

Seminar 8

Application of Artificial Intelligence in Healthcare



Dr. CHEUNG Ngai Tseung

MBBS, BSc(Med), MSc(Comp Sci)

Head of Information Technology And Health Informatics / Chief Medical Informatics Officer, Hospital Authority

Dr. NT Cheung is the Head of Information Technology & Health Informatics and Chief Medical Informatics Officer of the Hong Kong Hospital Authority (HKHA) and also the Consultant for eHealth for the Hong Kong Government. He has taken HA from a virtual "green fields" site to today's situation where clinical information systems have become ubiquitous and indispensable in the care delivery process. His current work focuses on developing the fourth generation of the Clinical Management System (CMS) embracing innovative IT and data driven approaches to enable new and enhanced healthcare service delivery models, on integrating with the wider health care ecosystem via the territory-wide Electronic Health Record Sharing System and in engaging patients directly through HA Go, a one stop eHealth solution for HA patients and their carers.

An AI Strategy for the Hospital Authority

Over the last 3 decades the Hospital Authority (HA) of Hong Kong has gained enormous experience in the use of electronic medical record (EMR) systems to support clinical service and hospital management via the development and operations of the Clinical Management System (CMS) and related systems. In recent years there has been a strong emphasis on the use of innovative technology to allow new models of service delivery and management. These technologies include Big Data and AI, Mobile, Cloud and Internet of Things. The HA has set up an IT Innovation Laboratory and Communities of Practice to explore all of these areas. The HA Data Collaboration Lab (HADCL) has been launched, and university researchers have started several machine learning projects on HA data in the HADCL.

AI in particular has great potential to be a step change agent in healthcare delivery. The ability to predict clinical events, to identify patients at risk, to make better clinical decisions or to automate manual and repetitive workloads promises to transform healthcare delivery. The current AI revolution is largely data driven, and the pervasive use of the CMS over three decades across a 43 hospital network has also led to the accrual of a large pool of detailed, structured and standardized clinical data for nearly 10 million lives. If "Data is the New Oil", then HA is setting on a rich oil field!

However, such a powerful technology could also lead to many unintended consequences. This presentation will highlight how HA will develop her own AI technology and integrate it with the workflow and systems that are already in place. The guiding principles that will guide HA's AI journey will be explained, and early experiences will be described.



Professor Ian CK WONG

PhD, FRCPCH (Hon), FRPharmS

Head and Lo Shiu Kwan Kan Po Ling Endowed Professorship in Pharmacy, Department of Pharmacology and Pharmacy, The University of Hong Kong

As an academic pharmacist with expertise in pharmacoepidemiology and big data research, Professor Wong has over 250 publications with publication in JAMA, JAMA Internal Medicine, JAMA Psychiatry, Lancet Psychiatry, Lancet Infectious Disease, BMJ and PLOS Medicine. According to Clarivate Analytics' Essential Science Indicators, Professor Wong has been a top 1% scholar in 2015 to 2018. Professor Wong has been awarded over £5 million in research grants as the principal applicant and approximately £170 million as a co-applicant. He is also the Founder of a University College London spin-off company which developed three licensed prescription only medicines in Europe.

Application of Healthcare Big Data in the Evaluation of Clinical Outcomes in Patients after H Pylori Eradication Treatment

The importance of observational studies in the evaluation of drug safety and effectiveness has been recognized in recent decades. Data generated from observational studies supplement pre-marketing experimental trials, especially in situations where the outcome of drug exposure is rare, delayed or observed in specific subgroups. In such cases, large databases offer a platform with relatively large sample sizes, long follow-up periods and few ethical issues, and are more cost-effective and efficient compared to interventional studies. Healthcare big databases are an important tool to generate "Real-World Evidence" for medicine research.

The Hong Kong Hospital Authority (HA) has a unified electronic health record system which contains clinical information from all publicly funded primary, secondary, tertiary care and accident and emergency admissions. The Hospital Authority electronic health records platform has the appropriate infrastructure and potential to be developed into a world-class research database, much like the "Clinical Practice Research Datalink" in the UK. Furthermore, it contains important data, including patient demographics, laboratory results, and medical records, that are captured as part of routine clinical management, currently the database contains data from 11 million patients.

In this talk, I will demonstrate the application of Hong Kong Hospital Authority clinical database in evaluating clinical outcomes in patients after H pylori eradication treatment. Specifically, I will present the results of two published studies from our research team in the BMJ [1] and JAMA Internal Medicine [2].

