, and to explain the therapeutic effects of BCI.

Conducting fMRI scans with children with ADHD is not easy. The team faces many challenges, from addressing parents' concerns to conducting the actual scan with the child. "What is fMRI?", "I heard that it's bad for the child", "There's injection, right?", and "It's like X-ray right?" – These are some very common apprehensions raised by parents. It is understandable that most people do not know that fMRI is the most promising and broadly used imaging technology which is safe for children. It is non-invasive (meaning that no injection is needed), and does not involve radiation (unlike X-ray). The study team patiently addresses parents' concerns and ensures that they are comfortable before proceeding with the fMRI brain imaging.

To make the experience more fun and engaging for the child, the team put together a short "space mission" video clip, explaining the fMRI procedures to him/her. Presenting fMRI in a child-like way can help reduce the anxiety or fear prior to the scan, allowing the child to feel more comfortable during the process.

The use of BCI in tandem with fMRI technologies is an up-and-coming field in clinical technology and we are very excited about how we can utilise this technology to better understand our patients, plan their treatment, and monitor their improvement. We have already observed the rewarding effects BCI has on ADHD-participants in the pilot trial. We are now optimistic that fMRI technology can shed some light on how the brain correlates to ADHD, and explain the neural mechanisms underlying the therapeutic effect of BCI.

**The study is a joint-effort between the Institute of Mental Health (IMH), the Institute for Infocomm Research (I<sup>2</sup>R) and Duke-NUS Graduate Medical School. The Principal Investigator is Dr Lim Choon Guan (IMH) and the co-Investigator is Dr Guan Cuntai (I<sup>2</sup>R).**



**Snapshots of the fMRI Video Clip:** To make the fMRI scanning process more comfortable for the child, the team has put together a "space mission" where the child will be tasked to travel in a space shuttle (i.e. the fMRI scanning machine) to destroy an evil villain. The child will need to overcome challenges (i.e. tasks to be completed) while the scan is conducted.

**Ms Wendy Poh Xue Wei**  
Assistant Psychologist  
Department of Child and Adolescent Psychiatry  
Institute of Mental Health

## Reflectance Confocal Microscopy For *in vivo* Skin Imaging Research

In dermatology, an accurate clinical diagnosis can usually be made in about 75–80% of skin tumours. The final diagnosis is usually confirmed by invasive surgical biopsy which can be painful, scar-forming, and time consuming. Therefore, *in vivo* non-invasive diagnostic techniques (e.g. dermoscopy, high frequency ultrasonography, optical coherence tomography and reflectance confocal microscopy (RCM)) have been developed to provide additional information that is not readily available clinically. All these imaging tools are non-invasive and can provide both real-time diagnostics with the possibility of following the progression of skin lesions over time.

Of these, RCM has emerged to be a novel non-invasive imaging technique that allows the "*in vivo*" examination of the skin down to the level of papillary dermis while providing a cellular resolution comparable with histology. This technique has revolutionised dermatology research in the past decade. To date, there

are various studies reporting its usefulness in equivocal melanocytic lesions. For example, differentiating malignant from benign skin tumours such as melanoma from benign melanocytic nevus and basal cell carcinoma (BCC) from intradermal melanocytic nevus. It can also be used to assess tumour clearance following non-surgical treatment of superficial skin tumour such as superficial BCC and squamous cell carcinoma (SCC) *in situ*.

We have recently acquired the RCM machine at the National Skin Centre and **we are the first centre in Southeast Asia with this imaging tool.** I am privileged to be awarded a Health Manpower Development Plan (HMDP) to learn the use of this technique. One of my subspecialty interests is pigmentary disorders and with the skills of RCM, this will enable the study of pigmentary disorders and monitoring response to treatment without needing to biopsy patients. Our pigment team has used RCM in the characterisation of

various hyperpigmentary disorders, such as melasma, lichen planus pigmentosus and vitiligo (for selection for cellular grafting). We hope to apply this in the local population and help to advance our knowledge of pigmentary disorders in Asian skin.



**Dr Chuah Sai Yee**  
Associate Consultant  
Dermatologist  
National Skin Centre

In addition, working with our in-house skin cancer team, **we have started a skin cancer screening clinic using RCM as a complementary tool** in the diagnosis of skin tumour and monitoring the response of skin tumour treated with non-surgical treatment. In future, with improved diagnostic accuracy, this would lead to a reduction of unnecessary surgical excisions. Thus, it may help to reduce the cost associated with surgical biopsy in the management of skin cancer.

