Health Bureau
The Government of the
Hong Kong Special Administrative Region
of the People's Republic of China

Health Research Symposium 2024

26 November 2024

Advancing Health through Research and Technology

Table of Contents

Message from the Secretary for Health

It is my great pleasure to welcome all our distinguished speakers and attendees at the Health Research Symposium 2024.

The theme this year, "*Advancing Health through Research and Technology*", reflects the unwavering conviction of the Government of the Hong Kong SAR in fostering innovation in health and medical research. It also echoes the Chief Executive's 2024 policy initiative to develop Hong Kong into an International Health and Medical Innovation Hub.

The Health and Medical Research Fund (HMRF) has received over HK$ 4 billion public commitment since its establishment in 2011, and has funded over 2 000 investigator-initiated research projects, over 90 research fellowship awards and close to 300 commissioned studies that have shaped clinical practices, health system design, and healthcare policies. The ultimate goal is to promote and protect the health of citizens in Hong Kong.

In the face of the health challenges including ageing population, manpower shortage and emerging diseases, research and technology is the key driver of health advancement. The world has witnessed the power of innovation during the COVID-19 pandemic and benefitted from the fruits of research. The Health Bureau and HMRF allocated over HK$ 550 million in support of COVID-19 related research, of which innovation and technology was a major component. Significant insights have been yielded to support the Government in tackling COVID-19 and in ending the epidemic. I would like to take this opportunity to express my deepest gratitude for the contribution our researchers have made. Long before the COVID-19 pandemic, HMRF has been devoting significant resources to nurture Hong Kong's research and clinical trial capacity, in particular its support for the development of Phase 1 Clinical Trial Centres and enhancement of the capacity for conducting early phase and first-in-human clinical trial for novel pharmaceutical products. The knowledge, research capacity and expertise built up have laid a solid foundation for us to strive forward, making our city very well-positioned to transform into a health and medical innovation hub, leveraging the Guangdong-Hong Kong-Macao Greater Bay Area national strategy. These success stories showcase how HMRF enabled researchers to transform real-world practices, and geared local research community to further their breakthroughs outside Hong Kong, all for the better health of people.

Technology and innovation have been prominent themes in the studies supported by HMRF across the research spectrum and over different health areas, including non-communicable diseases, infectious diseases, primary care and preventive medicine, health system development, as well as health behaviours. Today is an excellent occasion for us to recognise the contribution that the HMRF research community has made to the wellbeing of our people. I am particularly delighted that we will have leading experts in mental health, digital health, proteogenomics and Real World Research from around the world to share with us their insights and experience at the event, fostering learning and synergy.

Above all, the Symposium is also a forum to connect everyone committed to improving the health of our population through research: our academic colleagues, healthcare professionals, policy-makers, community leaders, and friends from different sectors. To further support the translation of scientific evidence into social gains, HMRF will in the coming years put extra efforts in shaping the research translation culture, beginning with our new Research Translation Strategy. May I call upon you all to join hands in supporting this initiative, with in mind the remarks by Dr Françoise Barré-Sinoussi, Nobel Laureate who discovered HIV: "*We are not making science for science. We are making science for the benefit of humanity.*"

I look forward to the insightful discussions and collaborations that will emerge from this Symposium.

Professor Chung-mau LO, BBS, JP
Secretary for Health of the Hong Kong Special Administrative Region

Message from the Permanent Secretary for Health

I am delighted to welcome our esteemed speakers and participants to the Health Research Symposium 2024, themed '*Advancing Health through Research and Technology*'.

The Health Bureau has long been committed to supporting local health research through the Health and Medical Research Fund (HMRF). With over HK$ 4 billion commitment, HMRF has funded over 2 000 investigator-initiated research projects, over 90 research fellowship awards, and close to 300 commissioned studies since its establishment in 2011. With resources of such scale from the public coffer, our research must be impactful to be accountable. I am proud to share that the annual outcome evaluation of HMRF studies has repeatedly demonstrated the solid impact of the studies we fund. With close to 80% of our studies having published in peer-reviewed journals, including some prestigious ones like The Lancet, Nature Medicine, and Science, there is hardly any doubt on the new knowledge our research has generated. HMRF research however does not stop there. It is the mission of HMRF to facilitate not only the generation, but also the application of knowledge derived from local health and medical research, to promote clinical excellence, strengthen healthcare system, inform health policies, and ultimately to improve population health.

HMRF has commissioned a number of studies to support policy making, service planning and evaluation. Mental health is an issue that calls for concerted efforts from every member of society, and we know it is scientific evidence that will unite all actors and guide the way. HMRF has funded major research in mental health through its commissioned programme, focusing on children, adolescents, young people and elderly. The studies have mapped out the unmet mental health needs of our society, generated crucial information to inform policy, and will continue to inspire other research. The new Growth Charts for Hong Kong Children adopted by the Department of Health earlier this year, which is a significantly improved tool for the Hong Kong SAR Government to assess and monitor the growth of our children and adolescents, is another key study funded by the HMRF in recent years. To ensure the cost-effectiveness of various public health programmes, HMRF also funds research that evaluate such programmes, including the Government's Colorectal Cancer Screening Pilot Programme, the Hong Kong Genome Project and the Chronic Disease Co-Care Pilot Scheme. Supporting research of such nature will not only ensure that our public health programmes are effectively addressing the needs of our citizens, but also act as a safeguard for worthwhile investment of public money.

There are plenty of policy questions that need robust scientific findings from our local researchers, and today's Symposium will showcase many more HMRF studies that demonstrated how technology and research have informed healthcare policy formulation and transformed real-world practices. I am delighted that the Symposium will also enable exchanges among international and local experts over a wide range of important health topics, and I hope you will find this Symposium enlightening and inspiring.

Mr Thomas CHAN, JP
Permanent Secretary for Health of the Hong Kong Special Administrative Region

Message from the Under Secretary for Health

It is my honor to welcome all of you to the Health Research Symposium 2024. As the Chairperson of the Organising Committee for the Symposium, I would like to extend my heartfelt thanks to everyone who has made this event possible, for all their generous advice and hard work.

The theme of this Symposium, "*Advancing Health through Research and Technology*", underscores the Hong Kong SAR Government's commitment to leveraging research and technological innovation to improve our citizens' health. The Health and Medical Research Fund (HMRF) has been a cornerstone in nurturing local research capacity, resourcing health and medical research, and building research infrastructure. Our Investigator-initiated projects foster innovative research ideas; our Commissioned programmes invite expert advice to address specific research questions that support policy formulation, service planning and evaluation, while the Research Fellowship Scheme nurtures researchers and professionals in their early to mid-career. These initiatives collectively cultivate an environment where innovation and research can thrive, with an aim to advance our citizens' health. Since its establishment in 2011, HMRF has supported over 2 600 research and health promotion projects by over 5 800 researchers on a wide range of health issues that address the specific needs of Hong Kong, including clinical trials development, primary healthcare and non-communicable diseases, in particular tobacco control, cancer, diabetes and mental health, among others.

HMRF supports only research with the strongest scientific merits and translation potential - all research funded have gone through a rigorous two-tier peer review process involving an extensive network of over 5 000 local and overseas experts. Many of the research supported by HMRF has generated significant impact in improving healthcare services, community health programmes and public health practices. At the Symposium today, 28 research projects and four fellowship awards were selected for presentation, among over 420 high-quality projects. We would also like to celebrate the devotion of our researchers, the power of research and the fruits of public investment. Therefore we invited our Judging Panel members to select among over 310 candidate projects, the recipients for five Excellent Research Awards, two Most Promising Young Researcher Awards, one Excellent Health Promotion Project Award, and five Outstanding Project Team on COVID-19 Research Awards. Many congratulations to all the awardees.

While congratulating the success of the research supported by HMRF, we have been working to further amplify our impact, including the Research Translation Strategy of HMRF. Research translation is about fostering meaningful alliance between researchers and end-users to make research findings relevant and impactful. The Strategy aims to facilitate quality partnerships between researchers and end-users, promote end-of-grant translation, and enhance how our research impact is evaluated. I look forward to you all in supporting this collaborative endeavour. I am confident that the discussions and presentations at the Symposium will inspire new ideas, facilitate collaborations, and ultimately contribute to the betterment of public health.

Dr LEE Ha-yun, Libby, JP
Under Secretary for Health of the Hong Kong Special Administrative Region

Organising Committee of the Health Research Symposium 2024

Chairperson

Dr LEE Ha-yun, Libby, JP
Under Secretary for Health, Health Bureau

Members

Prof David Makram BISHAI
Clinical Professor in Public Health and Director
School of Public Health
Li Ka Shing Faculty of Medicine
The University of Hong Kong

Prof Paul CHAN Kay-sheung
Emeritus Professor and Honorary Clinical Professor
Department of Microbiology
Faculty of Medicine
The Chinese University of Hong Kong

Prof Brian CHUNG Hon-yin
Clinical Associate Professor
Department of Paediatrics and Adolescent Medicine
School of Clinical Medicine
Li Ka Shing Faculty of Medicine
The University of Hong Kong

Dr Raymond LAI Wai-man
Chief Infection Control Officer
Chief Infection Control Officer Office
Hospital Authority

Prof LEUNG Wai-keung
Li Shu Fan Medical Foundation Professor in Gastroenterology
Clinical Professor, Department of Medicine
School of Clinical Medicine
Li Ka Shing Faculty of Medicine
The University of Hong Kong

Prof Ronald MA Ching-wan
Assistant Dean (External Affairs)
S.H. Ho Professor of Diabetes
Professor
Department of Medicine and Therapeutics
Faculty of Medicine
The Chinese University of Hong Kong

Prof David SHUM Ho-keung
Yeung Tsang Wing Yee and Tsang Wing Hing Professor in Neuropsychology
Dean and Chair Professor of Neuropsychology
Department of Rehabilitation Sciences
Faculty of Health and Social Sciences
The Hong Kong Polytechnic University

Prof Martin WONG Chi-sang
Council Member
Hong Kong Academy of Medicine

Prof Samuel WONG Yeung-shan
Associate Dean (Education)
Professor and Director
The Jockey Club School of Public Health and Primary Care
Faculty of Medicine
The Chinese University of Hong Kong

Judging Panels of the Health Research Symposium 2024

Excellent Research Awards and The Most Promising Young Researcher Awards

Dr Raymond LAI Wai-man
Chief Infection Control Officer
Chief Infection Control Officer Office
Hospital Authority

Prof LEUNG Wai-keung
Li Shu Fan Medical Foundation Professor in Gastroenterology
Clinical Professor
Department of Medicine
School of Clinical Medicine
Li Ka Shing Faculty of Medicine
The University of Hong Kong

Prof Ronald MA Ching-wan
Assistant Dean (External Affairs)
S.H. Ho Professor of Diabetes
Professor
Department of Medicine and Therapeutics
Faculty of Medicine
The Chinese University of Hong Kong

Prof David SHUM Ho-keung
Yeung Tsang Wing Yee and Tsang Wing Hing Professor in Neuropsychology
Dean and Chair Professor of Neuropsychology
Department of Rehabilitation Sciences
Faculty of Health and Social Sciences
The Hong Kong Polytechnic University

Excellent Health Promotion Project Award

Prof David Makram BISHAI
Clinical Professor in Public Health and Director
School of Public Health
Li Ka Shing Faculty of Medicine
The University of Hong Kong

Prof Samuel WONG Yeung-shan
Associate Dean (Education)
Professor and Director
The Jockey Club School of Public Health and Primary Care
Faculty of Medicine
The Chinese University of Hong Kong

Best Poster Awards

Prof David Makram BISHAI
Clinical Professor in Public Health and Director
School of Public Health
Li Ka Shing Faculty of Medicine
The University of Hong Kong

Prof Paul CHAN Kay-sheung
Emeritus Professor and Honorary Clinical Professor
Department of Microbiology
Faculty of Medicine
The Chinese University of Hong Kong

Prof Brian CHUNG Hon-yin
Clinical Associate Professor
Department of Paediatrics and Adolescent Medicine
School of Clinical Medicine
Li Ka Shing Faculty of Medicine
The University of Hong Kong

Dr Raymond LAI Wai-man
Chief Infection Control Officer
Chief Infection Control Officer Office
Hospital Authority

Prof Martin WONG Chi-sang
Council Member
Hong Kong Academy of Medicine

Outstanding Project Teams on COVID-19 Research Awards

Chairperson

Dr LEE Ha-yun, Libby, JP
Under Secretary for Health
Health Bureau

Members

Dr CHING Wai-kuen
Director (Strategy and Planning)
Hospital Authority
(Representative from Hospital Authority)

Dr LEUNG Yiu-hong
Head
Emergency Response and Programme Management Branch
Department of Health
(Representative from Department of Health)

Dr Thomas TSANG Ho-fai
Chairman
Cancer Expert Working Group on Cancer Prevention and Screening
(Chairperson of the Assessment Panel on the Commissioned Research on COVID-19)

Awards

Excellent Research Awards

Principal Applicant	Project Title (Project No.)
Prof Richard CHOY Kwong-wai The Chinese University of Hong Kong	Whole genome sequencing analysis of genetically undiagnosed euploid fetuses with increased nuchal translucency (04152666)
Prof HAN Quan-bin Hong Kong Baptist University	Application of polysaccharide as chemical marker in quality control of saccharide-dominant Chinese medicines: Cordyceps sinensis, a case study (14150521)
Prof Margaret IP The Chinese University of Hong Kong	Dissecting human and animal Streptococcus agalactiae (Group B streptococcus) and its resistance determinants through territory-wide sampling (17160212)
Prof Cindy LAM Lo-kuen The University of Hong Kong	10-year risk prediction models of complications and mortality of diabetes mellitus in Chinese patients in primary care in Hong Kong (14151181)
Prof Simon NG Siu-man The Chinese University of Hong Kong	Endoscopic submucosal dissection (ESD) versus transanal minimally invasive surgery (TAMIS) for early rectal neoplasms: a prospective randomized controlled trial (04153006)

The Most Promising Young Researcher Awards

Principal Applicant	Project Title (Project No.)
Dr Shara LEE Wee-yee The Polytechnic University of Hong Kong	Prevention of vasovagal reactions in blood donors: A randomized double-blinded controlled comparison of efficacy and haemodynamic effects of oral prehydration fluids (12130371)
Prof WANG Zixin The Chinese University of Hong Kong	A randomized controlled trial evaluating efficacy of promoting Human Papillomavirus (HPV) vaccination among Chinese men who have sex with men (13141651)

Excellent Health Promotion Project Award

Principal Applicant	Project Title (Project No.)
Prof Winnie MAK Wing-sze The Chinese University of Hong Kong	Mindful flourishing-promoting college students' mental well-being through cultivation of mindfulness with online and offline approaches (01170708)

Awards

Outstanding Project Team on COVID-19 Research Awards

Principal Applicant	Project Title (Project No.)
Prof Francis CHAN Ka-leung The Chinese University of Hong Kong	Novel strategies to facilitate early detection, prevention and Intervention for long-Term Health problems related to COVID-19 (NovITor-COVID study) (COVID1903002)
Prof Philip LI Hei The University of Hong Kong	HKU Optimizing Protection and Effectiveness (HOPE) of COVID19 Vaccines (COVID1903011)
Prof Leo POON Lit-man The University of Hong Kong	Stability and transmissibility of 2019-nCoV (COVID190116)
Prof YUEN Kwok-yung The University of Hong Kong	Clinical study of flu-based and PD1-based vaccines for the SARS-CoV2 (COVID190123)
Ir Prof ZHANG Tong The University of Hong Kong	Strengthening sewage surveillance for SARS-CoV-2 (COVID1903015)

Programme

Venue	Run Run Shaw Hall	Pao Yue Kong Auditorium	Lim Por Yen Lecture Theatre	Function Room 1	Function Room 2

Time	Programme
09:00 – 09:10	**Opening Ceremony**
09:10 – 10:30	**Keynote Lectures:** **Digital Health and Research in Non-communicable Diseases** **Moderator: Prof LAU Chak-sing, Research Council member** **Keynote Lecture I – *How to Create a Mentally Healthy Population*** **Professor Anthony JORM** *Centre for Mental Health and Community Wellbeing, Melbourne School of Population and Global Health, University of Melbourne, Australia* **Keynote Lecture II – *Digital Innovation in Primary Care*** **Dr Alexander NG** *President, Tencent Healthcare* Live stream available | Live stream available
10:30 – 10:55	Coffee Break / Poster Session
10:30 – 10:45	**Sharing Sessions on Research Fellowship Scheme** ***SS1** Personalized Risk-based Care and Education for Early Survivors of Childhood Cancer in Hong Kong* **Prof CHEUNG Yin-ting** The Chinese University of Hong Kong ***SS2** The Increasing Incidence of Anaphylaxis in Hong Kong: A Westernized Allergy Trend and the Importance of Early Intervention* **Prof Agnes LEUNG Sze-yin** The Chinese University of Hong Kong
10:55 – 12:55	**Parallel Session 1 –** **Primary Care and Preventive Medicine** **Moderator : Prof Samuel WONG Yeung-shan, Research Council member** ***PS1.1** Using information communication technology (WhatsApp/WeChat) to deliver Brief Motivational Interviewing (i-BMI) to promote smoking cessation among smokers with chronic diseases* **Prof William LI Ho-cheung** The Chinese University of Hong Kong ***PS1.2** Combined brief cessation intervention for expectant fathers who smoke: a multi-centre, pragmatic randomised controlled trial* **Prof Kelvin WANG Man-ping** The University of Hong Kong ***PS1.3** Exposure to alcohol social media marketing and associations with young adult's drinking expectancies and behaviours: a study to inform regulation and health promotion* **Prof KIM Jean-hee** The Chinese University of Hong Kong ***PS1.4** Effect of a family-based multimedia intervention on the uptake of colorectal cancer screening among South Asian older adults in Hong Kong: a cluster-randomised control trial* **Prof Winnie SO Kwok-wei** The Chinese University of Hong Kong ***PS1.5** A community health worker-led multimedia intervention to increase cervical cancer screening uptake among South Asian women: a randomized controlled trial* **Prof WONG Cho-lee** The Chinese University of Hong Kong ***PS1.6** Building capacity to promote winter health in elderly: co-production of a volunteer-based home care programme for post-discharged elderlies by medical-social-academic sector* **Prof Eliza WONG Lai-yi** The Chinese University of Hong Kong **Parallel Session 2 –** **Non-communicable Diseases including Mental Health** **Moderator : Prof Juliana CHAN Chung-ngor, Research Council member** ***PS2.1** The effectiveness of an orthogeriatric multidisciplinary care model in improving clinical outcomes and cost-effectiveness for fragility hip fractures* **Prof Frankie LEUNG Ka-li** The University of Hong Kong ***PS2.2** "COMBO-KEY" (Coaching Ongoing Momentum Building On stroKe rEcovery journeY) - a home visiting and phone coaching programme to promote stroke survivors' recovery: a territory-wide project* **Prof Suzanne LO Hoi-shan** The Chinese University of Hong Kong ***PS2.3** Promoting brain health among people with suboptimal cognitive functioning in Hong Kong: A Brain Vitality Enhancement (BRAVE) programme* **Prof Polly LI Wai-chi** The University of Hong Kong ***PS2.4** The cost-effectiveness of myopia control to retard the progression from high myopia* **Dr LIAN Jinxiao** The Hong Kong Polytechnic University ***PS2.5** Striking a balance between cost, effectiveness and efficiency of emergency departments in Hong Kong: An integrated approach of data analytics, simulation, and system optimization* **Prof KUO Yong-hong** The University of Hong Kong Live stream available **Parallel Session 3 –** **Infectious Diseases I** **Moderator : Dr Thomas TSANG Ho-fai, Grant Review Board Executive** ***PS3.1** Epidemic Intelligence and Data Informed Risk Assessment for a System of Early Detection, Readiness, Timely Response and Recovery for Emerging and Re-Emerging Infectious Diseases: A Synthesis of Health System Research and Contextual Knowledge in the COVID-19 Pandemic* **Prof YEOH Eng-kiong** The Chinese University of Hong Kong ***PS3.2** Coronavirus disease-19 (COVID-19) Vaccination in Adolescents and Children (COVAC)* **Prof LAU Yu-lung** The University of Hong Kong ***PS3.3** Monitoring the effectiveness of vaccines and antivirals for COVID-19* **Prof Benjamin John COWLING** The University of Hong Kong ***PS3.4** A low-cost handheld device for decentralised detection of SARS-CoV-2 and host response in COVID-19 patients: development and evaluation* **Prof YIP Shea-ping** The Hong Kong Polytechnic University Live stream available

Programme

Venue	Run Run Shaw Hall	Pao Yue Kong Auditorium	Lim Por Yen Lecture Theatre	Function Room 1	Function Room 2