References:

[1] <https://www.bmj.com/content/352/bmj.h6926.long> (open access)

[2] <https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2517922> (open access)

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Professor Cindy LK LAM

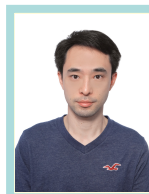
MBBS(HK), MD(HK), FHKAM(Family Medicine), FRCGP

Danny D. B. Ho Professor in Family Medicine & Head, Department of Family Medicine & Primary Care, The University of Hong Kong

Professor Cindy Lo-Kuen LAM, MH, JP, is a specialist in Family Medicine. She is currently Danny D. B. Ho Professor in Family Medicine and Head of the Department of Family Medicine and Primary Care of the University of Hong Kong. She serves as co-Chair of the Grant Review Board of the Health and Medical Research Fund, Government of Hong Kong SAR; Chief Censor of the Hong Kong College of Family Physicians. Her main research interests are primary care quality and outcome evaluation using big clinical data, health-related quality of life and mental health. She has over 350 publications.

Big Routinely Collected Clinical Data—A Treasure Hunt for Best DM Care

Computerization of medical record and digitalization of investigation results and drug prescriptions have enabled structured collection and linkage of big longitudinal data on the process and outcomes of care of very large numbers of people with different characteristics. Big routinely collected clinical data reflect real-world practice that can provide empirical evidence on quality, cost and outcomes of care. Such data are most valuable in research on chronic diseases such as diabetes mellitus. This presentation will describe the use of routinely collected data of 316,869 patients with diabetes mellitus (DM) managed in 73 Hospital Authority primary care clinics from 2009 to 2015 to answer important research questions on risk of complication and mortality, predictors of complications and deaths, service burden and costs, quality of care of DM, and the cost-effectiveness of a structured risk assessment and management (RAMP) intervention for DM. The big data analyses showed that for an average DM patient aged 63 under usual care the risks of any DM complication, CVD and death were 31%, 23% and 21%, respectively, and RAMP was associated with a relative risk reduction by 38%, 49% and 56%, respectively. We found a J-shaped relationship between HbA1c/ blood pressure and risks of CVD/mortality, with HbA1c 7-7.5% and SBP 130-134mmHg and DBP 65-69mmHg associated with the lowest risks. The average annual public service cost for each DM patient without complication was HKD11,015 in 2013, which was increased by 1.2 to 2.6 by each complication, and RAMP saved significant cost from reduction of complications.



Dr. Stanley SC WONG

MBBS (HK), FHKCA, FHKAM (Anaes), FANZCA

Clinical Assistant Professor, Department of Anaesthesiology, The University of Hong Kong

Dr. Wong Sau Ching Stanley, MBBS (HK), FHKCA, FHKAM (Anaesthesiology), FANZCA, graduated from The University of Hong Kong in 2007 and is a Fellow of the Hong Kong College of Anaesthesiologists (HKCA) and the Australian and New Zealand College of Anaesthetists. He was awarded Merit for the HKCA Final Fellowship examination. He obtained his HKCA Fellowship in Pain Medicine in 2017. His research interests include acute postoperative pain management, the effect of anaesthetic drugs and techniques on pain, and molecular signaling mechanisms in animal pain models. He is currently the Deputy Director of the Laboratory and Clinical Research Institute for Pain, The University of Hong Kong.

Big Data for Pain Medicine

Acute postoperative pain remains an important clinical problem, with less than half of patients receiving adequate pain relief. A large patient database of pain related outcomes would help improve the quality of acute postoperative pain control. PAIN OUT is a large international registry project on postoperative pain control involving numerous countries worldwide. By standardizing collection of clinical and patient outcome data, it allows benchmarking between different participating centres. In this talk, we will discuss PAIN OUT and also the development of the PAIN OUT initiative in Hong Kong and Shenzhen.



Dr. Benjamin FANG

MBBS, FRCR, FHKCR, FHKAM (Radiology)

Associate Consultant, Department of Radiology, Queen Mary Hospital, Hong Kong

Dr. Benjamin Fang serves in a multitude of mostly IT related roles in Queen Mary Hospital, Hong Kong College of Radiologists and Hospital Authority Head Office. Apart from serving at the administrative level, he also leads and participates at the technical level in various projects he is involved in. He is currently working closely with Hospital Authority Head Office to develop artificial intelligence tools for radiology and has already achieved some success in bringing about positive clinical impact to radiology service with the help of such tools.

Deep Learning in a Nutshell

The term AI – Artificial Intelligence puts up a grandiose front but does little in conveying what exactly happens behind the scene. The hype surrounding AI in the recent years had been mostly the result of the successes of one type of algorithm, the artificial neural network. While it requires a non-trivial amount of time and effort to acquire the technical skills and understanding to develop such algorithms, the core concepts of how such algorithms work are not difficult to understand. Having a basic understanding of such algorithms can shed insights into the possibilities they bring as well as the limitations they face.