## Using Smartphones to Identify High-Risk Locations for Dengue Infection

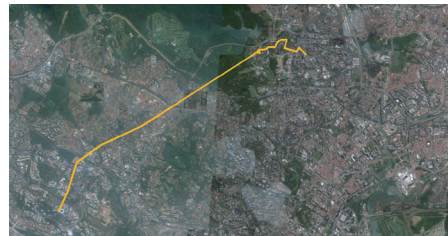
Dengue is an endemic disease which plagues the tropical regions of the world and is endemic to Singapore, with more than 22,000 cases reported in 2013 alone. The dengue viruses are transmitted by female *Aedes aegypti* mosquitoes when taking a blood meal. The mosquito has a limited flight range relative to the range of human hosts, and the movement of infected people is probably the major conduit for the spread of the dengue virus between geographical regions of Singapore.

Studies have suggested that substantial virus transmission occurs away from the home but it is not known where the other two-thirds of locally acquired cases acquired their infections, thus hampering vector control efforts, which are costly to implement.

**The Dengue Mapper phone application (“app”) was developed by Tan Tock Seng Hospital (TTSH) in collaboration with the National University of Singapore (NUS), and tracks the user’s location using GPS, Wi-Fi or cell tower proximity. In this project, we are recruiting patients who have recovered from dengue and controls that matched on demographics, and tracking the location types they visit prospectively following**

convalescence. The objective is to identify types of locations (for instance, parks or hawker centres) that are visited more frequently by people who had dengue recently, and therefore that might have greater risk of having mosquito breeding, or of having dengue infected mosquitoes. By relating visitation patterns to geographic information systems, we hope to provide information on high risk locations that might be targeted for more efficient vector control.

The app is simple to install, and has been written for android smartphones. After installation, the app then runs in the background and will automatically uninstall itself after the study period. Inconvenience to patients and controls is therefore minimised and we hope that they



*Dengue Mapper in action. The yellow line represents the trajectory of an individual who takes the public transport from home to office on a given morning. For demonstration purpose only, not actual research data.*

may continue with their normal activities. To minimise intrusion into their privacy, the app switches itself off at night.

The study leverages on the fact that Singapore has a relatively tech-savvy population with most people using smart phones equipped with location-tracking features. It provides a hassle-free means to identify high risk places. Learning more about movement data empowers healthcare professionals with deeper understanding on how geospatial data analysis plays a primary role in the transmission of infectious diseases like dengue. It will also shed some light on how dengue clusters are possibly formed, how places are connected, and the necessary precautionary measures to be taken to eradicate dengue. Although recruitment is ongoing, this is an example of technology contributing towards public health and hopefully reducing the burden on hospitals during dengue epidemics.

**A/Prof David Lye**  
Senior Consultant

Department of Infectious Disease  
Tan Tock Seng Hospital

**Asst Prof Alex Cook**

Saw Swee Hock School of Public Health  
National University of Singapore

**Ms Keisha Prem**

Saw Swee Hock School of Public Health  
National University of Singapore

## The Journey of Automated LogMAR Visual Acuity Assessment System (ALVAAS)

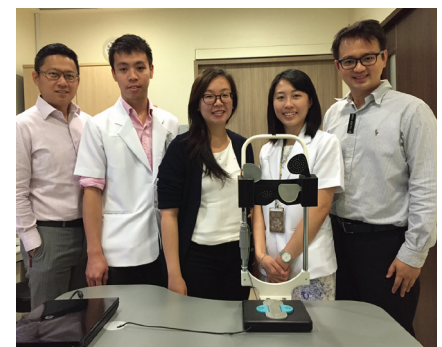
Visual acuity is integral in the management decisions for treatment of ophthalmic conditions such as Age-related Macular Degeneration (AMD) as well as for research. LogMAR designation of visual acuity has proven to be the gold standard of accuracy. However, LogMAR visual acuity requires an assessor with the knowledge of how the measurement is carried out and must be familiar with a rather complex method of calculation of its visual acuity results. In a tertiary eye institution with high patient volume, LogMAR visual acuity testing may place strain on the manpower requirement.