Time	Programme
12:55 – 14:05	Lunch / Poster Session
14:05 – 16:05	**Parallel Session 4 –** **Advanced Technologies** **Moderator : Prof Gilberto LEUNG Ka-kit, Research Council member** ***PS4.1*** *Long noncoding RNA profiling by whole transcriptome sequencing for classification and prognostication in adult acute myeloid leukaemia* **Dr IP Ho-wan** Queen Mary Hospital ***PS4.2*** *Disease burden of chronic viral hepatitis in Hong Kong – towards eliminating viral hepatitis by year 2030 according to World Health Organization (WHO) targets* ***and*** *Risk of hepatocellular carcinoma in patients with chronic hepatitis B achieved complete viral suppression – role of on-treatment hepatitis B surface/core-related antigen (HBsAg/ HBcrAg) levels* **Prof Grace WONG Lai-hung** The Chinese University of Hong Kong ***PS4.3*** *The incidence of intrauterine adhesion after ultrasound-guided manual vacuum aspiration (USG-MVA): A prospective randomized controlled trial* **Prof Jacqueline CHUNG Pui-wah** The Chinese University of Hong Kong ***PS4.4*** *Prospective comparative study investigating agreement between tele-ophthalmology and face-to-face consultations in patients presenting with chronic visual loss* **Prof Kendrick Co SHIH** The University of Hong Kong ***PS4.5*** *A randomised controlled clinical trial comparing subthreshold micropulse yellow (577nm) laser versus half-dose photodynamic therapy for central serous chorioretinopathy* **Prof Mårten Erik BRELÉN** The Chinese University of Hong Kong ***PS4.6*** *Precision Diagnosis of Intracranial Atherosclerosis by Using High-Resolution MRI: Plaque Morphology and/ or Components rather than Arterial Stenosis Predict Stroke Recurrence* **Dr Fiona CHEN Xiangyan** The Hong Kong Polytechnic University Live stream available Live stream available	**Parallel Session 5 –** **Infectious Diseases II** **Moderator : Prof YIP Shea-ping, Grant Review Board member** ***PS5.1*** *Early biomarkers in SARS-CoV-2 infection: correlation with short/ medium/ long-term clinical outcomes, and implications on acute patient management and long-term medical and health care* **Prof Paul CHAN Kay-sheung** The Chinese University of Hong Kong ***PS5.2*** *Long-term longitudinal comparisons of health status and immune responses in convalescent COVID-19 and vaccinated cohorts in Hong Kong* **Prof David HUI Shu-cheong** The Chinese University of Hong Kong ***PS5.3*** *Community based sero-epidemiological study of COVID-19* **Prof Joseph WU Tsz-kei** The University of Hong Kong ***PS5.4*** *Evaluation of the seroepidemiology of hepatitis A and B in the general population for informing the development of new hepatitis vaccination strategies in Hong Kong* **Prof LEE Shui-shan** The Chinese University of Hong Kong ***PS5.5*** *Preferences and cost-effectiveness of case detection and management strategies for chlamydia control in Hong Kong* **Prof William WONG Chi-wai** The University of Hong Kong ***PS5.6*** *A randomized controlled trial evaluating an online intervention based on the Trans-Theoretical Model in increasing seasonal influenza vaccination among community dwelling people aged ≥65 years* **Prof WANG Zixin** The Chinese University of Hong Kong ***PS5.7*** *Multi-stream data-driven forecasting of influenza activity and associated hospital admission burden: an implication for impact assessment of COVID-19 pandemic on 2019/20 winter influenza season in Hong Kong* **Prof Sheikh Taslim ALI** The University of Hong Kong Live stream available
16:05 – 16:25	Coffee Break / Poster Session
16:05 – 16:20	**Sharing Sessions on Research Fellowship Scheme**
	SS3 *The effect of alcohol pricing policies on public health: a modelling study* **Prof QUAN Jianchao** The University of Hong Kong	***SS4*** *Evaluating the impact of sugar-sweetened beverages tax in Hong Kong: An integrated study* **Prof CHONG Ka-chun** The Chinese University of Hong Kong
16:25 – 17:45	**Keynote Lectures:** **Big Data and Advanced Technology** **Moderator : Prof Philip CHIU Wai-yan, Research Council member** **Keynote Lecture III –** ***Harnessing the Power of Proteogenomics in Population Biobanks to Advance Precision Health*** **Prof CHEN Zhengming** *Richard Peto Chair Professor in Epidemiology, Nuffield Department of Population Health, University of Oxford, United Kingdom* **Keynote Lecture IV –** ***Opportunities for High-Quality Real World Research*** **Prof Corinne FAIVRE-FINN** *Professor of Thoracic Radiation Oncology, Division of Cancer Sciences, The University of Manchester, United Kingdom*
17:45 – 17:55	**Award Ceremony**
17:55 – 18:00	**Closing Remarks**	Live stream available	Live stream available

Keynote Lectures

How to Create a Mentally Healthy Population

Professor Anthony JORM

Centre for Mental Health and Community Wellbeing
Melbourne School of Population and Global Health
University of Melbourne
Australia

Professor Anthony Jorm is an Emeritus Professor at the University of Melbourne and National Health & Medical Research Council Leadership Fellow. His research focuses on building the community's capacity for prevention and early intervention with mental disorders. He also has expertise on the use of consensus methods in science. He is Editor-in-Chief of the journal Mental Health & Prevention and co-founder and Director of the not-for-profit organization Mental Health First Aid International. He has been listed in various rankings as one of the world's most cited researchers in Psychology and Psychiatry. He was recently awarded the prestigious James McKeen Cattell Fellow Award by the Association for Psychological Science.

How to Create a Mentally Healthy Population

Population surveys from many countries have shown that mental disorders have a high prevalence, but many people affected do not receive treatment. Efforts have been made to improve population mental health by reducing this “treatment gap”. However, increasing the availability of pharmacological and psychological treatment has not improved population mental health. Two reasons for this are that treatments are often of inadequate quality (the “quality gap”) and that prevention has been neglected (the “prevention gap”). In the area of prevention, there are a range of programs that work and have a positive return on investment, which are not being implemented. These include e-health and parenting interventions for prevention of anxiety in young people, interventions to reduce loneliness in older people, exercise and psychological interventions to prevent post-natal depression, and school-based programmes to reduce bullying. However, major benefits will require action on early childhood adversities and other social determinants of mental ill health such as unemployment, poverty, adverse workplace factors, low social connectedness and poor diet. For lower-income countries, efforts to improve indicators of human development are also likely to have a mental health benefit. Some nations are implementing well-being measurement frameworks as a step towards a “well-being economy”, and these will be important for monitoring national progress in creating mentally healthy populations.

Keynote Lectures

Digital Innovation in Primary Care

Dr Alexander NG

President, Tencent Healthcare

Dr Alexander Ng's personal mission is to support the under-privileged, the under-served and make this world a more equitable place.

Dr Ng is currently leading Tencent Healthcare to support healthcare industry's digital innovation and transformation. Tencent Healthcare currently connects and smoothens the process of accessing online and offline healthcare services for individuals on Tencent Healthcare mini-programme, and also provides AI and cloud solutions to health agencies, hospitals, medical institutions, and pharmaceutical companies.

Dr Ng serves as an expert on the WHO Digital Health Technical Advisory Group and Honorary Professor at the University of Hong Kong. Before joining Tencent, Dr Ng was the Deputy Director for Health Innovation and Partnership at the Bill & Melinda Gates Foundation and Associate Partner at McKinsey & Company.

Dr Ng is a trained physician from New Zealand where he served as the Chief Resident at Middlemore Hospital in Auckland. He received his medical qualifications from the University of Auckland, a Master of Public Health from Harvard University and Postgraduate Diploma in Health Informatics from the University of Otago.

Digital Innovation in Primary Care

As burden of chronic diseases continues to rise, novel scientific discoveries continue to change the paradigm of clinical medicine, the legacy of COVID-19 continues to change how the population views healthcare, the healthcare workforce is under increasing pressure to adapt.

Primary care is often seen as the first line of defense of the healthcare system to absorb this pressure. Instead of being the traditional gatekeeper, primary care needs to be more like the conductor of an orchestra. But in this day and age, this orchestra looks different, behaves differently, and plays to a much more diverse audience who enjoys music differently. If everyone enjoys music differently, how come we expect a one size fit all approach will work for primary care? How can we equip primary care with tools to engage and influence our patients, to keep them healthy, and do this at scale?

This lecture aims to provide a different perspective on how to think about the role of primary care in the age of mobile and AI, what is possible and what is not (yet), and what type of research we should invest in build the digital infrastructure for the future?

Keynote Lectures

Harnessing the Power of Proteogenomics in Population Biobanks to Advance Precision Health

Professor CHEN Zhengming

Richard Peto Chair Professor in Epidemiology
Nuffield Department of Population Health
University of Oxford
United Kingdom

Professor Chen Zhengming is an elected Member of Academia Europaea and inaugural Richard Peto Chair Professor in Epidemiology at the Nuffield Department of Population Health, University of Oxford. He qualified in medicine at Shanghai Medical University in 1983, followed by further postgraduate training in public Health in China and DPhil in Epidemiology at University of Oxford in 1991. His main research concerns causes, prevention and treatment of major chronic diseases of adults (e.g. IHD, stroke, diabetes, cancer) and development of precision health, using big data and multi-omics approaches. Over the last three decades, he has led several large randomised trials of stroke, heart diseases and certain cancers involving in total >100,000 patients, leading to major changes of international guidelines and clinical practice. In 2003, he initiated, designed and established in collaboration with research institutes in China, and has led ever since as UK PI, the China Kadoorie Biobank of >512,000 adults (www.ckbiobank.org), which will continue for the next 15-20 years. In Oxford he leads a large and expanding multi-disciplinary research team. He has published >640 papers (h-Index: >120; total citations>100,000), with expertise in a range of research areas including epidemiology, proteomics, genomic medicine and clinical trials.

Harnessing the Power of Proteogenomic in Population Biobanks to Advance Precision Health

Despite recent advances, our ability to prevent, predict and treat chronic non-communicable diseases (e.g. IHD, stroke, cancer and diabetes) is still limited. Understanding what causes these diseases in diverse populations with different lifestyles, environments and genetic architectures is essential for disease prevention and the development of "precision health". Unique opportunities to fulfill these goals are offered by prospective biobank studies in different populations around the world, with detailed characterisation of large numbers of apparently healthy individuals from the general population. In the last decade many large prospective biobank studies (e.g. UK B, CKB, ALL of Us) are being or have been established around the world, with extensive data collected on lifestyle, environmental, and physiological factors and with long-term electronic monitoring of their health status. These exposure and health outcome data are now being complemented by large-scale assays of stored biological samples, including genomics and proteomics. Proteomics offers unique insights into human biology and drug development and the advent of high-throughput affinity-based protein profiling technologies (e.g. aptamer-based SomaScan or antibody-based OLINK platform) now enable cost-effective and high throughput quantification of plasma levels of thousands of different protein markers in biobanks. These, together with genetic data, will enable scientists to make many important discoveries relevant to risk prediction, early diagnosis, drug target identification, and better understanding of disease aetiology, ageing and biology. The talk will highlight recent large-scale applications of proteomics technologies in biobanks and key novel findings relevant for the development of precision health.

Keynote Lectures

Opportunities for High-Quality Real World Research

Professor Corinne FAIVRE-FINN

Professor of Thoracic Radiation Oncology
Division of Cancer Sciences
The University of Manchester
United Kingdom

Professor Corinne Faivre-Finn is a Professor of Thoracic Radiation Oncology at the University of Manchester and Honorary Consultant Clinical Oncologist. She has numerous professional roles including radiotherapy research lead for Manchester Cancer Research Centre & the Cancer Research UK Lung Cancer Centre of Excellence, Chair of the ESTRO Lung Focus Group and Radiotherapy Chair of the EORTC Lung Group.

She has led numerous trials studying radiotherapy in lung cancer and is an author of international guidelines on the management of patients with lung cancer (ESMO, BTS, EORTC, ESTRO, ERS, ASTRO). In recent years, recognising the limitation of conventional clinical trials, she has developed a keen interest in real word data and pragmatic trials. She leads a programme of research focused on the concept of rapid-learning and an electronic patient reported outcome initiative at her institution.

She was awarded Christie international researcher of the year in 2016, Jim Cox Lectureship Award by IASLC in 2019, ESTRO "Honorary Physicist" award in 2022 and became an NIHR Senior Investigator in 2023.

She has published more than 300 original articles and has an H-index of 71 (06/2024).

Opportunities for High-Quality Real World Research

The increasing interest in Real World Data (RWD) and Real World Evidence (RWE) offers an opportunity to bridge the evidence gaps where clinical trial data is unavailable or difficult to obtain. This keynote lecture will explore the significant advancements in accessing and utilising RWD, spanning local hospital databases, regional care records, national repositories, and internationally collaborative studies enabled by federated learning approaches.

Key topics that will be discussed within the keynote lecture include:

- Definition of RWD and RWE: Understanding the fundamentals and distinctions of RWD and RWE.
- The Need for RWE: Addressing why RWE is crucial in the current healthcare landscape.
- Role of RWE: Highlighting RWE as an alternative to Randomized Controlled Trials in specific scenarios.
- Infrastructure for RWE Research: Identifying the necessary infrastructure to support high-quality RWE research.
- Federated Learning: Exploring how federated learning facilitates international collaboration while maintaining data privacy.
- Christie NHS Foundation Trust's Experience: Sharing practical insights and experiences with RWD at the Christie NHS Foundation Trust.
- Opportunities with High-Quality RWD: Discussing the potential and future opportunities presented by high-quality RWD.
- RAPID-RT Study Exemplar: Showcasing the RAPID-RT study as an exemplary model of successful RWD application.

This lecture aims to illuminate the transformative potential of high-quality RWD and RWE in modern healthcare research, emphasising the practical applications and future opportunities for enhancing evidence-based medical practice.

Parallel Session 1 –
Primary Care and Preventive Medicine

PS1.1 - Using information communication technology (WhatsApp/WeChat) to deliver Brief Motivational Interviewing (i-BMI) to promote smoking cessation among smokers with chronic diseases

Prof William LI Ho-cheung[1], Prof Kelvin WANG[2], Dr Laurie HO[1], Dr XIA Wei[3], Dr Derek CHEUNG[2], Prof LAM Tai-hing[4]

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Introduction:
Despite evidence showing that continued smoking in patients with chronic diseases can reduce treatment efficacy and increase the risk of disease progression and multimorbidity, many of them either have no intention of quitting or have failed in their attempts to quit.

Objectives:
To determine the feasibility, acceptability and potential efficacy of a general health promotion approach using brief motivational interviewing with instant messaging to help smokers with chronic diseases quit smoking.

Methods:
A randomized controlled trial was conducted in a special out-patient clinic. Between June 1, 2019, and July 17, 2020, 60 Chinese smokers with chronic diseases who had no intention of quitting smoking but were willing to take other measures to improve their health were recruited. Participants were randomly assigned to either an intervention group (n = 30) received a brief face-to-face motivational interviewing in the clinic and subsequently via WhatsApp/WeChat for 6 months to assist them with their chosen behavioural changes or a control group (n = 30) received only a smoking cessation booklet. Outcome measures included self-reported 7-day point prevalence of smoking abstinence, and any behavioural change reported by the participants at 6 and 12 months. Biochemical validation was performed for those who verbally reported a 7-day point prevalence of smoking abstinence at 12 months.

Results:
The response rate was 73.2%. Retention rates at 6-month and 12-month follow-up were 83.3 and 71.7%, respectively. Process evaluation showed that participants were satisfied with the content of the brief motivational interviewing messages and appreciated the use of instant messaging to provide them with professional advice and support in managing their health-related lifestyles. The rate of biochemically validated abstinence at 12 months was higher in the intervention group than in the control group (16.7% [5 of 30] vs 6.7% [2 of 30], adjusted odd ratio 2.4, 95% confidence interval, 0.43–13.75; P =.32), although the difference was not statistically significant. In addition, a higher proportion of participants reported behavioural changes at 6 and 12 months in the intervention group.

Conclusion:
This study demonstrates the potential efficacy, acceptability and feasibility of the proposed intervention in helping smokers with chronic diseases quit smoking. A fully powered randomized controlled trial is needed to provide a rigorous empirical evaluation of its efficacy. It is anticipated that the proposed intervention can be used to create a new smoking cessation service model for this group of smokers, thereby improving population health and saving more lives.

Project Number: 16172831

Parallel Session 1 –
Primary Care and Preventive Medicine

PS1.2 - Combined brief cessation intervention for expectant fathers who smoke: a multi-centre, pragmatic randomised controlled trial

A combined cessation intervention with brief advice, nicotine replacement therapy sampling and active referral (BANSAR) for smoking fathers: a multicenter, single-blinded, pragmatic randomised controlled trial

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Introduction:
Pregnancy presents a teachable moment to motivate expectant fathers to quit smoking, but effective intervention that can be readily implemented in prenatal services is lacking.

Objectives:
To test the effectiveness of a combined brief intervention in promoting smoking cessation among expectant fathers who smoke.

Methods:
This 2-arm, pragmatic randomised controlled trial was conducted in prenatal clinics of 7 public hospitals in Hong Kong. Participants were male daily smokers whose partners were pregnant and non-smoking. All participants received nurse-led brief cessation advice at baseline. The intervention group additionally received 1-week sample of nicotine replacement therapy (NRT) and active referral to an external smoking cessation service of their choices. The primary outcome was biochemically validated tobacco abstinence confirmed by an exhaled carbon monoxide level of <4 parts per million at 6 months after randomisation. The secondary outcomes included self-reported abstinence, use of NRT and cessation services at 3 and 6 months. Intention-to-treat analyses were used, assuming participants with missing data were non-abstinent. The trial was registered with ClinicalTrials.gov (NCT03671707).

Results:
From October 2018 to February 2020, 1053 participants were randomised to the intervention (n=527) or control (n=526) group. Of these, 86.3% of the participants were aged 26 to 45 years; 31.1% had moderate to high heaviness of smoking, 38.4% had never tried to quit and 79.8% were not ready to quit in 30 days. The retention rate at 6-month follow-up was 80.7%. By intention-to-treat, biochemical validated quit rate was significantly higher in the intervention than control group (6.8% [36 of 527] vs 3.6% [19 of 526]; OR=1.96; 95% CI 1.11–3.46; P=0.02). The intervention group also showed significantly higher self-reported 24-week continuous abstinence, 7-day point-prevalence abstinence, use of NRT, but not use of smoking cessation service. Perceived family harmony improved to a large extent in the intervention than control group (B = 0.28; 95% CI 0.063–0.50; P = 0.01), dispelling concerns that the intervention may fuel conflicts between expectant couples. The findings have been widely disseminated including publication in a top medical journal and presented in nursing training for midwifery. A formative evaluation study guided by implementation science frameworks is being conceived to inform the integration and roll-out of the brief intervention model in prenatal practice.

Conclusion:
This pragmatic trial shows that a proactive and simple intervention combining brief advice, NRT sampling and active referral can nearly double the odds of successful quitting among expectant fathers who smoked.

Project Number: 15162691

Parallel Session 1 –
Primary Care and Preventive Medicine

PS1.3 - Exposure to alcohol social media marketing and associations with young adult's drinking expectancies and behaviours: a study to inform regulation and health promotion

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Introduction:
Hong Kong's drinking landscape is characterized by low alcohol taxes, widespread availability and limited regulation of alcohol marketing. In recent years, the alcohol industry has been increasingly using social media marketing (SMM). Previous research has shown that exposure to traditional alcohol marketing encourages drinking. However, the influence of alcohol SMM in Chinese young adults drinking has not been examined despite the rapid rise in alcohol consumption in this group.

Objectives:
This study aims to determine the young adult subgroups in Hong Kong that are highly exposed to alcohol social media marketing (SMM). This project also aims to examine the association between alcohol SMM exposure with positive alcohol expectancies and whether these expectancies mediate recent drinking behavior and future drinking intentions.

Methods:
An anonymous, random telephone survey was conducted from June to August 2021 on Hong Kong Chinese residents between 18-34 years of age (n=675). Respondents were asked about their drinking patterns, exposure to traditional marketing and alcohol SMM, alcohol-related expectancies using the Chinese Drinking Expectancy Questionnaire (CDEQ). Logistic regression was used to examine factors associated with alcohol SMM exposure and drinking behaviors. Mediation analysis was used to determine whether alcohol expectancies mediated the effect of alcohol SMM on drinking behaviors.

Results:
Of our respondents, 53% reported past-month exposure to alcohol SMM. Males, those between 25-29 years of age, and those with university education and household income under HKD40,000/month were noted to have higher exposure to alcohol SMM. Although higher levels of alcohol SMM exposure was not independently associated higher scores total CDEQ score, higher alcohol SMM was associated with higher scores the following CDEQ subscales: interpersonal benefits, increased confidence, and tension reduction.

Higher alcohol SMM was also associated with: past-month drinking, weekly drinking, past-month binge drinking, problem drinking, future intention to drink and future intention to get drunk (OR_{mv}: 1.93- 7.85). Higher scores for total positive expectancies, interpersonal benefits expectancy subscale and tension reduction expectancy subscale showed significant mediation effects between alcohol SMM exposure and all drinking behavior outcomes except future intention to get drunk. Only 14.2% of the study sample supported greater regulation of alcohol SMM.

Conclusion:
Exposure to alcohol SMM is associated with increased drinking and there is evidence of mediation effects through various positive drinking-related expectancies. The results provide an evidence-base for increased regulation of alcohol SMM in the region.