**ALVAAS - Automated LogMAR Visual Acuity Assessment System is an innovative automation of the LogMAR visual acuity testing developed by a joint collaboration between National Healthcare Group Eye Institute (NHGEI) and Nanyang Polytechnic (NYP).** Its purpose is to achieve an accurate gold standard self-assessment of one’s vision as well as to relieve manpower strain.

The idea was first mooted by the current Deputy Group Chief Executive Officer (Education & Research) of the National

Healthcare Group, A/Prof Lim Tock Han and Dr Jimmy Lim (Consultant and Deputy Head of Cornea and Refractive Services, Department of Ophthalmology, TTSH) in 2007. Since 2008, when the first prototype was created by Dr Jimmy Lim and the NYP team, spear-headed by Miss Suneetha Varahamurthy, the ALVAAS team has grown bigger and involved more expertise from other institutions. The system is still undergoing rigorous clinical validations and software algorithm revisions. It has now evolved into a tangible robust platform capable of assessing a candidate’s visual acuity with good accuracy and comparable time efficiency when compared to the traditional manual testing method. Quoting the ALVAAS project leader Dr Jimmy Lim, “Technology has finally caught up with our vision of providing accurate automated visual assessment for the population”.

The potential of this project is immense as it can bring accurate and efficient measurements of vision to primary care institutes and even vision assessment for school children. The potential of improving the productivity in the clinics and other conveniences brought about by the automation is certainly exciting for the team.



*The ALVAAS team (Left to Right): Dr Jimmy Lim, Mr Lai Gin Loen, Dr Tan Xiu Ling, Miss Joannabell Tan, and Dr Philemon Huang*

### Team Members

**Dr Jimmy Lim Wei-Kheong**  
Consultant and Deputy Head of Cornea and Refractive Services

**Dr Philemon Huang**  
Deputy Chief Registrar

**Dr Tan Xiu Ling**  
Registrar

**Miss Joannabell Tan**  
Optometrist

**Mr Lai Gin Loen**  
Research Assistant

**Miss Elizabeth Wong**  
Senior Biostatistician

NHG Eye Institute @ Tan Tock Seng Hospital

**Miss Varahamurthy Suneetha**  
Senior Lecturer  
School of Engineering (Manufacturing)  
Nanyang Polytechnic



## Dermatology Research in the National Skin Centre – Recent Developments

In this second instalment of the “NHG’s Research Journey” series, National Skin Centre is featured to showcase the research developments in the recent years.

National Skin Centre (NSC) is committed to high quality and clinically-relevant research to advance dermatological knowledge and impact clinical care. Research in NSC has grown over the years and here, we highlight several exciting recent developments.

**Skin Research Institute of Singapore (SRIS)**  
In September 2013, the SRIS was established. This tripartite partnership between Agency for Science and Technology (A\*STAR), Nanyang Technological University (NTU) and NSC, aims to establish Singapore as a global centre of excellence for interdisciplinary skin research and innovation.

Following this, the A\*STAR-NHG-NTU Skin Thematic Grant was launched in October 2013 to foster greater multi-disciplinary, collaborative research amongst clinicians, scientists and bioengineers from the 3 partner institutions.

### Research Manpower Development

The NSC Clinician Researcher Track was launched in 2013. Our first recipient, Dr Yey

Hong Liang, Consultant Dermatologist, spent 50% of his time on research. He is the Theme Leader for Itch and has subsequently obtained several new grants to further his research.

In addition, we hope to build a pipeline of young, trained clinician researchers over the next few years. Of note, Dr Etienne Wang, our Associate Consultant, has started his full time PhD Programme in Cellular, Molecular and Biomedical Studies at Columbia University, New York, in September 2013, while Associate Consultant Dr Yew Yik Weng has completed a Masters in Epidemiology & Biostatistics at the Harvard School of Public Health.

### The NSC Biobank

The NSC BioBank was launched in May 2014 and it aims to develop a state of the art immunohistology, tissue and cell repository facility to systematically collect and store skin tissue samples. It will boost the capability of our cell culture laboratory and serve as a valuable resource for skin research in NSC and other academic institutes in Singapore.