Project Number: 17180611

Parallel Session 1 –
Primary Care and Preventive Medicine

PS1.4 - Effect of a family-based multimedia intervention on the uptake of colorectal cancer screening among South Asian older adults in Hong Kong: a cluster-randomised control trial

Effect of a family-based multimedia intervention on the uptake of colorectal cancer screening among South Asian older adults in Hong Kong: a randomised control trial

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Introduction:
Colorectal cancer (CRC) screening, including faecal immunohistochemical testing (FIT), is an effective means of CRC prevention. However, there is a low rate of utilisation of CRC screening among older adults in South Asian ethnic minorities in Hong Kong. Tailored education and appropriate messaging have potential to convey to this population group the importance of CRC screening.

Objectives:
The study aimed to evaluate the acceptability and effectiveness of a family-based multimedia intervention to raise awareness of CRC screening and increase the uptake of FIT among South Asians aged 56-75 in Hong Kong.

Methods:
A cluster-randomised controlled trial was conducted. Three-hundred and twenty dyadic participants (an adult aged 56-75 and his/her younger family member) were recruited from six districts of Hong Kong and randomised. One of the trained instructors delivered a family-based multimedia intervention to intervention dyads. The intervention involved a health talk with the aid of a PowerPoint presentation, the viewing of a video clip, and the receipt of a health information booklet. The adults were accompanied by their younger family member or our site coordinator to attend an FIT appointment with a family doctor. Control dyads received the intervention after data were collected at post-intervention. Data were collected at baseline and post-intervention. The primary outcome was the proportion of adults aged 56-75 who had undergone an FIT after the intervention.

Results:
After the intervention, a significantly higher proportion of adults aged 56-75 in the intervention group than in the control group underwent an FIT (71.8% vs 6.8%; $p<0.001$). The level of willingness of younger family members to encourage these adults to undergo an FIT and their readiness to assist them to collect a stool sample for the test remained high at post-intervention among the intervention dyads. In contrast, there was a significant decrease for both outcomes among control dyads at post-intervention. The majority of the intervention dyads (>86%) were satisfied with the intervention and perceived it to be effective in enhancing their knowledge of CRC screening.

Conclusion:
Our findings demonstrate the acceptability and effectiveness of using the family-based multimedia intervention in enhancing FIT uptake among South Asians aged 56-75 in Hong Kong. The intervention should be integrated into health promotion activities offered at district health centres or nongovernmental organisations that serve South Asians. The government should allocate more training resources to facilitate these staff members to act as programme instructors and site coordinators for implementation of the intervention.

Project Number: 01170848

Parallel Session 1 –
Primary Care and Preventive Medicine

PS1.5 - A community health worker-led multimedia intervention to increase cervical cancer screening uptake among South Asian women: a randomized controlled trial

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Introduction:
Cervical cancer is one of the most commonly diagnosed cancers in women. Early detection through cervical cancer screening can help detecting pre-malignant lesions, thereby allowing more treatment options to improve survival rates and reduce medical costs. However, utilization of cervical cancer screening services is lower among South Asian ethnic minorities compared with the general women in Hong Kong. Multimedia interventions led by community health workers may increase cervical cancer screening rates in this vulnerable population.

Objectives:
To examine the effects of a community health worker (CHW)-led multimedia intervention on the uptake of cervical cancer screening, readiness to undergo screening and beliefs regarding screening among South Asian women.

Methods:
This was a cluster-randomized controlled trial. South Asian women from Pakistan, India, or Nepal aged ≥ 25 years, sexually active, with no history of cancer, and who had not taken a pap test in the past five years were recruited from six local non-governmental organizations. These organizations were randomly assigned to the intervention or wait-list control groups. Intervention participants received a three-month CHW-led multimedia intervention that included multimedia health education, monthly telephone follow-ups, and navigation assistance.

Results:
Of the 402 participants recruited and randomized, 387 participants completed the study. At three months post-intervention, cervical cancer screening uptake (97.9%) and readiness to undergo screening (99.5%) were significantly higher in the intervention group compared with the control group (52.6%; 83.9%) ($p=0.005$; $p<0.001$), respectively. In addition, the intervention group reported significant reduction in perceived barriers to cervical cancer screening immediately post-intervention [-0.68; 95% confidence interval (CI): -1.35, -0.01; $p=0.047$] and three months post-intervention [-0.86; 95% CI: -1.69, -0.04; $p=0.041$] compared with the control group.

Conclusion:
The study findings support that the CHW-led multimedia intervention is effective in promoting uptake and readiness to undergo screening and reducing perceived barriers to cancer screening among South Asian women in Hong Kong. This approach can be adopted by government officials and policymakers to enhance the community's capacity to promote health within ethnic minority groups. Specifically, increasing the recruitment and training of community health workers would enable more South Asian women to benefit from the intervention.

Project Number: 01170958

Parallel Session 1 –
Primary Care and Preventive Medicine

PS1.6 - Building capacity to promote winter health in elderly: co-production of a volunteer-based home care programme for post-discharged elderlies by medical-social-academic sector

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Introduction:
As older adults' health needs grow more complex, the community health strategies of existing home visit programs require review and strengthening to enable older adults to live well in a community with complex medical conditions. Volunteers are one of the important resources in healthcare services, and there is exceptionally high demand for health needs during the winter season; therefore, expanding volunteer capacity can facilitate older adults to access integrated medical and social services in the community. Strengthening volunteer home visits can complement community home-based programs in improving elders' health-related quality of life.

Objectives:
This study aimed to enhance volunteer home visits by optimizing the Winter Health Programme and evaluating the effectiveness of volunteer-based home care for older adults. The study objectives included (1) developing a tailor-made assessment toolkit for volunteer-based home care; (2) recruiting and structural training community health ambassadors; (3) delivering effective health care interventions to empower older adults for self-care management; and (4) assessing the applicability and effectiveness of the volunteer-based home care model locally.

Methods:
The study was divided into three phases: (1) developing a local WINTER health ambassador toolkit and recruiting ambassadors; (2) conducting WINTER health ambassador training workshops; and (3) providing home care services through the WINTER health ambassador-led home visit program. The evaluation used pre- and post-test repeated measures to analyse the outcomes for older adults.

Results:
Assessment kits tailored to meet older adults' health needs were developed consisting of four components: warning signs and symptoms of common chronic diseases for screening, advice for self-care management, precautions for cold winter health, and safety guidelines for home visits. A total of 315 volunteers were recruited and well-trained as ambassadors. The ambassadors visited 278 older adults discharged from the hospital two to three times during the winter season, and 752 home visits were delivered. Approximately 20% of visits were identified by health ambassadors having clinical or social issues or both for subsequent followed by the nurses and social workers. Findings showed that this volunteer-based home visit programme had reduced healthcare utilization, strengthened self-care capability and brought a positive psychosocial impact.

Conclusion:
An enhanced volunteer-based home care model was established to strengthen care continuity, chronic disease management in community, emotional well-being, and quality of life for post-discharged older adults in Hong Kong.

Project Number: 01170948

Parallel Session 2 – Non-communicable Diseases including Mental Health

PS2.1 - The effectiveness of an orthogeriatric multidisciplinary care model in improving clinical outcomes and cost-effectiveness for fragility hip fractures

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Introduction:
Geriatric patients with hip fractures have multiple comorbidities and polypharmacy problems. They require considerable support during the early postoperative period to prevent deterioration in physical and mental health. Since November 2018, a newly developed orthogeriatric co-management multidisciplinary care model has been implemented to meet further increases in demand.

Objective:
The primary objective was to evaluate the effectiveness of the orthogeriatric multidisciplinary pathway in improving the clinical outcomes of fragility hip fractures. The secondary objective was to estimate the cost of each delivery model.

Methods:
The data of geriatric hip fracture patients from 1 April 2018 to 30 October 2018 was collected as the conventional orthopaedic care model (pre-orthogeriatric care model) to compare with data from the orthogeriatric co-management model from 1 Feb 2019 to 31 August 2019. Clinical outcomes were analysed between the groups, with the efficiency of the programme reflected in the total length of stay in acute and convalescent hospitals.

Results:
Of 401 eligible patients, 194 patients were recruited to the conventional group and 207 were recruited to the orthogeriatric group; 290 patients (72.3%) were female. The mean (SD) patient age was 84.2 (7.9) years. As for the fracture type, 217 (54.1%) patients had femoral neck fractures and 178 (44.4%) had per-trochanteric fractures. The median length of stay in the acute and rehabilitation hospitals decreased by 1 day and 2 days, respectively (P=.001). The orthogeriatric group was associated with a higher Modified Barthel Index score on discharge from the rehabilitation hospital and more patients in the orthogeriatric collaboration group received osteoporosis medication prescription within one year after the index fracture. There was no significant difference in the 28-day unplanned readmission rate, complication rate, mortality rate or Elderly Mobility Scale scores on discharge from the rehabilitation hospital between the two groups. Cost per episode was similar between the two models. The decreased cost in acute hospitals was offset by the increased cost in rehabilitation hospitals.

Conclusion:
Orthogeriatric collaboration has been proven to be effective in terms of a decreased length of stay in both the acute and the rehabilitation hospitals. The orthogeriatric co-management model significantly improves functional outcomes on discharge from the rehabilitation hospital. The benefits of the model can be achieved at minimal additional cost.

Project Number: 15162751

Parallel Session 2 – Non-communicable Diseases including Mental Health

PS2.2 - "COMBO-KEY" (Coaching Ongoing Momentum Building On stroKe rEcovery journeY) - a home visiting and phone coaching programme to promote stroke survivors' recovery : a territory-wide project

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Introduction:
International evidence-based guidelines recommend stroke survivors receive self-management support for improved health outcomes and more efficient use of healthcare services. However, most stroke self-management programmes were group-based and held in community settings, which may be restricted for survivors with greater physical impairment or who are more vulnerable to adverse events. More effective support is needed.

Objectives:
Our project aimed to promote stroke survivors' health by building confidence and positive expectations of recovery outcomes and enabling their engagement in stroke self-management behaviours. Specific objectives were to: 1) develop a multimodal resource package about developing survivors' confidence and positive outcome expectations of performing self-management behaviours; 2) build a team of coaches comprising healthcare providers and lay volunteers to promote survivors' physical and psychosocial health; and 3) assess the impact of the new programme (Coaching Ongoing Momentum Building On stroKe rEcovery journeY (COMBO-KEY)) on survivors' health outcomes.

Methods:
In Phase one, we developed a novel 8-week COMBO-KEY underpinned by Bandura's self-efficacy principles. The programme included four home visits, five follow-up phone calls and a resource package. Twenty-three trained coaches, including healthcare professionals and lay volunteers, delivered the COMBO-KEY. In Phase two, a 2-arm, assessor-blinded randomised controlled trial was conducted to evaluate the effects of the COMBO-KEY.

Results:
A total of 134 stroke participants (mean age=64.06 years old; standard deviation (SD)=12.69) were recruited. The mean years after a stroke was 4.19 years (SD=5.07). The intervention group had significantly more participants who had a haemorrhagic stroke (p=0.029) and received financial support (p=0.043) than the control group. The findings showed that the participants in the intervention group improved significantly more in total scores of self-efficacy, self-management behaviours, quality of life and community reintegration at follow-up with respect to baseline compared to those in the control group. The participants particularly appreciated the use of videos about other survivors' survival experiences. They all expressed a desire for more home visits by healthcare professionals and longer programme duration to provide personalised stroke recovery guidance. The coaches consistently described their experiences as a mutual learning experience in which they shared self-management tips for stroke survivors as well as professional knowledge, skills and positive care attitudes among the coaches.

Conclusion:
The programme was associated with positive improvements in survivors' recovery. A team of 23 trained coaches was formed. The programme protocol, resource package and coach training package may be adopted by community-based organisations.

Project Number: 01170718

Parallel Session 2 – Non-communicable Diseases including Mental Health

PS2.3 - Promoting brain health among people with suboptimal cognitive functioning in Hong Kong: A Brain Vitality Enhancement (BRAVE) programme

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Introduction:
The cognitive benefits of physical activity have proven to be effective for people with cognitive impairment. However, motivating this vulnerable cohort to remain physically active is challenging.

Objectives:
To examine the effects of a peer-assisted mobile app-supported exercise programme titled "Brain Vitality Enhancement (BRAVE)" on the cognitive and well-being outcomes of persons with mild cognitive impairment (PwMCI), and to explore participants' satisfaction and engagement experience in the programme.

Methods:
The programme comprised three components: a mobile app, peer volunteer training, and a peer-supported exercise programme for PwMCI. The app provided information on brain health, benefits of exercise and an exercise video bank, and served as an activity scheduler, tracker and social networking platform. A sequential mixed-methods design with a two-arm randomised controlled trial and a qualitative study was adopted to evaluate the programme's effectiveness. Community-dwelling PwMCI were randomised to the BRAVE group or the waitlist control group. A battery of validated tools was administered at 3 timepoints.

Results:
A total of 46 volunteers were trained and 229 PwMCI were randomised to the BRAVE group or control group. Compared with the control group (n=113), the BRAVE group (n=116) showed significantly greater improvements in processing speed and attention ($\beta = 6.281$, 95% CI = 2.106 – 10.456, $p = 0.003$) and working memory ($\beta = 0.540$, 95% CI = 0.199 – 0.881, $p = 0.002$) immediately post-intervention. The effects were sustained at 3 months post-intervention. Significantly greater improvements in sequencing and mental flexibility were observed in the BRAVE group at 3 months post-intervention ($\beta = 6.979$, 95% CI = 3.375 – 10.584, $p < 0.001$). MCI participants were highly satisfied with the programme as indicated by high satisfaction score (46.2/50) and positive qualitative comments. The volunteers spoke highly about the programme which offered self-fulfilling volunteering experience to them. The number of logins to the app and views to exercise videos were 23,957 and 42,519, respectively. The app was nominated by users for the Meritorious Healthy Mobile Apps Contest 2022 organised by the Office for Film, Newspaper and Article Administration. The deliverables of this project and the training model have linked to several ongoing large-scale research implementation projects to address the global advocacy on healthy aging promotion.

Conclusion:
The BRAVE programme is well received and effective at sustaining improvements in various cognitive domains of PwMCI. The programme also demonstrates an effective model to support senior volunteers in developing self-fulfilling experience and to promote active aging in our society.

Project Number: 01170728

Parallel Session 2 – Non-communicable Diseases including Mental Health

PS2.4 - The cost-effectiveness of myopia control to retard the progression from high myopia

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Introduction:
Myopia is a common eye condition with prevalence projected to increase from 23% to 50% of the global population by 2050. Various interventions have been developed to control the progression of myopia, but their long-term costs and effectiveness are not fully understood.

Objectives:
This study aimed to evaluate the cost-effectiveness of myopia control through optical approaches in children, with the specific objectives to 1) build a cost-effectiveness model to determine whether myopia control is value for money from a societal perspective, and, if yes, 2) examine whether subsidising myopia control is cost-effective from a government perspective to enable equitable access.

Methods:
An individual-based state-transition model was developed to simulate the development and progression of myopia in childhood and development of four high-myopia associated ocular complications in adulthood. The model compared the strategies of 1) using Defocus Incorporated Multiple Segments (DIMS) lens for myopia control with 100% uptake to 2) no control, to reflect the potential value for money of myopia control when barriers to access were minimised. Lifetime costs and quality-adjusted life-years (QALYs) were calculated for each strategy. Incremental cost-effectiveness ratios (ICERs) were calculated by dividing the difference in costs by the difference in QALYs and compared to the World Health Organization (WHO) recommended threshold - less than 1 x GDP per capita (HK$377,165) for a QALY gained was considered very cost-effective.

Results:
With myopia control, there was a 44.7% relative reduction in the prevalence of high myopia and 19.2% relative reduction in severe visual impairment compared to no myopia control. For cost-effectiveness from the societal perspective, with both costs and QALYs discounted at 3.5% annually, the incremental cost for myopia control versus no control was HK$10,089 (HK$57,387 vs HK$47,298) per individual across their lifetime and the incremental QALY gained was 0.05 (25.89 vs 25.84), producing an ICER of HK$205,978 per QALY gained. With no discount on QALYs the ICER was HK$61,870 per QALY gained. From the government perspective, with costs and QALYs discounted at 3.5%, the incremental cost of myopia control with subsidy (80% uptake) was HK$8,668 compared to myopia control with no subsidy (10% uptake) and the incremental QALY gained was 0.04, producing an ICER of HK$232,049 per QALY gained. With no discount on QALYs, the incremental QALY was 0.134 and the ICER was HK$64,924.

Conclusion:
Myopia control by use of DIMS lenses is potentially cost-effective for society. A government-subsidised programme could be a cost-effective option to improve equity of access.

Project Number: 16172591

Parallel Session 2 – Non-communicable Diseases including Mental Health

PS2.5 - Striking a balance between cost, effectiveness and efficiency of emergency departments in Hong Kong: An integrated approach of data analytics, simulation, and system optimization

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Introduction:
Emergency Department (ED) overcrowding can lead to numerous grievous consequences, including putting public safety at risk, prolonged pain and suffering, long waits, and patients' dissatisfaction. In this project, we applied operations research techniques, more specifically data analytics, system simulation, mathematical modelling, and optimisation, for analysing and improving operations of EDs in Hong Kong.

Objectives:
Our primary objective in this project was to investigate possible solutions, using a systematic approach based on a scientific foundation, which could relieve ED overcrowding. For our long-term goal, we demonstrated with this project that our integrated approach of data analytics, simulation, and system optimisation is beneficial to other healthcare systems as well.

Methods:
Four machine learning models were developed and applied for patient waiting time prediction. A simulation model was developed to assess the impacts of an adoption of a fast-track system. A workforce optimisation model was developed to suggest optimal physician schedules. Heuristics based on variable neighbourhood search (VNS) were proposed for dynamic patient scheduling.

Results:
In patient waiting time prediction, all the four machine learning algorithms with the use of systems knowledge outperformed the baseline model. Reductions of 17 – 22% in mean-square error due to the utilisation of systems knowledge were observed.
In assessing the impacts of a fast-track system, we observed that a fast-track system could achieve a larger reduction in the overall patient waiting time for EDs with more patients of higher levels of medical urgency.
In workforce planning, we observed that the optimal physician staffing level had a similar pattern with the arrival rate, but shifted around 2 hours behind. The optimisation tool was also helpful in conducting cost-effectiveness analyses.
In patient scheduling, computational results suggest that using the proposed VNS-based heuristics approximated the static problem well and had better performance than the greedy heuristic. The short computational time of the proposed heuristics also suggests that the algorithms be used in practice for dynamic patient scheduling.

Conclusion:
This project demonstrated that a systematic approach, powered by data analytics, simulation, and system optimisation, provides an effective and promising method to evaluate and determine solutions to improve ED operations. The tools are helpful for the hospital administrators and senior management in providing a scientific foundation to support their decisions. The use of this approach is not limited to ED operations, but can also be extended to other healthcare systems.

Project Number: 14151771

Parallel Session 3 – Infectious Diseases I

PS3.1 - Epidemic Intelligence and Data Informed Risk Assessment for a System of Early Detection, Readiness, Timely Response and Recovery for Emerging and Re-Emerging Infectious Diseases: A Synthesis of Health System Research and Contextual Knowledge in the COVID-19 Pandemic

Project 1: Investigation of Hong Kong's early detection, assessment and response (S-EDAR) system to the new emerging infectious disease outbreak COVID-19
Project 2: Epidemic Intelligence and a data informed risk assessment system to inform policy decisions critical for maintaining systems control of COVID-19 in strategies to enhance recovery

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Introduction:
In an outbreak of an emerging infectious diseases, exemplified by SARS-CoV-2, public health agencies and governments have to make decisions based on limited and uncertain scientific knowledge and contested expert advice. An effective system of early detection, assessment and response (S-EDAR) is critical for controlling such outbreaks. This system must be dynamic and adjustable to new scientific findings, changing transmission scenarios, and the effectiveness of public health interventions.

Objectives:
This research involves two inter-related studies. The S-EDAR study aims to enhance Hong Kong's S-EDAR for epidemic control across transmission scenarios, informing future preparedness and response. The Epidemic Intelligence (EI) study seeks to identify evidence gaps at different transmission stages and develop an epidemic intelligence and risk assessment system, and identify tools to source near-time data from diverse disciplines, which can be collated, analysed and synthesised to generate "epidemic intelligence" to inform policy decisions in preparedness, readiness, response and recovery for emerging infectious diseases.

Methods:
Both studies employ an iterative multi-stage mixed methods design, synthesising evidence from literature review, surveys, interviews and focus group with stakeholders, and mathematical modelling. Specifically, the S-EDAR study includes expert workshops to develop initial components of the enhanced system, reviewed by international experts; comparative case studies of control and mitigation policies in eight jurisdictions; and a group Delphi process to affirm the importance and feasibility of the components of the final S-EDAR framework. The EI study further conducts international case studies to learn about risk assessment and outbreak management systems; secondary data analysis on epidemiological characteristics and health service utilisation; and artificial intelligence to generate epidemic intelligence of impact and surge capacity.