### New Research Equipments in NSC

We invested and acquired new research equipments to boost our research capability and support the various core research programs and these include a state of the art *in vivo*

Confocal Microscope for non-invasive bio-imaging of pigmented and inflammatory skin lesions, a VISIA Photography Device for non-invasive, multi-spectra photography and vascularity assessment of the skin, the Aperio ScanScope for scanning histology slides to provide high quality histology images, a thermal sensitivity tester for non-invasive analysis of cutaneous innervation and sensitivity, a high-definition Optical Coherence Tomography for non-invasive 3D imaging of skin structures, and various skin physiology equipment for measurements of skin barrier function, sebum production and skin pH.

Research has made significant progress in NSC and we are committed to expanding research opportunities and enhancing our capabilities as the key national academic dermatology centre in Singapore.

For more information, please contact Ms Veron Lu at [veronlu@nsc.gov.sg](mailto:veronlu@nsc.gov.sg).

**Ms Veron Lu**

Senior Research Executive

**Dr Tey Hong Liang**

Deputy Research Director and Consultant Dermatologist

**A/Prof Mark Tang**

Research Director and Senior Consultant Dermatologist  
National Skin Centre

## Statins for Primary Prevention of Cardiovascular Disease in the Elderly

Statins’ cost-effectiveness will likely remain or even be better in the future, considering inflation and higher overall costs in the future when managing patients with myocardial infarction and stroke with the emergence of newer and more expensive invasive therapies.

**Dr Yong Quek Wei**

Senior Consultant, Department of Cardiology  
Tan Tock Seng Hospital

Singapore has one of the fastest growing ageing population in the world. The elderly, with their higher burden of chronic diseases, are the largest users of drugs. This brings to mind whether some of these drugs will continue to benefit them in their remaining lifespan.

Statins are among the most widely prescribed drugs with well-established benefits to prevent cardiovascular events such as heart attacks and strokes. However, their value in the elderly is less clear. The National Healthcare Group (NHG) Pharmacy and Therapeutics (P&T) Office investigated the clinical and cost-effectiveness of statins for primary prevention of cardiovascular disease (CVD) in the elderly.

Statins significantly reduced the risk of heart attack and stroke but not all-cause death in our meta-analysis of randomised controlled studies involving 20,143 elderly subjects aged 65 years and above. No significant increase in the risk of adverse events such as muscle or liver disorders was observed.

We developed a decision-analytic model to simulate 65-year-old patients without a history of heart attack or stroke over a lifetime. All patients progressed through the model from being “healthy” to experiencing a heart attack, stroke or all-cause death. Local epidemiological and cost data were applied.

Statin treatment was cost-effective over a lifetime; its incremental cost-effectiveness ratio (ICER) of SGD43,925 per quality-adjusted life-year (QALY) gained was below the willingness-to-pay threshold of SGD70,000 (2014 gross domestic product per capita in Singapore). Shortening the time horizon from lifetime to ten years (simulating limited life expectancy) considerably increased the ICER to SGD 291,313 per QALY gained.

QALY is a measure of benefit that incorporates both quantity and quality of life-years. ICER reflects the difference in costs over the difference in benefits (in terms of QALYs) comparing statin and no treatment.

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In all, available evidence supports statin use for primary prevention of CVD in the elderly. Treatment warrants re-evaluation when life expectancy becomes limited as other goals may take precedence over CVD prevention. This research has been presented at the 2015

Canadian Agency for Drugs and Technologies in Health (CADTH) Symposium and published in the journal “Cardiovascular Drugs and Therapy”. The work stems from a successful **collaboration between NHG P&T Office and two institutions**

**- Tan Tock Seng Hospital and National University Hospital.**

**Ms Lin Liang**  
Principal Research Analyst  
P&T Office  
Group Corporate Development  
National Healthcare Group

## Adult-Onset Diabetes Mellitus is Heterogenous: A Far Well from the “All Inclusive Concept”

Diagnosis of diabetes mellitus in an adult is often more challenging than anticipated before. A raised blood glucose per se does not provide any clue on the cause of the disease. However, knowing the specific disease type is of considerable importance since it may directly lead to the right treatment. Therefore, a classification test, helping to separate and distinct categories will be instrumental to enable proper medical decisions about treatment and prognosis.

Recent data suggest that a considerable subset of adult-onset diabetes patients in Asian countries reveal an autoimmune cause of their diabetes, resulting in an undesired destruction of self-tissue by the body’s own immune system. Timely and precise diagnosis of such patients is critical to improve the long-term outcome of these patients.