Results:
We developed a S-EDAR framework comprising Preparedness, Readiness, Response and Recovery, covering 14 domains and 37 recommendations. Preparedness domains include surveillance and risk assessment; command structure; regulation; drills; surge capacity and contingency plan. Readiness involves developing capacity and capability for operational preparedness when outbreak risk is imminent. Response focuses on coordination, implementation and engagement of society, including case finding, contact tracing and quarantine arrangements; case management, isolation and health care services; social/physical distancing and community quarantine; port health and international movement control; risk communication, public engagement and infodemic management; and social and economic mitigation. Recovery domains cover recovery plans; review and build back better.

We also developed a contextualised EI System for risks detection, characterisation and assessment. This system captures data from diverse sources of data at global, national, local and individual levels, integrating both Indicator-based (IBS) and Event-based Surveillance (EBS). The system enables analysis, interpretation, verification, characterisation and risk assessment. Epidemic intelligence is generated from contemporary sciences, including epidemiological modelling, big data analytics of user-generated social media content and novel artificial intelligence tool, applying neural network algorithms for risk quantification. Continuous risk detection, characterisation and assessment across different pandemic phases are critical for preparedness, readiness, response and recovery. Risk communication and community engagement strategies are essential control measures and sources for EI.

Conclusion:
The enhanced S-EDAR, based on a whole-of-society approach, offers a robust and structured framework applicable to different emergency management phases, strengthening health system and community resilience in a pandemic. Investments in data linkage infrastructures and automation modernisation are critical for early detection and risk assessment of health hazards to inform decision-making. Hong Kong needs to invest in capacities and capabilities for IBS and EBS surveillance systems and collaborate with animal health surveillance, guided by the One Health perspective.

Project Number: COVID190105
Project Number: COVID19F03

Parallel Session 3 – Infectious Diseases I

PS3.2 - Coronavirus disease-19 (COVID-19) Vaccination in Adolescents and Children (COVAC)

Project 1 : To compare the reactogenicity and immunogenicity of the recommended COVID-19 vaccines in young adolescents in Hong Kong
Project 2 : To compare the reactogenicity and immunogenicity of a third dose of the recommended COVID-19 vaccines in young adolescents in Hong Kong
Project 3 : To compare the reactogenicity and immunogenicity of the recommended COVID-19 vaccines via intradermal and intramuscular routes in children and adolescents in Hong Kong

LAU Yu-lung on behalf of the COVAC Team
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Introduction:
When BNT162b2 (B) and CoronaVac (C) were introduced in early 2021 for Hong Kong in response to COVID-19, little was known regarding the immunogenicity and safety of these two vaccines in children. There was an urgent need to generate data.

Objectives:
We aimed to establish the vaccine efficacy (VE) and immunogenicity of these vaccines in children, compared to adults. In response to Omicron, we aimed to study how a third dose could induce cross-variant antibody and T-cell response.

To optimise the immunogenicity, the antibody and T cell response to CoronaVac given intradermally was investigated.

Methods:
COVID-19 vaccination in Adolescents and Children (COVAC) is a registered clinical study (NCT04800133) with a non-inferiority design aimed at establishing immunobridging for BNT162b2 and CoronaVac in children. The intradermal route of administration (ID) for CoronaVac was tested for superiority against the intramuscular route (IM). The immunogenicity in children with kidney diseases and inborn errors of immunity (IEI) were investigated.

Results:
Antibodies and T cell response were non-inferior or similar in adolescents receiving 2 doses versus adults. We found higher S, neutralising, avidity and Fc receptor-binding antibody responses in adolescents receiving BB than CC and a similar induction of S-specific T cells by the 2 vaccines; N- and M-specific T cells were induced by CoronaVac but not BNT162b2. After 3 doses of BNT162b2, adolescents had preserved SIgG avidity, SIgG FcγRIIIa-binding against Omicron BA.2, as well as preserved T cell responses against BA.1S and neutralisation levels against BA.1, BA.2 and BA.5. After 3 doses of CoronaVac, SIgG and neutralising antibody responses to BA.1 were lower than to WT, but remained detectable in 96% and 86% of adolescents. T cell response to peptide pools spanning mutations of BA.1S, N and M were preserved, increased and halved compared to WT respectively. For ID-CCC, S-RBD IgG, surrogate virus neutralisation test, PRNT90, PRNT50, SIgG avidity, SIgG, FcγRIIIa-binding, M-specific IL-2$^+$CD4$^+$, interferon-γ$^+$CD8$^+$ and IL-2$^+$CD8$^+$ responses were superior and non-inferior to IM-CCC. The estimated VE were 66% and 79% for IM-CCC and ID-CCC respectively.

Conclusion:
Our study has informed vaccination policy, such as endorsing one dose of BNT162b2 for adolescents due to high risk of post-dose 2 myocarditis in male adolescents; and 3 doses of CoronaVac rather than 2 doses as the primary series. The VE and safety data have contributed to public confidence in vaccinating children. Children with kidney diseases and IEI were vaccinated according to our recommendation.

Project Number: COVID19F02
Project Number: COVID19F10
Project Number: COVID19F12

Parallel Session 3 – Infectious Diseases I

PS3.3 - Monitoring the effectiveness of vaccines and antivirals for COVID-19

Project 1 : Comprehensive assessment of longitudinal vaccine-induced immune responses, safety and potential effectiveness of COVID-19 vaccines
Project 2 : Randomized trial of COVID-19 booster vaccinations (Cobovax trial)
Project 3 : Joint analysis of vaccination effectiveness and antiviral drug effectiveness for COVID-19

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Introduction:
When vaccines and antiviral drugs became available for SARS-CoV-2 treatment and prevention, an urgent public health priority was to evaluate their effectiveness and safety to inform their appropriate use. I will summarize the findings of commissioned studies COVID1903001, COVID19F09 and CID-HKU2-12 and place them in the context of other pertinent research.

Objectives:
To estimate the effectiveness of various doses and combinations of BNT162b2 and CoronaVac. To estimate the effectiveness of nirmatrelvir/ritonavir and molnupiravir.

Methods:
We established a cohort of more than 1000 adults and a separate cohort of more than 1400 older adults to monitor the effectiveness and reactogenicity of one or more doses of BNT162b2 and CoronaVac, and followed up participants for more than 3 years. We conducted a randomized trial of homologous and heterologous third vaccine doses in 400 adults. We analyzed laboratory markers of vaccine immunogenicity, we tabulated daily data on reactogenicity after each dose, and we used Cox proportional hazards models to estimate vaccine effectiveness against COVID-19. We analyzed a detailed line list of more than 1 million confirmed COVID-19 cases to estimate jointly the effectiveness of vaccines and antivirals.

Results:
BNT162b2 and CoronaVac were both effective in preventing infections for a short period after each dose, when circulating strains generally did not match vaccine strains. Nirmatrelvir-ritonavir was more effective in providing protection against all-cause mortality and development of severe COVID-19 than molnupiravir, and effects were independent of the protection provided by vaccinations.

Conclusion:
SARS-CoV-2 vaccines and antivirals have been effective in reducing mortality during the COVID-19 pandemic. Booster doses will continue to play an important role in reducing disease burden. SARS-CoV-2 antivirals can reduce the risk of disease progress regardless of vaccination history.

Project Number: COVID1903001
Project Number: COVID19F09
Project Number: CID-HKU2-12

Parallel Session 3 – Infectious Diseases I

PS3.4 - A low-cost handheld device for decentralised detection of SARS-CoV-2 and host response in COVID-19 patients: development and evaluation

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Introduction:
The widespread COVID-19 outbreak has necessitated large-scale screening to reduce community transmission. The gold standard of RT-PCR has its limitations on decentralised testing. To achieve on-site decentralised testing, new detection method that is portable, rapid, low-cost, and simple should be developed. Another important challenge is the ability to accurately predict the disease severity in COVID-19 patients.

Objectives:
(1) Evaluation of real-time reverse transcription–loop-mediated isothermal amplification (RT-LAMP) with gold nanoparticle (AuNP)-based colourimetric signal readout probes against the reference method of real-time RT-PCR for SARS-CoV-2 detection; (2) identification of SARS-CoV-2-encoded viral microRNAs (v-miRNAs) and their target host gene transcripts that are related to disease severity in COVID-19 patients; and (3) validation of an in-house, previously developed point-of-care testing (POCT) diagnostic platform for screening and monitoring of COVID-19 patients.

Methods:
The AuNP-based RT-LAMP (Gold-RT-LAMP) assay was first optimised and evaluated with purified SARS-CoV-2 genome from a commercial source. Analytical sensitivity (limit of detection; LoD) and specificity (24 common respiratory pathogens) tests were investigated, followed by RT-LAMP assay for a total of 346 purified nucleic acid extracts from clinical specimens. Then, on-site testing was conducted in the emergency department of Queen Mary Hospital with a total of 277 nasal swab specimens (heat-treated with Chelex without nucleic acid extraction). For v-miRNAs identification, total RNA was isolated from SARS-CoV-2-infected cells and small RNA sequencing was conducted in Illumina NovaSeq platform. The relationship of v-miRNA expression with viral load in COVID-19 patients was examined by digital PCR.

Results:
The Gold-RT-LAMP assay was successfully optimised for SARS-CoV-2 detection. The LoD was 4 copies per reaction (20 µL) – the same as with real-time RT-PCR. The specificity test results showed that E gene primers differentiated 23 out of 24 common respiratory pathogens (except SARS-CoV (2003)) while N gene primers distinguished SARS-CoV-2 from SARS-CoV (2003). For the 346 purified extracts, the assay achieved 100% sensitivity and 100% specificity. On-site testing achieved 98.4% sensitivity and 100% specificity in the 277 clinical specimens. SARS-CoV-2 v-miRNAs were detected during infection, and their expressions were shown to be positively correlated with viral load in COVID-19 patients.

Conclusion:
We successfully established the Gold-RT-LAMP as a point-of-care assay for detecting SARS-CoV-2 infection with the same detection limit as RT-PCR. On top of being simple and fast, Gold-RT-LAMP does not require nucleic acid purification. In addition, the expressions of v miRNAs were positively correlated with viral load or disease severity in COVID-19 patients.

Project Number: COVID190208

Parallel Session 4 – Advanced Technologies

PS4.1 - Long noncoding RNA profiling by whole transcriptome sequencing for classification and prognostication in adult acute myeloid leukaemia

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Introduction:
Acute myeloid leukaemia (AML) is a heterogeneous disease with diverse pathogenetic mechanisms and highly variable prognostication. Clinical management of AML relies critically on accurate risk stratification to tailor appropriate treatment strategies to individual patients. In this study, we investigated the prognostic role of long noncoding RNAs (lncRNAs) independent of the prevailing European LeukaemiaNet (ELN) 2022 risk classification in AML.

Objectives
1. To devise a lncRNA-based prognostic score and validate its prognostic performance.
2. To translate research findings into clinical application by means of a CaptureSeq assay.

Methods:
All 185 adult AML patients underwent routine risk stratification that fulfilled ELN 2022 risk classification, including conventional karyotyping and targeted DNA-sequencing for 52 leukaemia-implicated genes. Deep whole transcriptome sequencing using Illumina NovaSeq 6000 system was performed to yield at least 120 million paired-end reads per specimen, after depletion of ribosomal RNA and globin mRNA. Trimmed mean of M values-normalised read counts were compiled according to Gencode (release 30), with the annotated lncRNA counts used for survival analysis. Least absolute shrinkage and selection operator (Lasso) was used to select lncRNA with prognostic significance in multivariable analysis. Identical bioinformatic strategies were applied to TCGA-LAML and BeatAML cohorts for validation of 10 lncRNA prognostic score. CaptureSeq assay was designed from the 10 prognostically significant lncRNAs, along with 297 coding genes implicated in structural rearrangement in leukaemias. An independent local cohort of 135 AML patients was recruited for validation of the prognostic performance of the CaptureSeq assay.

Results:
Lasso regression in 1,874 expressed lncRNAs yielded 10 lncRNAs with coefficients larger than zero. Prognostic score from these 10 lncRNAs showed independent prognostic role (exponential of coefficient: 20.918; 95% C.I. 6.313-69.312; $p < 0.0001$) in multivariable analysis using Cox proportional hazards model, with the co-variables of age, white cell count at diagnosis and ELN 2022 risk classification by genetic status. This observation was validated in TCGA-LAML (n=125; exponential of coefficient: 2.283; 95% C.I. 1.005-51.86; $p = 0.0485$) and Beat-AML (n=393; exponential of coefficient: 2.8; 95% C.I. 1.293-6.066; $p = 0.0090$). We translated this research finding into a CaptureSeq assay for clinical application and validated its prognostic performance using an independent local cohort (n=135, exponential of coefficient: 2.993; 95% C.I. 1.176-7.615; $p = 0.0214$) in a clinical laboratory.

Conclusion:
This project demonstrated the clinical utility of transcriptomics in empowering clinical management of AML patients. The research findings have been translated into clinical application in the local diagnostic setting.

Project Number: 05160046

Parallel Session 4 – Advanced Technologies

PS4.2 - Disease burden of chronic viral hepatitis in Hong Kong – towards eliminating viral hepatitis by year 2030 according to World Health Organization (WHO) targets

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Introduction:
The Hong Kong Viral Hepatitis Action Plan 2020–2024 was published in October 2020 to set out the strategic plan for reducing the burden of chronic viral hepatitis (CVH) through effective prevention, treatment and control of viral hepatitis and hence to lower the disease burden of hepatocellular carcinoma (HCC). Machine-learning (ML) is a comprehensive tool which allows direct selection of predicting parameters among all available parameters without subjective preselection, and maximises data use while minimising bias to predict HCC.

Objectives:
We aimed to develop novel clinical and laboratory parameter-based prediction models using ML algorithms to define the risk levels of HCC in patients with CVH. These models can potentially be incorporated into computer-based management systems to facilitate clinical assessment and risk stratification of HCC in patients with CVH.

Methods:
We performed a territory-wide, registry cohort study using data from the Hospital Authority Data Collaboration Lab (HADCL), Hong Kong. Five popular ML methods including logistic regression, ridge regression, AdaBoost, decision tree and random forest were performed and compared to find the best prediction model for HCC.

Results:
We included 124,006 patients with CVH to build and validate ML models, by including all 46 available parameters, with 36 or 20 selected parameters with best predictive power. In the training cohort (n=86,804; 6,821 HCC), random forest, decision tree and ridge regression performed the best with all parameters (AUROC = 0.992±0.001, 0.800±0.004, and 0.842±0.006, respectively), with 36 selected parameters (AUROC = 0.991±0.002, 0.884±0.004, and 0.839±0.006, respectively), or with 20 selected parameters (AUROC = 0.987±0.003, 0.877±0.005, and 0.817±0.005, respectively). In the validation cohort (n=37,202; 2,875 HCC), ridge regression had consistently high accuracy with all parameters (0.844±0.009), with 36 selected parameters (0.840±0.009), and with 20 selected parameters (0.821±0.009) (Table 2). HCC ridge score (HCC-RS) was formed for further comparisons. HCC-RS performed better than these common HCC risk scores in terms of larger AUROC (0.840) and high applicability, and small proportion of patients falling into the gray zone (30.7%).

Conclusion:
The novel HCC-RS from ridge regression ML model accurately predicted HCC in CVH patients. These ML models may be developed as built-in functional keys or calculators in electronic health systems to reduce cancer mortality. Prospective studies and randomised trials comparing ML model-guided HCC surveillance with routine clinical practice for the early diagnosis of HCC in CVH patients are warranted.

Project Number: 07180216

Parallel Session 4 – Advanced Technologies

PS4.2 - Risk of hepatocellular carcinoma in patients with chronic hepatitis B achieved complete viral suppression – role of on-treatment hepatitis B surface/core-related antigen (HBsAg/HBcrAg) levels

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Introduction:
Hepatitis B core-related antigen (HBcrAg) is a novel serum viral marker which is associated with the development of HCC in patients with chronic hepatitis B (CHB).

Objectives:
We aimed to evaluate the accuracy of on-treatment serum HBsAg and HBcrAg levels at baseline to predict HCC.

Methods:
From 2005 onwards, we identified CHB patients who had received oral nucleos(t)ide analogues (NA) therapy with stored samples. Their earliest stored serum samples were retrieved for serum HBsAg and HBcrAg assays. All patients were followed at the medical clinics with regular monitoring of clinical and laboratory parameters every 3 to 6 months. The primary endpoint was HCC. The secondary endpoints were other hepatic events, liver-related death and all death. Sensitivity, specificity, positive predictive values (PPV), negative predictive values (NPV) of HBcrAg were calculated to predict HCC.

Results:
We included 1,400 CHB patients in the final analysis. Serum HBcrAg was an independent risk factor of HCC in the cohorts of all patients, patients with negative HBeAg, all cirrhotic patients and cirrhotic patients with negative HBeAg. For the cohorts of overall patients and HBeAg-negative patients, the cumulative incidences of HCC were significantly different in groups of patients with different HBcrAg level (P = 0.018 and P = 0.043, respectively). For HBeAg-positive patients, HCC risk did not differ in different HBcrAg levels (P = 0.227). HBeAg-negative patients with HBcrAg level below 2.9 log10 U/mL had significantly lower bilirubin, ALT, HBV DNA and HBsAg levels than patients with HBcrAg above 2.9 log10 U/mL. The 5-year cumulative incidence of HCC were respectively 11.6% (95%CI, 9.8-13.4) and 6.0% (95%CI, 4.0-8.0) among HBeAg-negative patients with high HBcrAg and low HBcrAg.

Conclusion:
The level of HBcrAg at baseline could predict the risk of HCC accurately in HBeAg-negative CHB patients received antiviral treatment. This new viral marker may be widely used to predict the risk of HCC and help physicians to stratify the CHB patients in order to provide appropriate HCC surveillance. Further studies on the accuracy of HCC prediction by combining those viral markers would be helpful to further refine its accuracy.

Project Number: 15160551

Parallel Session 4 – Advanced Technologies

PS4.3 - The incidence of intrauterine adhesion after ultrasound-guided manual vacuum aspiration (USG-MVA): A prospective randomized controlled trial

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Introduction:
Miscarriage is a common complication of pregnancy, occurring in up to 25% of all pregnancies. This can be a distressing experience for many women and often requires surgical management to ensure the complete evacuation of the uterine contents. Two primary surgical approaches are electric vacuum aspiration (EVA) and manual vacuum aspiration (MVA), both of which are considered effective and safe. MVA, in particular, offers advantages such as being cost-effective, portable, and able to be performed without general anesthesia, making it suitable for outpatient settings.

In recent years, an alternative technique known as ultrasound-guided manual vacuum aspiration (USG-MVA) has emerged, where real-time ultrasound guidance is employed to enhance the precision and safety of the MVA process. While USG-MVA has been shown to be effective and safe, the incidence of intrauterine adhesion (IUA) following this procedure is not well-established. IUA is a potential complication that can lead to serious long-term reproductive issues, including infertility and placental abnormalities in future pregnancies. Therefore, understanding the relative risk of IUA associated with different surgical approaches is crucial for optimizing the management of first-trimester miscarriage and informing clinical decision-making.

Objectives:
This study aimed to compare the incidence of IUA in women undergoing USG-MVA versus EVA for the management of first-trimester miscarriage.

Methods:
This was a prospective, randomized controlled trial at the Prince of Wales Hospital Department of Obstetrics and Gynaecology. Chinese women aged ≥18 with delayed or incomplete miscarriage ≤12 weeks were randomly assigned to USG-MVA or EVA. Participants underwent hysteroscopy for IUA assessment 6-20 weeks after, and their menstrual and reproductive outcomes were evaluated at 6 months.

Results:
303 patients underwent surgical evacuation, of whom 152 were randomized to the 'USG-MVA' group and 151 patients to the 'EVA' group. 126 from the USG-MVA group and 125 from the EVA group came back and completed the hysteroscopic assessment. The incidence of IUA from USG-MVA was 19.0% (n=24/126) and from EVA was 32.0% (n=40/125), which is significantly ($p<0.02$) different between the two groups. There was no significant difference in the menstrual outcomes EVA at 6 months post- surgery between the two groups but more patients had miscarriage in EVA group with IUA.

Conclusion:
USG-MVA may be a safer surgical option than EVA for first-trimester miscarriage, with a lower risk of IUAs.

Project Number: 06170286

Parallel Session 4 – Advanced Technologies

PS4.4 - Prospective comparative study investigating agreement between tele-ophthalmology and face-to-face consultations in patients presenting with chronic visual loss

Evaluation of the accuracy of diagnostic and management decision by teleophthalmology in comparison with face-to-face consultation

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Introduction/Objectives:
This study aimed to investigate the diagnostic accuracy of store-and-forward tele-ophthalmology consultations for non-diabetic patients, aged 40 and above, presenting with vision impairment of 3 months or more, in terms of cataracts, glaucoma, and age-related macular degeneration.

Methods:
This was a prospective comparative study. Enrolled subjects were independently assessed by both tele-ophthalmology and face-to-face assessment. Agreement level between the two modalities for diagnosis and severity were compared using kappa statistic. Diagnostic accuracy of tele-ophthalmology was determined using the face-to-face consultation serving as the gold standard. Costs were compared by calculating the downstream costs generated by each modality in terms of investigations and treatment.

Results:
A total of 860 eyes of 430 patients were assessed during the study period. Tele-ophthalmology consultations had significantly high agreement with face-to-face consultations in the diagnosis and grading of all three ocular conditions; cataracts, glaucoma, and AMD. Diagnosis and grading of cataracts and AMD reached values of > 0.8, while diagnosis and grading of glaucoma reached values between 0.61 and 0.8. In terms of diagnostic accuracy, tele-ophthalmology consultations were highly sensitive and specific for AMD with greater than 99% sensitivity and specificity achieved by tele-ophthalmology. There was high specificity when diagnosing cataracts, but lower sensitivity at 87.8%. Conversely, there was high sensitivity for diagnosing glaucoma, but lower specificity at 76.5%. Downstream costs were similar between groups.

Conclusion:
Store-and-forward tele-ophthalmology consultations are accurate and comparable to face-to-face consultations for diagnosis and grading of cataracts, glaucoma, and AMD.

Project Number: 16172111

Parallel Session 4 – Advanced Technologies

PS4.5 - A randomized controlled clinical trial comparing subthreshold micropulse yellow (577nm) laser versus half-dose photodynamic therapy for central serous chorioretinopathy

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Introduction:
Central serous chorioretinopathy (CSCR) is a condition characterised by the accumulation of subretinal fluid (SRF) at the macula which, if left untreated, can result in irreversible vision loss. Current treatments like half-dose photodynamic therapy (PDT) and subthreshold micropulse laser therapy (SMLT) have shown promise in managing chronic CSCR. However, PDT uses Verteporfin, which is an expensive self-financed item in the Hospital Authority, and there is currently a global supply shortage of Verteporfin, making this treatment increasingly difficult to perform. Micropulse laser therapy is a significantly cheaper and easier procedure to perform, but there has not previously been a comparative study comparing the outcomes between these two treatments.

Objectives:
This study compared the anatomical and functional outcomes of half-dose PDT and SMLT in treating patients with chronic CSCR over a 12-month period.

Methods:
A prospective, double-masked, randomised controlled clinical trial was conducted from April 2017 to October 2020. Patients (N=68) with confirmed chronic CSCR were randomised (1:1) to receive either half-dose PDT or SMLT. Treatment responses were assessed at 3 monthly intervals up to the endpoint at 12 months.

Results:
At one month after treatment, SRF resolved in 8/33 (24.2%) patients receiving SMLT and 20/34 (58.8%) patients receiving half-dose PDT. This increased to 23/28 (82.1%) in the SMLT group and 30/33 (90.9%) in the half-dose PDT group at 12 months of follow-up. Kaplan-Meier survival curves showed significantly faster resolution of SRF in the half-dose PDT group than SMLT group ($p=0.016$). Both groups showed significant improvement in best corrected visual acuity (BCVA) (-0.12 + 0.21, $p=0.005$ for SMLT; -0.13 + 0.12, $p<0.001$ for half-dose PDT), central macular thickness (-154.2 + 105.6, $p<0.001$ for SMLT; -140.8 + 94.0, $p<0.001$ for half-dose PDT), and retinal sensitivity (5.70 + 5.02, $p<0.001$ for SMLT; 6.05 + 3.83, $p<0.001$ for half-dose PDT) at 12 months compared with baseline. There was no significant difference between the two treatment groups at each time point in all investigations except BCVA at 3 months ($p=0.03$).

Conclusion:
This study demonstrated that both half-dose PDT and SMLT are effective treatment options for chronic CSCR. Half-dose PDT exhibited marginally faster anatomical success and functional improvement, but these differences were not significant at the endpoint of the study. As a result of this study, new Hospital Authority treatment guidelines have been established for the use of SMLT and PDT in patients with chronic CSCR.

Project Number: 04152826

Parallel Session 4 – Advanced Technologies

PS4.6 - Precision Diagnosis of Intracranial Atherosclerosis by Using High-Resolution MRI: Plaque Morphology and/or Components rather than Arterial Stenosis Predict Stroke Recurrence

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Introduction:
Intracranial atherosclerosis (ICAS) is a significant cause of stroke, particularly in Asian populations. Traditional imaging techniques focusing on luminal stenosis have limitations in characterising ICAS. High-resolution magnetic resonance imaging (HRMRI) offers a novel approach to visualise vessel wall pathology, potentially providing better diagnostic and prognostic insights.

Objectives:
This study aimed to evaluate the association between plaque features (morphology and/or components) assessed by HRMRI and the short/long-term outcomes of ischaemic stroke or transient ischaemic attack (TIA) patients with ICAS. The goal was to determine specific parameters of plaque features with the best predictive efficacy for stroke recurrence.

Methods:
A hospital-based prospective observational study was conducted at the Prince of Wales Hospital. Consecutive patients with ischaemic stroke or TIA were screened and recruited based on specific inclusion and exclusion criteria. HRMRI was performed using a 3T scanner with an 8-channel phase array brain coil. The imaging protocol included T1-weighted volumetric isotropic turbo spin-echo acquisition (VISTA) sequences and TOF-MRA. Plaque morphology and components were analysed, and patients were followed up for one year to monitor stroke recurrence.

Results:
A total of 132 patients were recruited, with a mean age of 62.30 ± 11.17 years. HRMRI identified ICAS in 65.9% of left middle cerebral arteries (MCAs) and 62.1% of right MCAs. Higher degrees of stenosis and plaque burden were significantly associated with symptomatic lesions. Eccentric plaques were more likely to be symptomatic compared to concentric plaques. Interestingly, hyperintensive signals indicating intraplaque haemorrhage were more prevalent among patients without stroke recurrence.

Conclusion:
HRMRI provides detailed morphological assessments of intracranial atherosclerotic plaques, offering valuable insights beyond traditional luminal stenosis measurements. The study findings suggest that both luminal stenosis and plaque morphology/components play a synergistic role in stroke occurrence. The identification of heavier plaque burden and eccentric plaques as predictors of symptomatic lesions highlights the potential of HRMRI in improving stroke risk stratification and guiding clinical management. Further studies are needed to validate the predictive value of hyperintensive signals within plaques.

Implications:
The application of HRMRI in clinical practice can enhance the precision diagnosis of ICAS, leading to better-targeted treatments and improved outcomes for stroke patients. The findings support the integration of advanced imaging techniques into health policies and clinical guidelines to optimise stroke prevention and management strategies, ultimately improving population health.

Project Number: 04152586

Parallel Session 5 – Infectious Diseases II

PS5.1 - Early biomarkers in SARS-CoV-2 infection: correlation with short/ medium/ long-term clinical outcomes, and implications on acute patient management and long-term medical and health care

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Introduction:
The recent pandemic COVID-19 cast a remarkable adverse global public health and economic impact. The novel virus, SARS-CoV-2, is still actively evolving. Infected individuals, though mostly mild, could deteriorate unexpectedly. Therefore, early prognostic biomarkers are still valuable in triaging patients for the most appropriate and cost-effective management.

Objectives:
This study aims at:
1. Characterising selected early biomarkers of SARS-CoV-2 infection.
2. Delineating the association between early biomarkers with clinical severity.
3. Examining the long-term outcome of COVID-19.
4. Exploring the prognostic value of early biomarkers.

Methods:
A prospective study was conducted between 2020 and 2022 on 1253 patients with 55.6% from the first 4 waves, and 44.4% from the fifth wave. Samples collected soon after hospital admission were investigated for a wide range of microbial, immunologic and metabolomic biomarkers.

Results:
Subgenomic viral RNA (sgRNA) was more superior than crude viral load to indicate viral activity. sgRNA ORF7b was the best surrogate marker that can be measured by simple RT-PCR allowing feasible routine application.
Nasopharyngeal microbiome analyses revealed 13 bacterial genera that predicted the subsequent need for intensive care (AUC, 0.96; 95% CI, 0.91–0.99).
Meteorin-like protein (METRNß), a novel immunosuppressive cytokine, correlated well with viral load, proinflammatory cytokines, such as IL-6, and disease severity.
Interferon (IFN) response was swift and robust in the majority (71%) of vaccine naïve patients, yet low IFN responders were more likely to be asymptomatic.
Cytokines/chemokines including GFG-2, IL-1RA, IL-5, IL-6, IL-10, IL-15, IL-18, MIG, MIP-1ß, and TNFα, demonstrated strong associations ($P < 0.001$), and all were upregulated in severe disease.
Metabolome profile analyses indicated a strong association with 54 metabolites that were significantly downregulated in severe disease (Z score: -3.30 to -8.61), and 14 of them had AUC >0.8, suggesting a high predictive value.
Long-term outcome assessed at 12-45 (mean: 21) months revealed cognitive impairment and fatigue in 46.5% and 39.0%, respectively. Female gender and high levels of 10 cytokines/chemokines measured soon after admission predicted late mental problems. In particular, higher IFN-γ was associated with anxiety, depression and somatic symptoms.

Conclusion:
A number of microbial, immunologic and metabolomic early biomarkers carry a tight association with COVID-19 disease severity and long-term outcome. These early biomarkers are valuable in optimizing treatment and infection control strategies to achieve a cost-effective management when facing limited resource during large outbreaks.

Project Number: COVID19F06

Parallel Session 5 – Infectious Diseases II

PS5.2 - Long-term longitudinal comparisons of health status and immune responses in convalescent COVID-19 and vaccinated cohorts in Hong Kong

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Introduction:
SARS-CoV-2 emerged as a zoonotic pathogen in late 2019, rapidly leading to a global pandemic. In Hong Kong, inactivated virus and mRNA vaccines have been primarily used to control the outbreak.

Objectives:
1. To examine the health status and immune responses of COVID-19 patients recovering from different disease severity.
2. To investigate the SARS-CoV-2-specific cellular and humoral immune responses in individuals receiving different COVID-19 vaccination strategies.
3. To differentiate the multi-omic responses in participants who received either inactivated virus or mRNA COVID-19 vaccines.

Methods:
The health conditions of adults who had recovered from COVID-19 were assessed through clinical diagnosis and questionnaires. The kinetics of SARS-CoV-2-specific humoral and cellular immune responses in both convalescent and vaccinated cohorts were determined by neutralization assays and measuring T cell responses upon stimulation with a SARS-CoV-2 peptide library.

Results:
1. COVID-19 survivors showed similar recovery rates in lung function and exercise capacity, but psychological recovery varied, resembling patterns seen in SARS survivors. Parenchymal changes in HRCT were negatively correlated with the 6MWD of COVID-19 survivors(Chan KKP. BMC Pulm Med 2023).
2. Antibody waning slowed over time, with PRNT50 antibodies predicted to remain detectable for approximately 1,717 days post-symptom onset, while protective levels would last around 990 days in symptomatic patients (Lau EH. EClinicalMed 2021).
3. BNT162b2 vaccination one month after the second dose produced stronger humoral responses to the wild-type strain than CoronaVac (Mok CK. Respirology 2022). As a third dose, both vaccines boosted antibodies in individuals initially immunized with CoronaVac, though BNT162b2 elicited higher antibody levels against variants of concern (Mok CK. AJRCCM 2022). Monovalent or bivalent mRNA vaccines, but not inactivated virus vaccines, as the 4th or 5th dose, induced antibodies against XBB variants (Cheng SM. Virol J 2024).
4. T cell responses to the wild-type and Omicron BA.1 viruses were comparable between CoronaVac and BNT162b2 recipients. However, BNT162b2 induced higher frequencies of Omicron-specific CD4 and CD8 T cells, especially in those aged ≥60yrs. A third dose of either BNT162b2 or CoronaVac boosted waning T cell responses but levels did not exceed those seen 1 month after the second dose (Mok CK. Lancet Microbe 2023). However, a bivalent mRNA vaccine as the 5th dose significantly boosted T cell responses to the XBB variant. T cells from vaccine-induced or hybrid immunity showed memory phenotypes dominantly.
5. Multi-omic analysis revealed distinct differences between the mRNA and inactivated virus vaccines.

Conclusion:
While mRNA vaccines provide stronger though transient humoral response than inactivated virus vaccine, the use of either vaccine can be considered if the primary aim is to reduce severity and death caused by the new omicron subvariants.

Project Number: COVID1903003

Parallel Session 5 – Infectious Diseases II

PS5.3 - Community based sero-epidemiological study of COVID-19

Community-based sero-epidemiological study of COVID-19 to provide data in real time on age-stratified infection attack rates, disease severity and population immunity, for guiding intervention policy

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Introduction:
Data on population-based infection attack rates (IAR) is important for situational awareness and public health policy-making during an epidemic. Surveillance data based on case detection inevitably under-estimates the IAR due to under-ascertainment. Sero-epidemiology can provide a better estimate of IAR.

Objectives:
To define the infection attack rate to SARS-CoV-2 in the population of Hong Kong to inform public health policy.

Phase 1: April 2020-Oct 2021

Methods:
Five cohorts with different levels of risk-exposure were recruited. A. age-stratified population-based cohort (n=4,736), B. blood donor cohort (n=14,164), C. individuals working in occupations with increased interaction with the public excluding health care (n=2,336), D. contacts of known COVID-19 cases in quarantine (4,296), E. COVID-19 convalescent cohort (n=622). We developed and validated a serology testing algorithm for screening and confirmatory testing (virus neutralization) of large numbers of sera.

Results:
We estimated that there had been 60,000 infections (95% CI 12,000-140,000) as of October 2021, implying IAR of ~1% of the population and a reporting rate of 17% (95% CI 7.3%-85%). Higher-risk occupations did not have higher levels of sero-prevalence (0.23%, adjusted Risk Ratio: 0.69, 95% CI: 0.076, 6.3).

Phase 2/3: May 2022-July 2023

Methods:
Blood donor cohort (n=5,173), community children (n=137).

Results:
We validated serological assays to differentiate natural infection and vaccination. IAR increased to 45% (CI 41-48%) between January – 31st July 2022 with a case-ascertainment rate of 41% (RT-PCR and rapid antigen tests). We estimated vaccine effectiveness (VE) against COVID-19 infection for the third dose of BNT162b2 and CoronaVac was 48% (34–64%) and 30% (1–66%), respectively. We estimated that cumulative infection attack rate in the population reached 117% (CI 114-121%) by August 2023. Vaccine derived protection waned with a half-life of approx. 5 months. Each successive "natural infection" reduced the risk of reinfection by 63% (CI 41-87%), with protection waning with a half-life of 8 (CI 5-19) months.

Conclusion:
The low (~1%) infection attack rate up to October 2021 confirmed the effectiveness of Hong Kong's SARS-CoV-2 control measures in the first two years of the pandemic, but emphasized the need for high levels of vaccine coverage. The Omicron BA.2 outbreak increased IAR to 45% by July 2022. Sero-epidemiology studies allowed estimation of vaccine efficacy against infection (rather than symptomatic or severe disease), a parameter that is important for assessing population immunity but rarely estimated in other studies. The outputs of this research grant were communicated to HMRF in real-time.

Project Number: COVID190126

Parallel Session 5 – Infectious Diseases II

PS5.4 - Evaluation of the seroepidemiology of hepatitis A and B in the general population for informing the development of new hepatitis vaccination strategies in Hong Kong

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Introduction:
Both hepatitis A virus (HAV) and hepatitis B virus (HBV) are causes of vaccine-preventable endemic infections. With the evolving epidemiology of HAV and HBV, strategic development of vaccination policy is needed.

Objectives:
This study aims to update the epidemiology of hepatitis A and B, and assess population susceptibility and transmission potential of the viruses in Hong Kong.

Methods:
The study was composed of two parts, a prospective territory-wide cross-sectional household survey with blood sampling, and mathematical modelling. Geographically random sampling was adopted for recruiting subjects who were tested for anti-HAV, HBsAg, anti-HBs and anti-HBc. Prevalence of HAV/HBV infection and vaccination coverage were calculated. Factors associated with anti-HAV and HBsAg positivity were identified in bivariable and multivariable logistic regression models. An age structured catalytic HAV model was developed for evaluating the transmission of HAV from 2001-2030. An age-gender structured HBV epidemic model was developed for hepatitis B in 1981-2030.

Results:
Between October 2018 and August 2021, 2267 respondents from 1325 households were recruited. The age- and sex-adjusted prevalence was 49.88% (95%C.I.=47.8%-52.0%) for anti-HAV, and 6.0% (95%C.I.=5.0%-7.0%) for HBsAg. Age was a significant positive while local born was a negative factor associated with anti-HAV positive and HBsAg positive status. Around 20% and 41% of participants self-reported history of HAV and HBV vaccination, respectively. In the HAV model, the estimated prevalence of anti-HAV would drop from 43% in 2020 to 35% in 2030. Scaling up vaccination uptake would effectively reduce the HAV susceptible population. In the HBV model, the prevalence of chronic infection would fall from 4.9% in 2020 to 4.2% in 2030. The HBsAg prevalence in the general population in 2030 could be lower at 3.5% under the scenario of 5% prevalence in immigrants, but could be high at 7.1% for the scenario of 30% prevalence in immigrants.

Conclusion:
With low anti-HAV prevalence and low HAV vaccination coverage, the risk of HAV outbreaks could be high unless HAV vaccination coverage is enhanced. For hepatitis B, the rate of decline would be slow, with the burden attributed to imported infections from immigrants. Targeted HBV screening and vaccination could be a strategy for consideration.

Project Number: 17160962

Parallel Session 5 – Infectious Diseases II

PS5.5 - Preferences and cost-effectiveness of case detection and management strategies for chlamydia control in Hong Kong

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Introduction:
Chlamydia is one of the most prevalent sexually transmitted infections (STIs) worldwide, including Hong Kong. Effectively controlling and managing chlamydia requires a deep understanding of patient preferences and the identification of optimal strategies for case detection, management and targeted intervention amongst the general population.

Objectives:
We aimed to identify patient preferences and optimal strategies of case detection and management for chlamydia control in Hong Kong.

Methods:
We conducted a discrete choice experiment (DCE) to identify patient preferences for the characteristics for chlamydia testing and management services; and, economic evaluation to investigate the cost-effectiveness of different approaches to chlamydia control in Hong Kong to recommend optimal options that could be adopted by the policymakers and frontline professionals. Three interventional scenarios: 1) Screening only with no contact tracing; 2) Screening plus expedited partner therapy; and 3) Screening plus partner testing with re-testing and targeted testing for higher risk population (i.e. those >1 partners) were examined in an individual-based transmission model. A cost-effectiveness analysis was conducted to estimate the cost, benefits and resulting quality adjusted life year (QALY) gained for each scenario.

Results:
In 520 individuals who participated in the DCEs, the choice to test for chlamydia was most influenced by cost, followed by speed of testing and delivery of results, additional STI testing, availability of appointment and finally the location of testing. Staff attitude, cost, who they consult, access to patient-delivered partner therapy, travel time and treatment location were the order of the importance in chlamydia management. The mean prevalence of universal (10% coverage) and targeted screening of higher-risk population at equilibrium were 3.24 ± 0.31% and 3.35 ± 0.38%; and after intervention 2.75 ± 0.30% and 2.35 ± 0.21%, respectively which could be further reduced to 1.48 ± 0.13% with 40% contact tracing efficiency.

Conclusion:
Targeted screening with strengthened contact tracing efforts is more cost-effective than universal screening to reduce the prevalence of chlamydia in the local context.

Project Number: 18171282

Parallel Session 5 – Infectious Diseases II

PS5.6 - A randomized controlled trial evaluating an online intervention based on the Trans-Theoretical Model in increasing seasonal influenza vaccination among community dwelling people aged ≥65 years

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Introduction:
Receiving seasonal influenza vaccination (SIV) is important for adults. Research indicates that the most effective way to combat vaccine fatigue is by tailoring the vaccine information to meet individuals' specific characteristics and needs. However, there are few robust evaluations of tailored interventions for improving SIV uptake among older adults.

Objectives:
To evaluate the relative efficacy of a stage-of-change (SOC)-tailored online intervention compared with a standard, non-SOC-tailored online intervention in increasing SIV uptake among Hong Kong residents 65 years or older.

Methods:
This partially blinded (outcome assessors and data analysts) parallel-group randomized controlled trial was conducted between December 1, 2021, and July 31, 2022. Eligible participants were 65 years or older, had Cantonese- and/or Mandarin-speaking skills, were community-dwelling, had Hong Kong residency, were smartphone users, and had not received SIV for the 2021/2022 influenza season. Participants were recruited through random telephone calls and were randomized to either the intervention or control group. In the intervention group, a rule-based Chatbot first assessed participants' SOC related to SIV uptake and then automatically selected and sent participants SOC-tailored online health promotion videos or messages through WhatsApp once every 2 weeks for 4 sessions. In the control group, the Chatbot sent a standard online health promotion video covering general SIV information through WhatsApp every 2 weeks for 4 sessions. The primary outcome was self-reported SIV uptake at Month 6, which was validated by the research team. Intention-to-treat (ITT) analysis was performed.