This particular patient group can now be accurately diagnosed by special tests called radiobinding assays that record the self-destructive activity of the immune system by defining the presence of islet-cell specific

antibodies. To pinpoint this very specific patient cohort a team of researchers from the immune-metabolism laboratory at the Lee Kong Chian School of Medicine (LKCmedicine), NTU, and clinicians and clinician scientists from Tan Tock Seng Hospital (TTSH) are on these kinds of islet autoantibody studies. To ensure standard performance of the assays system applied and to enable comparison on a worldwide basis, LKCmedicine laboratory was the first in Singapore and South East Asia successfully participating in the International Diabetes Autoantibody Standardization Program (DASP) under the supervision of the Centres for Disease Control and Prevention (CDC) in Atlanta, USA.

Using this assay system, a pilot study has been performed in a cohort of so-called Type 2 diabetic patients from Singapore. More than 8% of adult-onset diabetic patients reveal this kind of diabetes subtype. Disease-onset in these patients is at a younger age compared to classical Type 2 diabetes patients and they are more prone to diabetes related complications.

**Professor Bernhard Otto Boehm**  
Professor and Scientific Director of Metabolic Disease  
Research Program  
Lee Kong Chian School of Medicine

Deputy Director (Clinical)  
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(NITHM), Nanyang Technological University

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**Dr Daniel Chew**  
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**Dr Rinkoo Dalan**  
Senior Consultant  
Department of Endocrinology  
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Research Fellow  
Lee Kong Chian School of Medicine  
Nanyang Technological University

**Ms Jovina Tan Zhi Qi**  
Research Assistant  
Lee Kong Chian School of Medicine  
Nanyang Technological University

## Mental Health Research: An Administrator’s Perspective

**Research work is always changing. Every study requires a customised and unique kind of administration.**

Jenny started as a Research Assistant working on her first mental health study “Pharmacogenetics of Tardive Dyskinesia” led by Prof Chong Siow Ann, Vice Chairman, Medical Board (Research). Since then, she has been actively involved in coordinating various clinical trials and research projects. As a research administrator, Jenny supports

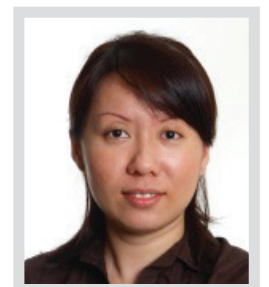
the division in her role as the central resource in providing critical information and administrative support to the Clinical Research Committee, Clinical Trial Unit and all investigators in the hospital who undertake clinical research projects or trials.

She also acts as a liaison between various ethics committees, funding agencies, stakeholders and researchers. Another area of responsibility is to ensure that the grant for each research project is efficiently and prudently used.

On why she chose a career in research administration, Jenny said “Research work is always changing. Every study requires a customised and unique kind of administration. I enjoy working on different kinds of research projects as it is challenging and definitely not mundane. To be with the team from the beginning till completion of each project and witness its fruition when the study is published in journals gives me a great sense of

accomplishment and satisfaction. This is what motivates me in my job”.

“I hope that in my own small ways, I can contribute towards more research projects to further the study of mental health so as to better understand and improve treatment and care for those affected by mental illness,” she added. Ms Jenny Tay, has been with Research Division since 2007.



**Jenny Tay**  
Assistant Manager  
Research Division  
Institute of Mental Health

# Congratulations

to awardees of

## National Medical Research Council (NMRC) Clinician Scientist Award (CSA)



**A/Prof Melvin Leow Khee Shing**

*Senior Consultant,  
Dept of Endocrinology,  
Tan Tock Seng Hospital*

## National Medical Research Council (NMRC) Transition Award (TA)



**Dr Tey Hong Liang**  
*Consultant Dermatologist,  
National Skin Centre*



**Dr Colin Tan Siang Hui**  
*Senior Consultant,  
Dept of Ophthalmology,  
Tan Tock Seng Hospital*

## National Healthcare Group (NHG) Clinician Investigator (CI) Scheme

The Clinician Investigator (CI) Scheme is a research manpower development programme administered by the NHG Research & Development Office (RDO). The CI Scheme is designed for established clinicians who wish to incorporate research into their clinical expertise with the aim of improving healthcare.

In this issue, we have Dr Howe Hwee Siew (Senior Consultant, Department of Rheumatology, Allergy and Immunology, Tan Tock Seng Hospital), an FY2014 awardee, shares with us on her receiving of the award. For more information of the CI Scheme and the awardees, please visit [www.research.nhg.com.sg](http://www.research.nhg.com.sg) (Grants & Programmes → Research Career Development).