Results:
A total of 396 participants (mean [SD] age of 70.2 [4.3] years; 249 females [62.9%]) were randomized into the intervention (n=198) or control (n=198) group. The ITT analysis showed that the validated SIV uptake rate was higher in the intervention group than the control group (50.5% vs. 35.3%, p=.002). The mean (SD) SOC score was higher in the intervention group than the control group (2.8 [1.4] vs 2.4 [1.4], p=.02). More participants in the intervention group completed at least one episode of intervention than in the control group (77.3% vs. 62.6%, p<.001). Approximately 80% of participants in the intervention group found it easy to interact with the Chatbot and were satisfied with the online interventions.

Conclusion:
SOC-tailored online intervention was more effective than the non-SOC-tailored intervention and may be a sustainable new method in increasing SIV uptake among older adults. The Chatbot developed by this project became the prototype of numerous artificial-intelligence Chatbots promoting healthy behaviors among older adults in Hong Kong.

Project Number: 19181152

Parallel Session 5 – Infectious Diseases II

PS5.7 - Multi-stream data-driven forecasting of influenza activity and associated hospital admission burden: an implication for impact assessment of COVID-19 pandemic on 2019/20 winter influenza season in Hong Kong

Forecasting influenza epidemics in Hong Kong using multiple streams of syndromic and laboratory surveillance data

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Introduction:
In theory, better forecast or projection of influenza depends on understanding the impacts of the associated drivers and interventions, and their incorporation could empower the predictive performance of the underlying models. Like other tropical and subtropical regions, influenza viruses can circulate year-round in Hong Kong. However, during the COVID-19 pandemic, there was a significant decrease in influenza activity.

Objectives:
The objective of this study was to retrospectively forecast influenza activity during the year 2020 and assess the impact of COVID-19 public health social measures (PHSMs) on influenza activity and hospital admissions in Hong Kong.

Methods:
Using weekly surveillance data on influenza virus activity in Hong Kong from 2010 to 2019, we developed a statistical modeling framework to forecast influenza virus activity and associated hospital admissions. We conducted short-term forecasts (1-4 weeks ahead) and medium-term forecasts (1-13 weeks ahead) for the year 2020, assuming no PHSMs were implemented against COVID-19. We developed two frameworks based on (1) statistical modelling and (2) mechanistic modelling to construct the respective multiple streams data driven predictive models. We used the out-of-sample validation and temporal cross-validation techniques to check the forecasting performance. We estimated the reduction in transmissibility, peak magnitude, attack rates, and influenza-associated hospitalization rate resulting from these PHSMs.

Results:
For short-term forecasts, mean ambient ozone concentration and school holidays were found to contribute to better prediction performance, while absolute humidity and ozone concentration improved the accuracy of medium-term forecasts. We found the influenza activity/transmissibility had significant non-linear associations with the mean absolute humidity (U-shaped), mean ambient ozone concertation (negative power) in Hong Kong. We observed a maximum reduction of 44.6% (95% CI: 38.6% - 51.9%) in transmissibility, 75.5% (95% CI: 73.0% - 77.6%) in attack rate, 41.5% (95% CI: 13.9% - 55.7%) in peak magnitude, and 63.1% (95% CI: 59.3% - 66.3%) in cumulative influenza-associated hospitalizations during the winter-spring period of the 2019/2020 season in Hong Kong. We found the forecast outcomes in both frameworks are comparable with respective predictive accuracy.

Conclusion:
We developed the integrated frameworks to not only forecast influenza activity and hospitalizations but also project influenza activity and hospitalizations retrospectively under a counterfactual scenario without COVID-19 PHSMs since January 2020. The implementation of PHSMs to control COVID-19 had a substantial impact on influenza transmission and associated burden in Hong Kong.

Project Number: 18171202

Sharing Sessions on Research Fellowship Scheme

SS1 - Personalized Risk-based Care and Education for Early Survivors of Childhood Cancer in Hong Kong

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Introduction:
Survivors of childhood cancer are at-risk of developing treatment-related late effects. A comprehensive survivorship program that includes late effects screening and health promotion is essential in improving survivors' health outcomes.

Objectives:
To identify high-priority late effects for harmonizing screening guidelines and its implementation barriers in practice
To evaluate the short-term efficacy of the personalized survivorship care plan intervention in improving awareness of personal health risks among survivors

Methods:
Phase 1 consisted of a Delphi survey and a focus group discussion involving 14 paediatric oncologists in Hong Kong and the Chinese Children Cancer Group.
Phase 2 consisted of a prospective interventional study involving survivors diagnosed with cancer at ≤18 years old, were >5 years post-cancer diagnosis and >2 years from the completion of treatment. The intervention included a personalized survivorship care plan and counselling. The participants' knowledge of their cancer diagnosis, treatment and potential treatment-related late effects was assessed at baseline, immediately post-intervention, and 1-3 months post-intervention.

Results:
Phase 1 – The Delphi survey of paediatric oncologists identified cardiovascular, endocrine, secondary cancers, and psychosocial complications as "high-priority late effects". The panel concluded that these late effects could be screened systematically across institutions in China at reasonably low financial and labour expenditures.
Phase 2 – In total, 244 survivors received a personalized survivorship care plan and counselling (mean age: 19.4 [SD = 6.7] years; 54.1% male; 66.1% haematological malignancies), of whom 162 survivors completed all assessments. Generalized estimating equations showed that there was significant increase in survivors' awareness of their cancer diagnoses (mean adjusted score: baseline 66.9, post intervention 86.3; P<0.001) and potential late effects (baseline 30.9, post intervention 66.3; P<0.001). The proportion of survivors who demonstrated awareness of their potential late effects increased from 9.7% to 54.3%. The interaction analysis showed that there was significantly less improvement in awareness among survivors of non-central nervous system (non-CNS) solid tumours (P=0.032) and lower socioeconomic status (P=0.014).

Conclusion:
We developed a preliminary framework to enable systematic and harmonized screening of late effects, and increasing survivors' awareness of their personal health risks. To highlight, the provision of a personalized survivorship care plan and health-risk counselling is now part of routine clinical care in the newly established Long-term Follow-up Clinic of the Hong Kong Children's Hospital since October 2023.

Research Fellowship Number: 03170047

Sharing Sessions on Research Fellowship Scheme

SS2 - The Increasing Incidence of Anaphylaxis in Hong Kong: A Westernized Allergy Trend and the Importance of Early Intervention

Timing of solids introduction in Hong Kong children – is early introduction better?

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Introduction:
Food allergy (FA) is a growing public health concern globally, with increasing prevalence rates. While data on FA is limited in Hong Kong, the impact on individuals and their quality of life is significant. This study aimed to evaluate the local disease burden of FA and food anaphylaxis and identify associated risk factors.

Objectives:
This study aims to assess the disease burden of FA and FA-induced anaphylaxis in Hong Kong and to investigate the relationship between the timing of solids introduction and FA development in Hong Kong children.

Methods:
A retrospective and prospective epidemiological survey was conducted. In the first stage, all food allergy and/or anaphylaxis cases were identified through electronic database searches using ICD codes. Patient medical records were reviewed, and data on allergic reactions, suspected allergens, age of onset, timing of solids introduction, investigation findings, and management plans were collected using standardized forms. In the second stage, investigators prospectively recruited food allergy and/or anaphylaxis patients over 18 months from seven major hospitals in Hong Kong. These patients and their caregivers were interviewed, and their medical records were reviewed.

Results:
A 10-year estimated incidence rate of anaphylaxis of 3.57 per 100,000 person-years was reported, with an increasing trend observed from 2009 to 2014. The incidence of new food allergy diagnoses increased from 12.4 per 100,000 population in 2009 to 38.1 per 100,000 population in 2019, correlating with the increase in anaphylaxis incidence. The overall adrenaline autoinjector (AAI) prescription rate for patients admitted for anaphylaxis was less than 15%, significantly lower for adults compared to paediatric patients. Food-induced anaphylaxis accounted for the majority of hospital presentations, with peanut and shellfish being the top food triggers.
Despite increasing evidence supporting early introduction of allergenic foods, delayed introduction, especially for nuts and peanuts, was common in Hong Kong children.

Conclusion:
The study highlights the increasing burden of food allergy and anaphylaxis in Hong Kong, comparable to rates in the Western world. The findings emphasize the need for improved physician and public education regarding FA management and the importance of increasing AAI prescription rates. Further research is required to explore the applicability of early peanut introduction to the Chinese population with a lower peanut allergy prevalence.

Research Fellowship Number: 04180047

Sharing Sessions on Research Fellowship Scheme

SS3 - The effect of alcohol pricing policies on public health: a modelling study

Prof QUAN Jianchao

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Introduction:
Unlike most developed economies, Hong Kong reduced and eliminated taxes on beer, wine, cider, and ready-to-drinks over the last 15 years, leading to increasing alcohol consumption.

Objectives:
To examine the effect of reversing alcohol taxation on alcohol-related health harms and direct healthcare costs in Hong Kong.

Methods:
We applied econometric epidemiological modelling linking alcohol pricing to consumption, and changes in consumption to health outcomes and healthcare costs. We modelled the population health effects of reverting ad valorem taxation to pre-2007 and pre-2008 levels (40% on beer and 80% on wine; and 20% on beer and 40% on wine respectively). We conducted econometric analyses using 15 years of industry data (2004-2018) to derive 25 own-price and cross-price elasticity estimates. We applied risk functions from World Health to model the impact on morbidity and mortality of 29 alcohol-attributable conditions.

Results:
Raising taxes to pre-2007 and pre-2008 levels reduced consumption of pure ethanol by 33.8%-36.1%. The largest reductions in relative and absolute terms were for wholly alcohol-attributable conditions. The largest relative changes in cancer burden were for cancers of the upper aerodigestive tracts, oral cavity/pharynx, larynx, oesophagus, and breast. Significant absolute and relative reductions were observed for cardiovascular diseases, lower respiratory tract infections, tuberculosis, and liver cirrhosis. The tax policies are effective at averting the alcohol-attributable portion of population health burden from alcohol-related conditions and results in annual direct healthcare savings of HKD $30.3-31.7 million from treating alcohol-attributable conditions. Baseline alcohol-attributable health burden and absolute reductions in health harms and cost savings are far greater in males.

Conclusion:
Reversing the 2007-08 alcohol tax reductions is effective at averting the alcohol-attributable health burdens and results in moderate annual direct healthcare savings. Reintroduction of taxes to reduce alcohol-related burden of disease merits consideration to mitigate against avoidable harms.

Research Fellowship Number: 03170067

Sharing Sessions on Research Fellowship Scheme

SS4 - Evaluating the impact of sugar-sweetened beverages tax in Hong Kong: An integrated study

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Introduction:
Hong Kong, an affluent setting in Asia has been discussing the feasibility of the policy on sugar-sweetened beverages (SSB) tax as a strategy to reduce sugar uptake and in a long run to decrease the burden from non-communicable diseases.

Objectives:
This study aimed to assess the impact of SSB taxation on the prevalence of obesity/overweight and type 2 diabetes mellitus (T2DM) in Hong Kong using a willingness-to-pay (WTP) survey and simulation analysis.

Methods:
A random telephone survey was conducted with 1,000 adults from May to June 2020. We used a contingent valuation approach to assess individuals' WTP for SSBs under four tax payment scenarios (5%, 10%, 40%, and 50% of the current market price). Based on the WTP, a simulation analysis was conducted to project changes in SSB purchase and associated reductions in the prevalence of obesity/overweight and T2DM over a 10-year simulation period.

Results:
When 5% and 10% taxation rates were introduced, approximately one-third of the population were unwilling to maintain their SSB purchase. Our simulation demonstrated a gradual decline in the prevalence of obesity/overweight and diabetes with a more pronounced decrease when higher taxation rates were introduced. 10% taxation resulted in a mean reduction of 1,532.7 cases of overweight/obesity per 100 thousand population at the sixth year, while T2DM prevalence decreased by 267.1 (0.3%).

Conclusion:
This study underscores the effects of an SSB tax on purchase behaviors and health outcomes in an affluent Asia setting, with a more pronounced influence on adult population. These findings are expected to inform policymakers in making decisions regarding an effective and equitable tax rate on SSBs.

Research Fellowship Number: 04180017

Abstracts for Poster Presentation

AMR-01

Identification and evaluation of a serum microRNA panel to diagnose Colorectal Cancer patients

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Introduction: Screening plays a crucial role in the early detection of colorectal cancer, greatly reducing mortality rates.

Objectives: The objective of this study was to identify a non-invasive diagnostic method utilizing serum microRNA expression for the diagnosis of colorectal cancer patients.

Methods: The study consisted of three stages. In the first stage, 129 patients with colorectal cancer and 129 normal subjects were recruited as the training set for the development of a blood miRNA panel. The second stage involved recruiting 200 patients from each group as the validation cohort. Finally, a blinded study was conducted in the third stage, with 260 patients recruited to determine the predictive value of our miRNA panel. Serum samples were prospectively collected from colorectal cancer patients and normal subjects between 2017 and 2021 at Queen Mary Hospital in Hong Kong. Quantitative PCR was utilized to detect the serum levels of candidate microRNAs, and a multiple linear regression model was employed to formulate a serum microRNA panel for diagnosing colorectal cancer patients. The performance of the panel was evaluated using ROC analysis.

Results: Our study showed that the values of three pairs of serum microRNAs, namely miR-106b-5p/miR-1246, miR-106b-5p/miR-16, and miR-106b-5p/miR-21-5p, exhibited statistically significant differences between colorectal cancer patients and normal subjects. A serum microRNA panel formulated from these three pairs of microRNAs demonstrated high accuracy in diagnosing colorectal cancer patients from normal subjects, with an AUC of approximately 0.9, hence it can be considered as a screening test for identifying high risk individuals with colorectal cancer.

Conclusion: The serum miRNA test proved to be a feasible and promising non-invasive biomarker for the diagnosis of colorectal cancer patients in comparison to normal subjects.

Project Number: 04151956

AMR-02

Precision Diagnosis of Intracranial Atherosclerosis by Using High resolution MRI: Plaque Morphology and/or Components rather than Arterial Stenosis Predict Stroke Recurrence

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Introduction: Intracranial atherosclerosis (ICAS) is a significant cause of stroke, particularly in Asian populations. Traditional imaging techniques focusing on luminal stenosis have limitations in characterizing ICAS. High-resolution magnetic resonance imaging (HRMRI) offers a novel approach to visualize vessel wall pathology, potentially providing better diagnostic and prognostic insights.

Objectives: This study aimed to evaluate the association between plaque features (morphology and/or components) assessed by HRMRI and the short/long-term outcomes of ischemic stroke or TIA patients with ICAS. The goal was to determine specific parameters of plaque features with the best predictive efficacy for stroke recurrence.

Methods: A hospital-based prospective observational study was conducted at the Prince of Wales Hospital. Consecutive patients with ischemic stroke or TIA were screened and recruited based on specific inclusion and exclusion criteria. HRMRI was performed using a 3T scanner with an 8-channel phase array brain coil. The imaging protocol included T1-weighted volumetric isotropic turbo spin-echo acquisition (VISTA) sequences and TOF-MRA. Plaque morphology and components were analyzed, and patients were followed up for one year to monitor stroke recurrence.

Results: A total of 132 patients were recruited, with a mean age of 62.30 ± 11.17 years. HRMRI identified ICAS in 65.9% of left MCAs and 62.1% of right MCAs. Higher degrees of stenosis and plaque burden were significantly associated with symptomatic lesions. Eccentric plaques were more likely to be symptomatic compared to concentric plaques. Interestingly, hyperintensive signals indicating intraplaque hemorrhage were more prevalent among patients without stroke recurrence.

Conclusion: HRMRI provides detailed morphological assessments of intracranial atherosclerotic plaques, offering valuable insights beyond traditional luminal stenosis measurements. The study findings suggest that both luminal stenosis and plaque morphology/components play a synergistic role in stroke occurrence. The identification of heavier plaque burden and eccentric plaques as predictors of symptomatic lesions highlights the potential of HRMRI in improving stroke risk stratification and guiding clinical management. Further studies are needed to validate the predictive value of hyperintensive signals within plaques.

Project Number: 04152586

AMR-03

A randomized controlled clinical trial comparing subthreshold micropulse yellow (577 nm) laser versus half-dose photodynamic therapy for central serous chorioretinopathy

Dr Marten BRELEN[1], Dr Mary HO[2], Dr Sophia LI[2], Dr Danny NG SC[1], Ms Yolanda YIP WY[1], Ms LEE Wing-sze[1], Prof CHEN Li-jia[1], Prof Alvin L YOUNG[2], Prof Clement C THAM[1], Prof PANG Chi-pui[1]
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Abstracts for Poster Presentation

Introduction: Central serous chorioretinopathy (CSCR) is a condition characterized by the accumulation of subretinal fluid, leading to potential visual impairment. While many cases resolve spontaneously, chronic CSCR may require intervention to prevent permanent vision loss. This study compares half-dose photodynamic therapy (PDT) and yellow 577 nm subthreshold micropulse laser (SMLT) as treatment options.

Objectives: To evaluate and compare the anatomical and functional outcomes of half-dose PDT versus SMLT in patients with chronic CSCR.

Methods: In a prospective, double-masked, randomized controlled trial, eligible patients with chronic CSCR were assigned to receive either half-dose PDT or SMLT. Treatments were repeated if persistent subretinal fluid (SRF) was observed. The primary outcome was the complete resolution of SRF at 12 months, assessed via optical coherence tomography (OCT). Secondary outcomes included changes in best-corrected visual acuity (BCVA), central macular thickness (CMT), retinal sensitivity, and vision-related quality of life.

Results: Between April 2017 and October 2020, 68 patients were recruited. At one month after treatment, SRF resolved in 8/33 (24.2%) patients receiving SMLT and 20/34 (58.8%) patients receiving half-dose PDT. This increased to 23/28 (82.1%) in the SMLT group and 30/33 (90.9%) in the half-dose PDT group at 12 months of follow-up. Kaplan-Meier survival curves showed significantly faster resolution of SRF in the half-dose PDT group than SMLT group (p=0.016). Both groups showed significant improvement in BCVA (-0.12 +/- 0.21, p=0.005 for SMLT; -0.13 +/- 0.12, p<0.001 for half-dose PDT), CMT (-154.2 +/- 105.6, p<0.001 for SMLT; -140.8 +/- 94.0, p<0.001 for half-dose PDT), and retinal sensitivity (5.70 +/- 5.02, p<0.001 for SMLT; 6.05 +/- 3.83, p<0.001 for half-dose PDT) at 12 months compared with baseline. There was no significant difference between the two treatment groups at each time point in all investigations except BCVA at 3 months (p=0.03). The results offer the first evidence basis for SMLT as a cheaper alternative treatment to PDT amidst the ongoing verteporfin supply chain shortages. This study resulted in new HA guidelines on management of CSCR.

Conclusion: When comparing half-dose PDT to subthreshold SMLT this study has shown both treatments to be viable options, with half-dose PDT achieving marginally faster anatomical and functional improvement.

Project Number: 04152826

AMR-04

Evaluation of anxiolytic and antidepressant effects of colon-specific delivery and control-release of probiotics on brain and behavior using a mouse model of social defeat stress

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Introduction: Recent researches show that 61% of Hong Kong adults suffer from poor mental well-being. Evidence has suggested that probiotics (Pro) can positively influence gut microbiota, subsequently has benefits on mental disorders via the gut-brain axis. However, oral administration of Pro may subject it to damage from gastric acid. To address this issue, a microencapsulation system was developed to protect the probiotics and improve their efficacy.

Objectives: The project aims to evaluate the anxiolytic and antidepressant effects of colon-target delivery probiotics using mice models.

Methods: To investigate the efficacy and mechanism of the microencapsulated probiotics (MPro) on treating mental disorders, social defeat stress (SDS) was applied to build depressive mice models. The dead bacteria (negative control), fluoxetine (positive control), Pro and MPro were administered respectively to the model mice. The behavioral tests including open filed test, elevated plus maze test, sucrose consumption test and forced swimming test were conducted to evaluated the efficacy of MPro on anxiety and depression. The effect of MPro on mice intestinal microbiota was also evaluated by 16sRNA sequencing. The expressions of the pro-inflammatory factors, such as TNF-α and IL-6 in the intestine and hippocampus, were also tested to explore the mechanism of gut microbiota–brain axis activated by MPro.

Results: MPro was developed utilizing zein, which enhanced the survival of probiotics. The ideal zein concentration was established at 10mg/ml, with a zein-to-probiotic mass ratio of 5:1 proving optimal. This microencapsulation improved probiotics survival during in vitro gastric digestion, achieving a viable amount of 6.44 CFU/g. Behavioral assessments indicated that MPro alleviated anxiety and depression more effectively than Pro. Moreover, these MPro corrected gut microbiota imbalances linked to depression and reduced inflammation in the intestine and hippocampus of depressed mice, suggesting a potential mechanism.

The innovative research outcome, MPro, will be developed into commercial products with health benefits. We have reached preliminary cooperation with health product manufacturers to use MPro in probiotic products, aiming to ameliorate mood disorders and enhance public health.

Conclusion: Zein microencapsulated probiotics were developed. The MPro had a therapeutic effect on the depressive, anxious, and despairing behaviors of the social defeat stress mice models.

Project Number: 05161016

AMR-05

PIM kinase inhibition suppresses progression and chemoresistance of hepatocellular carcinoma

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Abstracts for Poster Presentation

Introduction: Targeted therapy is a promising approach in devising treatment regimen for cancers. While PIM (proviral integration site for Moloney murine leukaemia virus) kinase is an emerging molecular target in some human cancers, its potential therapeutic implications in hepatocellular carcinoma (HCC) is still largely unknown.

Objectives: In the current study we investigated the pre-clinical efficacy of targeting PIM kinase by pharmacological approach as a therapeutic strategy in the treatment of HCC.

Methods: PIM kinase inhibitors SGI-1776 and PIM447 were employed. Cell proliferation, migration, invasion, chemosensitivity and self-renewal of HCC cell lines upon administration of PIM inhibitors were examined by in vitro assays. The in vivo effects of PIM inhibitors on tumour growth and chemoresistance were studied using xenograft mouse models. RNA-sequencing of tumour tissues harvested from animal models was performed to interrogate the downstream molecular mechanisms elicited by PIM inhibitors in HCC cells.

Results: Our findings demonstrated that PIM inhibitors SGI-1776 and PIM447 suppressed proliferation, metastatic potential, and self-renewal of HCC cells in vitro. Attenuated tumor growth in vivo was observed in the PIM inhibitor treatment group from animal experiments. In addition, enhanced chemosensitivity toward cisplatin and doxorubicin, chemotherapeutic agents used in trans-arterial chemoembolization for HCC, was observed upon administration of PIM inhibitors. Transcriptomic profiling revealed downregulation of the MAPK/ERK pathway upon PIM inhibition in HCC cells, and the results were validated by western blotting.

Conclusion: Taken together, PIM inhibitors demonstrated remarkable anti-tumor effects in HCC in terms of tumor growth and chemosensitivity. PIM kinase inhibition is a potential therapeutic approach in formulating adjuvant therapy for HCC patients.

Project Number: 05161056

AMR-06
Development of a new anti-obesity drug

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Introduction: Obesity is not just about being fat. It is a major global public health threat, with 39% adults classified as overweight and 13% adults classified as obese. We have made a ground-breaking drug discovery in treating multiple metabolic diseases related to obesity and insulin resistance like diabetes and fatty liver disease. The new drug, recombinant human arginase (rhArg), opens a new path for safe, long-lasting cures to multiple obesity related diseases simultaneously through an ingenious treatment mechanism – arginine starvation.

Objectives:
(i) To examine the effects of rhArg on whole-body and tissue-specific energy homeostasis
(ii) To evaluate the efficacy and safety of long-term use of rhArg
(iii) To test the effects of rhArg on human cells to determine the potential of translating findings from animals to humans

Methods: Diet-induced obese (DIO) mice were used in the studies, including measurement of whole-body energy expenditure and tissue-specific bioenergetics. Evaluation of drug efficacy and safety was studied, including measurement of anti-drug antibodies, neutralizing activity and arginine concentrations; blood and urine tests, and blood pressure; insulin sensitivity and glucose tolerance. Other methods include human preadipocyte culture, human hepatocyte culture, and data processing and analysis.

Results: We found that treatment with rhArg promotes lipid oxidation and enhances net energy loss to reduce bodyweight. Importantly, long-term treatment with rhArg remains effective and safe. Intriguingly, treatment with rhArg inhibits adipogenesis in human preadipocytes and enhances insulin sensitivity in steatotic human hepatocytes.

Conclusion: We discovered that a low level of arginine (a semi-essential amino acid) in the blood can suppress fat synthesis, promote fat breakdown and sensitise cells to insulin. We found that within eight weeks of treatment with rhArg, the treatment group's body weight, fat mass, fatty liver and characteristic features of diabetes such as high blood glucose, insulin resistance and glucose intolerance were entirely reversed. The rhArg drug shows promise for the effective treatment of multiple metabolic diseases including prediabetes, type 2 diabetes and nonalcoholic fatty liver disease. The fabrication process of rhArg is inexpensive and highly efficient, making it affordable and widely adoptable for clinical applications.

Project Number: 05161096

AMR-07
Inhibition of microglial P2X4 receptor attenuates neuroinflammation and enhances photoreceptor survival in retinal degeneration

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Introduction: Retinitis pigmentosa (RP) is a group of inherited retinal dystrophies caused by mutations in genes that are typically expressed by rods, which results in initial death of rods followed by cones. Although a number of gene mutations associated with RP have been identified, the molecular mechanisms underlying this family of incurable condition remains unknown. Recently, purinergic signaling has been implicated in the progression of retinal degeneration. This study aimed to investigate the role of the P2X4 receptor (P2X4-R) in microglia activation and to evaluate the effects of P2X4-R inhibition on neuroinflammation and photoreceptor death in RP.

Abstracts for Poster Presentation

Objectives: To investigate the role of P2X4-R in the mechanisms of photoreceptor death during RP and thereby identify potential therapeutic approach to slow disease progression, we aim to: (1) validate the involvement of the P2X4-R in microglia activation in a mouse model of retinal degeneration, (2) evaluate the effects of P2X4-R inhibition on neuroinflammation and photoreceptor death in retinal degeneration, and (3) investigate the mechanisms underlying the protective effects of microglial P2X4-R inhibition on retinal degeneration.

Methods: Pharmacological blockade of the P2X4-R was performed by administering duloxetine to rd10 mice, a model of autosomal recessive RP. To achieve specific retinal microglia P2X4-R inhibition, we subretinally injected an AAV-Cre vector driven by a CX3CR1 promoter into rd10/P2X4-R-floxed mice to knockdown microglial P2X4-R. We examined photoreceptor survival and mechanisms using immunohistochemistry, qRT-PCR and visual performance tests.

Results: Microglial P2X4-R expression was elevated during photoreceptor death and contributed to the loss of visual function in the rd10 mouse retina. Pharmacological inhibition and genetic ablation of microglial P2X4-R alleviated neuroinflammation and significantly prolonged photoreceptor survival. Improved visual performance in microglial P2X4-R-depleted rd10 mice corroborated our histological findings, indicating that inhibition of microglial P2X4-R ameliorated photoreceptor degeneration in rd10 retina.

Conclusion: Inhibition of microglial P2X4-R delays retinal degeneration in rd10 mice by attenuating neuroinflammation. Our findings highlight a potential role for P2X4-R as a therapeutic target for neurodegenerative diseases. Understanding the role of microglial P2X4-R in RP can aid development of therapeutic strategies for regulating neuroinflammatory responses associated with photoreceptor death in patients with retinal dystrophies.

Project Number: 05161116

AMR-08

Identification of Serine/Threonine kinase 39 (STK39) as a novel therapeutic kinase against liver tumor-initiating cells in hepatocellular carcinoma

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Introduction: Hepatocellular carcinoma (HCC) is a prevalent cancer worldwide, with a poor prognosis due to high recurrence and treatment resistance. Substantial evidence indicates that cancer stem cells (CSCs) play a vital role in therapeutic resistance. However, few kinase inhibitors have been identified that specifically target liver CSCs in HCC therapy.

Objectives: To identify kinase that is crucial for the regulation of liver CSCs leads to multidrug resistance in hepatocellular carcinoma.

Methods: RNA-Seq analysis was used to identify kinases critical for liver CSCs. Lentiviral-based overexpression and knockdown approaches were used to characterize the functional roles of STK39 in the regulation of liver CSCs and multiple drug resistance. The directly phosphorylated STK39 substrate was identified by mass spectrometry. Further pathway validation was performed by western blotting, kinase assays, and DNA condensation assays.

Results: Our analysis identified serine/threonine kinase 39 (STK39) as a commonly upregulated protein kinase in liver CSCs. Clinically, we found that STK39 overexpression was detected in HCC tumor tissues ($p<0.001$) and was significantly associated with poorer overall survival and disease-free survival. Using lentiviral overexpression and knockdown approaches, we demonstrated the role of STK39 in regulating liver CSC properties, including self-renewal, tumorigenicity, cell invasiveness, and the expression of liver CSC markers. STK39 expression was found to be significantly elevated in HCC cells that were resistant to both sorafenib and lenvatinib, and its inhibition resulted in an increased sensitivity of HCC cells to these treatments. We identified PARP1 as a novel protein-binding partner of STK39. Upon suppression of STK39 in HCC cells, the phosphorylation of PARP1 at Threonine 368 (T368) was significantly inhibited, indicating its role as a downstream effector of STK39-mediated liver CSC functions. Interestingly, STK39-mediated PARP1 phosphorylation led to the development of resistance to the PARP1 inhibitor rucaparib. Additionally, STK39 plays a critical role in regulating PARP1-mediated chromatin decondensation, enabling it to open the chromatin structure at the promoter regions of SOX2/OCT4.

Conclusion: We identified STK39 as a key regulator of multiple drug resistance in HCC by influencing cancer stemness. Combining molecular targeted drugs, such as rucaparib and lenvatinib, with STK39 inhibitors may offer a promising therapeutic strategy for this fatal disease.

Project Number: 05161216

AMR-09

A randomized controlled trial comparing gradual and immediate brace weaning for clinical management of adolescent idiopathic scoliosis patients

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Introduction: Lack of evidence and consensus for brace weaning protocol in adolescent idiopathic scoliosis (AIS) results in clinicians prescribing gradual weaning in the hope of avoiding curve deterioration after weaning. However, gradual weaning contributes to prolonged brace wear, which can affect spinal stiffness and health-related quality of life (HRQoL).

Objectives: To determine whether gradual weaning results in better curve magnitude and truncal balance maintenance after brace weaning vs immediate brace removal for patients with AIS.

Abstracts for Poster Presentation

Methods: This was an open-labeled randomized clinical trial with 24-month follow-up. Patients were randomized to gradual weaning protocol (n = 176) with an additional 6 months of nighttime wear before completely stopping or immediate weaning protocol (n = 193) with immediate brace removal at recruitment. Outcome assessors were masked to weaning protocol assigned. Patients with AIS ready to wean off of brace wear were eligible and those who were treated with a custom molded thoracolumbosacral orthosis and had reached skeletal maturity were consecutively recruited. Changes in major curve Cobb angle, truncal balance and HRQoL was assessed from the time of weaning to 6-month, 12-month, and 24-month follow-up.

Results: A total of 369 patients (mean [SD] age, 14.9 [1.1] years; 304 [83.4%] girls) were randomized with 284 (77.0%) completing 24-month longitudinal follow-up. Immediate and gradual weaning groups had no significant differences in change of major Cobb angle at postweaning 6-month (difference, −0.6°; 95% CI, −1.4 to 0.2; P = .17), 12-month (difference, −0.3°; 95% CI, −1.2 to 0.6; P = .47), and 24-month (difference, −0.3°; 95% CI, −1.2 to 0.7; P = .60) follow-up. The number of curve progression, nonprogression, and rebound cases were comparable ($\chi 2$ 2 = 2.123; P = .35). Postweaning changes in truncal balance and HRQoL demonstrated no significant differences between groups.

Conclusion: Gradual weaning did not demonstrate superiority to immediate weaning with predefined criteria of Cobb angle and truncal balance maintenance and HRQoL after brace weaning. Gradual and immediate weaning achieved very similar maintenance of brace outcomes in AIS. We therefore recommend the consideration of immediate brace weaning, which aims to benefit patients with earlier time for increased exercises and activity level.

Project Number: 05161356

AMR-10

Protein Tyrosine Kinase 7 (PTK7) Promotes Metastasis in Hepatocellular Carcinoma via SOX9 Regulation and TGF-β Signaling

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Introduction: Metastasis is found in most advanced hepatocellular carcinoma (HCC) patients, and it drives tumor recurrence and systemic failure. There is no effective treatment owing to its complex biological features. Many of the molecular drivers of metastasis are crucial players in normal physiology but behave unconventionally during cancer progression. Targeting these molecular drivers for therapy and differentiating them from a physiological background requires a detailed examination of the novel mechanisms involved in their activation during metastasis.

Objectives: This project aims to identify novel regulators of HCC metastasis.

Methods: Publicly available transcriptomic data such as TCGA-LIHC and Gene Expression Omnibus were utilized to identify novel targets upregulated in advanced and metastatic HCC. Validation of candidates was assisted by immunohistochemistry performed on tissue microarrays derived from more than 100 HCC patients. Expression of protein tyrosine kinase 7 (PTK7) was studied under the treatment of transforming growth factor-β1 and knockdown of SRY-Box Transcription Factor 9 (SOX9) to delineate upstream regulation, while CRISPR-mediated knockout and lentiviral overexpression of PTK7 in HCC cells were performed to study their functional and signaling consequences. Manipulated HCC cells were injected into mice models either by orthotopic or tail-vein injection to observe for any in vivo pro-metastatic effects.

Results: PTK7 was discovered to be the kinase most significantly upregulated in advanced and metastatic HCC, at both transcriptomic and proteomic levels. Bioinformatic analyses and functional assays performed in HCC cell lines revealed transforming growth factor-β signaling and SOX9 to be important activators of PTK7 expression. Functionally, enrichment of PTK7 expression could positively regulate the metastatic potential of HCC cells in vitro and lung metastasis models performed in immunodeficient mice. The up-regulation of PTK7 recruited the epithelial-mesenchymal transition components, zinc finger protein SNAI2 (SLUG), and zinc finger E-box-binding homeobox 1 (ZEB1).

Conclusion: Our study proposes PTK7 as a novel molecular driver in metastatic HCC, particularly in a transforming growth factor-β-activated microenvironment. The preferential expression of PTK7 resulted in a previously unobserved regulatory effect on the recruitment of epithelial-mesenchymal transition components, which established PTK7 as a potential determinant of specific epithelial-mesenchymal transition status. Therefore, our data support the continual development of PTK7-targeted agents as antimetastatic therapies.

Project Number: 05161756

AMR-11

Pathological significances and therapeutic potential of targeting FACT complex in liver cancer

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Introduction: Liver cancer is a common cancer worldwide that with an extremely poor prognosis. The molecular mechanism of liver carcinogenesis remains poorly understood. A better understanding of the molecular mechanism of liver carcinogenesis may shed light on the development of novel therapeutics for HCC patients.

Abstracts for Poster Presentation

Objectives: Facilitates Chromatin Transcription (FACT) complex is a histone chaperone participating in DNA repair- and transcription-related chromatin dynamics. In this study, we investigated its oncogenic functions, underlying mechanisms, and therapeutic implications in human hepatocellular carcinoma (HCC).

Methods: We obtained HCC and its corresponding non-tumorous liver samples from 16 patients and identified FACT complex as the most upregulated histone chaperone by RNA-Seq. We further utilized CRISPR-based gene activation and knockout systems to demonstrate the functions of the FACT complex in HCC growth and metastasis. Mechanisms and functions of the FACT complex in oxidative stress response were investigated by ChIP assay, flow cytometry, gene expression assays, and 4su-DRB transcription elongation assay. The therapeutic effect of the FACT complex inhibitor, Curaxin, was tested in both in vitro and in vivo models.

Results: We showed that the FACT complex was remarkably up-regulated in HCC and contributed to HCC progression. Importantly, we unprecedentedly revealed an indispensable role of the FACT complex in NRF2-driven oxidative stress response. Oxidative stress prevented NRF2 and FACT complex from KEAP1-mediated protein ubiquitination and degradation. Stabilized NRF2 and FACT complex form a positive feedback loop; NRF2 transcriptionally activates the FACT complex, while FACT complex promotes the transcription elongation of NRF2 and its downstream antioxidant genes through facilitating rapid nucleosome disassembly for the passage of RNA polymerase. Therapeutically, Curaxin effectively suppressed HCC growth and sensitized HCC cells to Sorafenib.

Conclusion: In conclusion, our findings demonstrated that the FACT complex is essential for the expeditious HCC oxidative stress response and is a potential therapeutic target for HCC treatment.

Project Number: 05161786

AMR-12

Cardiac Magnetic Resonance Assessment of Heart Failure with Preserved Ejection Fraction

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Introduction: Heart failure with preserved ejection fraction (HFpEF) continues to be a diagnostic challenge. Cardiac magnetic resonance (CMR) atrial measurement, feature tracking (CMR-FT), tagging, and phase contrast (PC) imaging have long been suggested to diagnose HFpEF and potentially complement echocardiography especially when echocardiography is indeterminate. Data supporting the use of CMR atrial measurements, CMR-FT or tagging, are absent. 4D intraventricular flow is a novel and advanced imaging technique that can determine the intraventricular flow components that could be utilised to diagnose HFpEF. The four components are direct flow, delayed ejection, retained inflow and residual volume.

Objectives: Conduct a prospective case-control study assessing the diagnostic accuracy of CMR atrial volume/area, CMR-FT, tagging, PC imaging and novel 4D intraventricular flow to diagnose HFpEF amongst patients suspected of HFpEF.

Methods: 121 suspected HFpEF patients were prospectively recruited from four centres. Patients underwent echocardiography, CMR, and N-terminal pro-B-type natriuretic peptide (NT-proBNP) measurements within 24 h to diagnose HFpEF. Patients without HFpEF diagnosis underwent catheter pressure measurements or stress echocardiography to confirm HFpEF or non-HFpEF. Area under the curve (AUC) was determined by comparing HFpEF with non-HFpEF patients.

Results: Fifty-three HFpEF (median age 78 years, interquartile range 74–82 years) and thirty-eight non-HFpEF (median age 70 years, interquartile range 64–76 years) were recruited. Cardiac magnetic resonance left atrial (LA) reservoir strain (ResS), LA area index (LAAi), and LA volume index (LAVi) had the highest diagnostic accuracy (AUCs 0.803, 0.815, and 0.776, respectively). LA ResS, LAAi, and LAVi had significantly better diagnostic accuracy than CMR-FT left ventricle (LV)/right ventricle (RV) parameters and tagging ($P < 0.01$). Tagging circumferential and radial strain had poor diagnostic accuracy (AUC 0.644, 0.541, respectively). Compared with LAAi and LA reservoir strain AUC, other PC parameters were significantly lower apart from the phase contrast S wave. Among the 4D flow parameters, residual volume had the largest AUC 0.740 when comparing HFpEF and non-HFpEF patients. Results are now being utilised in identifying HFpEF.

Conclusion: CMR LA ResS, LAAi, LAVi and residual volume have the highest diagnostic accuracy to identify HFpEF patients from non-HFpEF patients. CMR feature tracking LV/RV parameters, tagging and PC had low diagnostic accuracy to diagnose HFpEF.

Project Number: 05162736

AMR-13

Angiopoietin-2 : A novel genetic biomarker for diabetic macular edema

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Introduction: Diabetic macular edema (DME) is the leading cause of vision loss in the working-age population. Current treatments, such as anti-vascular endothelial growth factor (anti-VEGF) agents, are not universally effective, resulting in newer combined treatments that also target Angiopoietin2/Tie2 pathway being used. However, clinical results are still variable, highlighting the need for personalised treatment strategies based on pharmacogenetics.

Objectives: To determine the association of polymorphisms with the treatment responses of Ranibizumab, an anti-vascular endothelial growth factor (anti-VEGF), and / or in combination with AKB-9778, a Tie2 receptor activator, in treating diabetic macular edema (DME).

Abstracts for Poster Presentation

Methods: A prospective cohort study was conducted with 129 DME patients from the TIME-2 clinical trial. Participants were randomized into three groups: subcutaneous AKB-9778 injections, intravitreal Ranibizumab, and a combination of both. Forty-three single nucleotide polymorphisms (SNPs), including 30 TIE2 SNPs, 6 ANGPT2 SNPs, 5 PGF SNPs, CFH rs800292 and HTRA1 rs11200638 were genotyped. Logistic regression models assessed the correlation between SNP genotypes and treatment outcomes, controlling the false discovery rate (FDR) at 25%.

Results: Significant associations were found between certain SNPs and visual acuity improvements in the combination therapy group, but not in monotherapy groups. Specifically, two SNPs in ANGPT2 (rs13269021, rs4455855) and five SNPs in TIE2 (rs3780317, rs2152065, rs1413828, rs10967760, rs3818283) were associated with a best-corrected visual acuity (BCVA) outcomes in combination therapy group ($p<0.05$, $q<0.25$) after controlling for FDR. For the anatomical outcomes, no analyzed SNPs showed statistical significance in all three treatment groups after controlling for FDR in the central subfoveal thickness (CST) on optical coherence tomography scans. Translation to Clinical Practice: This research highlights a strong pharmacogenetic association, suggesting personalized treatment plans could improve clinical outcomes for DME patients. Understanding genetic influences on drug response can guide personalized medicine, potentially improving treatment efficacy and reducing costs by tailoring therapies to individual's genetic profiles.

Conclusion: The study identifies key genetic polymorphisms in TIE2 and ANGPT2 associated with enhanced visual acuity outcomes in combined anti-VEGF and AKB-9778 treatments for DME. These findings support the development of personalized treatment strategies, improving patient care and optimizing resource use in clinical settings.