### *What motivated you to apply for the CI Scheme?*

I required protected time to do the work for the several grants I hold, as a Principal Investigator. While my clinical load has not increased, the time taken to complete each clinic session has lengthened due to various factors. For example, entering medical notes electronically and dealing with investigations is much more time consuming.

### *What are some of the challenges faced when embarking on your research journey?*

I think many of us, on return from Health Manpower Development Plan (HMDP) training, are fired with enthusiasm to implement the knowledge we have acquired. However, any change is likely to occur in small steps, so unless we are aware of this, the enthusiasm will fade and the efforts to implement new things will sputter.

Notwithstanding this, the research culture and environment has transformed radically in the last two decades. I think that younger specialists have many more opportunities to do research in the clinical hospital setting compared to what was available when I was at their stage.

### *On a lighter note, what do you like most about research?*

What I like most about research is that it compels you to delve further into the topic you are researching. This really deepens your understanding of the medical condition and consequently new thoughts and ideas are generated. This, to me is also the most important reason why clinicians should do research; so that their understanding of disease is expanded, and their approach to management of the clinical problem enhanced.

### *Being awarded the CI Scheme, what are some of your research plans moving forth?*

I plan to start projects that involve more Associate and junior Consultants, Senior Residents, as well as our rheumatology nurse clinicians. As for the longitudinal studies that are ongoing, I hope to build on these research efforts and to involve younger members of the department, in order to advance and consolidate what our department started on over a decade ago.

### *Any word of advice for aspiring Clinician-Scientists/ Investigators out there?*

I would encourage them to be tenacious in their efforts to continue research in their area of interest, no matter how small, and not be discouraged. Opportunities for advancement will arise if they persevere.



# Biomedical Research Symposium

REHABILITATION  
AGEING  
INFECTIOUS DISEASES  
SKIN

## Posters Exhibition @ Biomedical Research Symposium

There will be a posters exhibition held in conjunction with the symposium where you can find out about NHG's complete roadmap for clinician-scientists development, efforts in fostering collaborations with our research partners and latest innovations. Don't miss the prototypes and demonstrations in the poster exhibition!

Singapore Health & Biomedical Congress ▶▶▶

ADVANCING HEALTHCARE INTO THE FUTURE

2 - 3 October 2015, MAX Atria Singapore EXPO | Organised by National Healthcare Group

INNOVATE  
IMPROVE  
INTEGRATE  
2015

## Qualité

(Issue 19, July 2015) – Education to facilitate high standards of research conduct.

### Newspaper Advertisements, News Stories and Subject Recruitment: Is DSRB Review Required?

Read about how researchers intending to recruit research participants through news stories or articles can adhere to DSRB guidelines for advertising.

### Responsible Conduct of Research (RCR): Data Management Practices

A case study is used to illustrate how collected research data should be appropriately stored and handled.

Click here to read your full issue of *Qualité* (Issue 19, July 2015) or visit [www.research.nhg.com.sg](http://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	
20 Aug 2015	Proper Conduct of Research - Intermediate (PC201) Workshop	
24-25 Aug 2015	Singapore Guideline for Good Clinical Practice Course (Classroom)	
26 Aug 2015	Intellectual Property Seminar (Basic)	
27-28 Aug 2015	14th Healthcare Operations Research Appreciation Course	Health Services & Outcomes Research (HSOR) Unit, NHG
1 Sep 2015	Investigational Product Management Workshop	NHG Research & Development Office
16 Sep 2015	Intellectual Property Seminar (Advanced)	
21-22 Sep 2015	Project Management for Clinical Research Professionals Workshop	
25 Sep 2015	Designing Questionnaire & Clinical Data Form with Data Management	Tan Tock Seng Hospital (TTSH) CRIO

\*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](http://www.research.nhg.com.sg) (Training & Education → Register for a course) ~ TTSH CRIO, please contact Ms Jennifer Teo ([Jennifer\\_hp\\_teo@ttsh.com.sg](mailto:Jennifer_hp_teo@ttsh.com.sg)) ~ HSOR Unit, please contact Ms Cheryl Lobo ([Cheryl\\_lobo@nhg.com.sg](mailto:Cheryl_lobo@nhg.com.sg))

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