Project Number: 05162786

AMR-14

Gut microbiome dysbiosis across prodromal and early stages of Parkinson's disease

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Introduction: Gut microbiota and metabolites are increasingly suggested to be involved in the pathogenesis of diverse neuropsychiatric disorders, including Parkinson's disease (PD) and its specific prodromal phase, isolated/idiopathic REM sleep behavior disorder (RBD). In-depth study of gut microbiota in this critical prodromal stage will contribute to the current understanding of gut-brain hypothesis of PD and identify potential targets for future prevention and intervention in neurodegeneration.

Objectives: The project aims to disentangle the associations of gut microbiota with the progression of Parkinson's disease.

Methods: This is a case-control study involving 259 clinically diagnosed RBD, 191 controls and 42 patients with early PD. Stool samples were collected from all subjects and gut metagenomic sequencing were performed.

Results: Patients with RBD and early PD showed significantly higher richness of gut microbiota than controls. In addition, gut microbiota compositions were significantly altered in early PD and RBD, particularly with a sustained decrease in short-chain fatty acids-producing bacteria (e.g., Faecalibacterium_prausnitzii and Roseburia_faecis) and enrichment of species, such as Ruthenibacterium_lactatiformans, in patients with RBD and early PD as compared to controls. Host-microbiota interaction analyses showed that age, sex, bowel movement frequency, diabetes had a notable effect on the gut microbiota of both control and RBD patients, while diabetes, use of metformin, and anxiety were more closely associated with gut microbial configuration in RBD than in control group. Finally, random forest classification found that microbial species could differentiate RBD from controls with the sensitivity of 73.5% and specificity of 90.9%.

Conclusion: These findings suggest that PD-like gut dysbiosis occurs at the prodromal stage of PD when RBD develops. Gut microbiome signature may serve as as a potential biomarker for early detection of prodromal PD and guide future personalized treatment or interventions of PD.

Project Number: 05162876

AMR-15

Protease-activated receptor-1 (PAR-1)–targeted therapy: potential for preventing renal fibrosis

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Introduction: Chronic kidney disease (CKD) is a significant public health concern, characterized by progressive renal fibrosis. Current treatments exhibit limited efficacy, leading to the development of end-stage renal disease (ESRD). Emerging evidence suggests that dysregulation of the coagulation cascade, particularly the activation of protease-activated receptor 1 (PAR-1), may contribute to tissue fibrosis. However, the role of PAR-1 in renal fibrosis remains unclear.

Objectives: This study aimed to (1) investigate the effect of PAR-1 activation on tubular epithelial-mesenchymal transition (EMT) and extracellular matrix (ECM) accumulation, (2) elucidate the mechanism by which PAR-1 influences TGF-β signaling, and (3) determine the therapeutic potential of pharmacological inhibition of PAR-1 signaling in renal fibrosis.

Methods: The pathological roles of PAR-1 in renal inflammatory and fibrotic responses were investigated using thrombin-stimulated cultured tubular epithelial cells. The therapeutic potential of targeting

Abstracts for Poster Presentation

PAR-1 was evaluated with oral administration of the FDA-approved first-in-class PAR-1 antagonist, Vorapaxar, in mouse models of unilateral ureteral obstruction (UUO) and diabetic nephropathy (DN).

Results: Vorapaxar attenuated thrombin-induced expression of fibrotic markers, including fibronectin, collagen type I, alpha-smooth muscle actin, and vimentin, while preventing the loss of the epithelial marker E-cadherin in tubular epithelial cells. Mechanistically, Vorapaxar reduced oxidative stress and inhibited activated ERK1/2 MAPK and TGF-β/Smad3 signaling pathways. In vivo, administration of Vorapaxar significantly ameliorated renal fibrosis in the UUO mouse model and showed a decreasing trend in kidney injury and improved vascular injury in diabetic db/db mice. These findings provide new insights into the role of the coagulation system in renal fibrosis and suggest that targeting PAR-1 could be a novel approach to improve clinical outcomes for patients with CKD.

Conclusion: During the progression of CKD, PAR-1 mediates inflammation, EMT, and fibrotic responses in tubular epithelial cells, leading to renal fibrosis. Pharmacological inhibition of PAR-1 may represent a promising therapeutic strategy for CKD.

Project Number: 05163596

AMR-16

The incidence of intrauterine adhesion after ultrasound-guided manual vacuum aspiration (USG-MVA): A prospective randomized controlled trial

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Introduction: Miscarriage is a common complication of pregnancy, occurring in up to 25% of all pregnancies. Surgical management is often required, with two common approaches being electric vacuum aspiration (EVA) and manual vacuum aspiration (MVA), both of which are considered effective and safe. An alternative technique, ultrasound-guided manual vacuum aspiration (USG-MVA), has emerged, where real-time ultrasound guidance is used during the procedure to improve the precision and safety of the manual vacuum aspiration process. While USG-MVA is also deemed effective and safe, the incidence of intrauterine adhesion (IUA) following this procedure is not well-established. IUA is a potential complication that can lead to long-term reproductive issues, such as infertility and placental abnormalities. Understanding the relative risk of IUA associated with different surgical approaches is crucial to optimizing the management of first-trimester miscarriage and informing clinical decision-making.

Objectives: This study aimed to compare the incidence of IUA in women undergoing USG-MVA versus EVA for the management of first-trimester miscarriage.

Methods: This was a prospective, randomized controlled trial at the Prince of Wales Department of Obstetrics and Gynaecology. Chinese women aged ≥18 with delayed or incomplete miscarriage ≤12 weeks were randomly assigned to USG-MVA or EVA. Participants underwent hysteroscopy for IUA assessment 6-20 weeks after, and their menstrual and reproductive outcomes were evaluated at 6 months.

Results: 303 patients underwent surgical evacuation, of whom 152 were randomized to the 'USG-MVA' group and 151 patients to the 'EVA'. 126 from the USG-MVA group and 125 from the EVA group came back and completed the hysteroscopic assessment. The incidence of the IUA from USG-MVA is 19.0% (n=24/126) and EVA was 32.0% (n=40/125), which is significantly ($p<0.02$) different between the two groups. No significant difference in the menstrual outcomes EVA at 6 months post- surgery between the two groups but more patients had miscarriage in EVA group with IUA.

Conclusion: USG-MVA may be a safer surgical option than EVA for first-trimester miscarriage, with a lower risk of IUAs.

Project Number: 06170286

AMR-17

A study on the epidemiology and genetic basis of metabolic abnormalities in Hong Kong Chinese patients with schizophrenia

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Introduction: Second-generation antipsychotics (SGAs) are widely used to treat schizophrenia (SCZ), but they often induce metabolic side effects, including dyslipidemia and obesity, posing significant clinical challenges. Long-term studies are lacking, and genetic factors are believed to contribute to the variability of these side effects.

Objectives: To compare the long-term anthropometric and metabolic side effects of seven SGAs in a Chinese population and identify genetic variants associated with these side effects.

Methods: We collected longitudinal data from 767 Chinese SCZ patients treated with SGAs, with follow-up lasting up to 18.7 years (median ~6.2 years). Linear mixed models were used to estimate the effects of SGAs on fasting blood glucose (BG), lipid profiles, and BMI, which utilized 19,316 prescription records and 3917 to 7596 metabolic measurements for each outcome. A genome-wide association study (GWAS) was conducted on 669 patients to identify genetic variants associated with SGA-induced metabolic changes.

Results: Considering SGA medications as binary predictors, clozapine and olanzapine were associated with the most substantial worsening of lipid profiles and BMI. When SGA dosage was considered, clozapine showed the most severe metabolic side effects at the minimum effective dose, followed by olanzapine. Aripiprazole was associated with significant

Abstracts for Poster Presentation

improvement in lipid profiles but a small increase in BMI. The GWAS identified five genome-wide significant SNPs associated with SGA-induced metabolic changes, including variants linked to olanzapine-induced LDL changes and aripiprazole-induced triglyceride changes. Gene-based analysis revealed six genome-wide significant genes associated with SGA-induced metabolic side effects.

Conclusion: This longitudinal study clarified the long-term and dose-dependent effects of different SGAs on metabolic parameters in Chinese SCZ patients and identified several genetic variants associated with these side effects. Our findings may inform clinicians of SGA choices and have potential implications for personalized medicine in managing SCZ patients, enabling tailored treatment strategies to minimize metabolic risks.

Project Number: 06170506

AMR-18

Generation of a Comprehensive Shrimp Allergen Panel for Component-resolved Diagnosis of Shrimp Allergy

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Introduction: Clinical management of shrimp allergy is hampered by the lack of accurate tests. Molecular diagnosis have been shown to more accurately reflect clinical reactivity. However, the full spectrum of shrimp allergens and their clinical relevance are yet to be established.

Objectives: This study sought to (1) identify clinically relevant high molecular weight shrimp allergens; (2) develop and evaluate the diagnostic utility of component-resolved diagnosis for shrimp allergy.

Methods: Subjects with documented history of shrimp allergic reactions were recruited and classified according to results of double-blind placebo-controlled food challenge (DBPCFC). Non-atopic subjects were also recruited as controls. IgE-binding proteins of Penaeus monodon (black tiger prawn) were probed by western blotting and identified by mass spectrometry. Recombinant shrimp allergens were synthesized and analyzed for IgE sensitization. Basophil activation test (BAT) was also performed for comparison. Stepwise diagnostic algorithms were constructed based on test results.

Results: A total of 500 subjects were recruited. DBPCFC was performed in 180 subjects. Ten IgE-binding proteins were identified and a comprehensive panel of 11 recombinant shrimp allergens was generated, including two high molecular weight allergens hemocyanin and glycogen phosphorylase. The major shrimp allergens were tropomyosin (TM, 65.9%), hemocyanin (64.7%) and fatty acid-binding protein (FABP, 60%). FABP was the best component for IgE test with AUC (0.84), Youden Index (0.52), PPV (0.84), and likelihood ratio (7.2). A stepwise algorithm comprising SPT, shrimp-sIgE and TM/FABP-sIgE tests showed the highest diagnostic accuracy of 62% while a single-step BAT test showed the highest AUC of 0.88.

Conclusion: Glycogen phosphorylase was identified as a novel high molecular weight shrimp allergen. Conventional allergy tests lack accuracy. FABP is the relevant shrimp allergy biomarker beyond TM and incorporation of TM- and FABP-sIgE tests into the workflow improves shrimp allergy diagnosis.

Project Number: 06170856

AMR-19

Elucidation of the Blomia tropicalis genome and transcriptome to identify new allergens for future research in dust mite-related allergic diseases

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Introduction: One of the most common cockroach types in urban areas, the American cockroach (Periplaneta americana), has been reported to impose an increased risk of allergies and asthma. Limited groups of allergens (Per a 1–13) have been identified in this species due to the lack of genome-related information.

Objectives:

1. To determine and annotate the genome and transcriptome of P. americana using Illumina / PacBio sequencing technology and bioinformatics tools;
2. To identify allergen genes in P. americana based on sequence homology and immunological assays with patients' IgE.

Methods: To expand the allergen profile of P. americana, genomic, transcriptomic, and proteomic approaches were applied. With the support of a high-quality genome assembled using nanopore, Illumina, and Hi-C sequencing techniques, potential allergens were identified based on protein homology. Then, using enzyme-linked immunosorbent assay, selected allergens were tested in Thai patients allergic to P. americana.

Abstracts for Poster Presentation

Results: A chromosomal-level genome of P. americana (3.06 Gb) has been assembled with 94.6% BUSCO completeness, and its contiguity has been significantly improved (N50 = 151 Mb). A comprehensive allergen profile has been characterized, with seven novel groups of allergens, including enolase (Per a 14), cytochrome C (Per a 15), cofilin (Per a 16), alpha-tubulin (Per a 17), cyclophilin (Per a 18), porin3 (Per a 19), and peroxiredoxin-6 (Per a 20), showing IgE sensitivity in enzyme-linked immunosorbent assay. A new isoallergen of tropomyosin (Per a 7.02) and multiple potential isoallergens of Per a 5 were revealed using bioinformatics and proteomic approaches. Additionally, comparative analysis of P. americana with the closely related Blattodea species revealed the possibility of cross-reaction.

Conclusion: The high-quality genome and proteome of P. americana are beneficial in studying cockroach allergens at the molecular level. Seven novel allergen groups and one isoallergen in Per a 7 were identified.

Project Number: 06171016

AMR-20

Terminable cell-encapsulating collagen-alginate composite device for sustained intraocular drug delivery as a therapy for retinal degenerative diseases

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Introduction: The management of vision-threatening retinal diseases remains challenging due to the lack of an effective drug delivery system. Encapsulated cell therapy (ECT) with cellular release of fresh therapeutics enables local sustained drug delivery to the retina while avoiding repeated intravitreal injections, offering a promising approach for the continuous delivery of therapeutic agents. Therefore, we designed an injectable and terminable collagen-alginate composite (CAC) ECT gel with a Tet-on pro-caspase-8 system as a safe intraocular drug delivery platform for the sustained release of glial cell-derived neurotrophic factor (GDNF) to treat retinal degenerative diseases (RDDs).

Objectives:
1. To examine the safety, performance, and termination of CAC ECT gels in healthy rabbit eyes;
2. To evaluate the therapeutic efficacy of CAC ECT gel in rabbits with sodium iodate-induced retinal degeneration.

Methods: New Zealand White rabbits received intravitreal injection of CAC ECT gels. After 2 weeks, safety of CAC ECT gels was determined by measurements of intraocular pressure and electroretinogram (ERG) as well as analyses of retinal morphology and glial activation. Retrieved gel biocompatibility and mechanical stability were evaluated by light and scanning electron microscopy (SEM). in vivo GDNF delivery was assayed by ELISA. Rabbits receiving CAC ECT gels were also given doxycycline in drinking water for 1 week to assess in vivo termination efficiency. Efficacy of CAC ECT gels was evaluated in a rabbit model of retinal degeneration induced by intravenous sodium iodate injection.

Results: CAC ECT gel can be safely implanted without harming the retina or lens, displaying resistance to degradation, facilitating cell attachment, and secreting bioactive GDNF. Furthermore, GDNF levels could be modulated by the number of implants. Moreover, doxycycline administration was effective in terminating gel function without causing retinal damage. Notably, rabbits with retinal degeneration exhibited significant functional recovery in both ERG a-wave and b-wave amplitudes and showed remarkable morphological improvement in photoreceptor apoptosis upon gel injection.

Conclusion: Given its biocompatibility, mechanical stability, controlled drug release, terminability, and therapeutic effectiveness, our CAC ECT gel presents a promising potential therapeutic strategy for various RDDs in a clinical setting.

Project Number: 06171516

AMR-21

Economic evaluation on breastfeeding promotion in Hong Kong

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Introduction: Increasing breastfeeding rates reduces admissions and healthcare expenditures for gastroenteritis and lower respiratory tract infections among children. Costs associated with not breastfeeding have been assessed in both high- and low-income settings highlighting the economic benefits of promoting breastfeeding. In some Asian settings, admission rates of neonatal jaundice are high, partially related to genetic predisposition of G6PD deficiency and permissive admission policies. Not assessed in the previous studies is the economic impact of increased health care costs for treating neonatal jaundice related to breastfeeding, which has important policy implication to maximize economic benefits of breastfeeding.

Objectives: This study estimated the healthcare costs-savings the government due to prevention of gastroenteritis (GE) infections and lower respiratory tract infections (LRTI) in the first year of life attributed to an increase in the exclusive breastfeeding rate in Hong Kong.

Methods: We estimated the healthcare costs and savings to the government during 2010-2019 due to prevention of GE infections and LRTI in the first year of life attributed to an increase in the exclusive breastfeeding rate at 4 months from the actual rate (~15-30%) to hypothetical rates of ≥50%. The model used best available data inputs with uncertainty considered using probabilistic sensitivity analysis. We additionally assessed the impact of neonatal jaundice (NNJ) on the economic benefits of exclusive breastfeeding.

Abstracts for Poster Presentation

Results: During 2010-2019, 5 admissions for GE and 3 admissions for LRTI per 1000 births would be prevented in the first year of life should the exclusive breastfeeding rate at 4 months increase from the actual levels (~15-30%) to 50%, resulting in annual healthcare cost-savings of USD1.05 (95% CI 1·03-1·07) million/year. The cost-saving would reach USD1·89 (95% CI 1·86-1·92) million/year should the exclusive breastfeeding rate at 4 months increase to 70%. However, if higher NNJ admissions during 7-90 days related to more exclusive breastfeeding is considered, the cost-saving would reduce by 60%.

Conclusion: For the first time we demonstrated that changes in practice guidelines and admission policies are needed to avoid unnecessary admissions for neonatal jaundice to maximise the economic and health benefits of increasing exclusive breastfeeding rates in Hong Kong and similar settings with high admission rates for neonatal jaundice.

Project Number: 07181226

AMR-22

ImmuneMirror: A Computational Platform and Web Server to Predict Neoantigen Based on a Machine Learning Model

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Introduction: Neoantigens are derived from somatic mutations in the tumors but are absent in normal tissues. Emerging evidence suggests that neoantigens can stimulate tumor-specific T-cell-mediated antitumor immune responses, and therefore, are potential immunotherapeutic targets. However, identification of neoantigen is challenging due to the lack of experimental and clinical data.

Objectives: We aim to establish a computational platform with a web server for neoantigen prediction for clinical trials.

Methods: The prediction model was trained and tested using known immunogenic neoantigens collected from nineteen published studies. The machine learning model was developed using the balanced random forest algorithm for neoantigen prediction using multiple biological features relevant to neoantigen biogenesis, transportation, presentation, and T-cell recognition.

Results: The area under the curve of our trained model was 0.87 based on the testing data. We applied ImmuneMirror to the whole-exome sequencing and RNA sequencing data obtained from gastrointestinal tract cancers including 805 tumors from colorectal cancer (CRC), esophageal squamous cell carcinoma (ESCC), and hepatocellular carcinoma patients. We discovered a subgroup of microsatellite instability-high (MSI-H) CRC patients with a low neoantigen load but a high tumor mutation burden (> 10 mutations per Mbp). Although the efficacy of PD-1 blockade has been demonstrated in advanced MSI-H patients, almost half of such patients do not respond well. Our study identified a subset of MSI-H patients who may not benefit from this treatment with lower neoantigen load for major histocompatibility complex I ($P < 0.0001$) and II ($P = 0.0008$) molecules, respectively. Additionally, the neopeptide YMCNSSCMGV-TP53G245V, derived from a hotspot mutation restricted by HLA-A02, was identified as a potential actionable target in ESCC.

Conclusion: This is so far the largest study to comprehensively evaluate neoantigen prediction models using experimentally validated data. Our results demonstrate the reliability and effectiveness of ImmuneMirror for neoantigen prediction. The computational platform will be helpful to standardize the data analysis procedure in neoantigen prediction, and thus, could be applied in multi-center clinical studies for neoantigen-based immunotherapy.

Project Number: 07182016

AMR-23

The synergistic effect of Ivabradine and Olaparib on triple negative breast cancer

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Introduction: Triple-negative breast cancer (TNBC) lacks targetable proteins for treatment and has aggressive clinical behaviour. PARP inhibitors interfere with DNA repair to cause synthetic lethality in BRCA1/2 mutated cancer cells. Ivabradine is an FDA-approved Hyperpolarization-activated cyclic nucleotide-gated channel (HCN) inhibitor, used to treat chronic angina. We previously found that HCN2 and HCN3 are overexpressed in breast cancer, and high expression is associated with poorer survival. Targeting HCN with Ivabradine can suppress tumour growth in vitro and in vivo through the induction of ER stress. Since ER stress can suppress homologous recombination (HR) by enhancing the degradation of RAD51, we hypothesized that Ivabradine can induce BRCAness by reducing RAD51 expression, compromising HR, thus sensitizing PARP inhibitors to induce synthetic lethality in non-BRCA mutated breast cancer.

Objectives: We aim to examine the efficacy of Ivabradine and Olaparib co-treatment on non-BRCA mutated TNBC using in vivo and in vitro models.

Methods: Functional assays were examined in non-BRCA mutated TNBC cell-lines MDA-MB231 and MDA-MB-453. Clinical and chemical grade Ivabradine and PARP inhibitor, Olaparib were used. Combination index (CI<1) indicated therapeutic synergy. In vivo, combined Ivabradine and Olaparib treatment was evaluated in xenograft and patient-derived tumour xenograft (PDTX) models.

Results: Ivabradine suppressed HR by reducing RAD51 protein expression, which was reversed by ER stress reliever 4-PBA. Ivabradine induced ER stress and down-regulated RAD51, whilst

Abstracts for Poster Presentation

co-treatment of Ivabradine and Olaparib enhanced DNA damage. Mechanistically, RAD51 expression could be recovered through inhibition of ATF6. Ivabradine treatment enhanced the expression of FBXO24, an ATF6-targeted F-box protein gene. It was confirmed that FBXO24 mediated RAD51 degradation via the proteasome, reducing the capability of HR to repair DNA. BRCAness condition was triggered. Olaparib and Ivabradine co-treatment demonstrated a synergistic effect. These findings were further confirmed in xenografts and non-germline BRCA1/2 mutation patient-derived tumour xenograft (PDTX) models by subcutaneous injection and oral administration, respectively.

Conclusion: Our findings support the potential use of Olaparib and Ivabradine co-treatment for non-BRCA mutated breast cancer, offering the rationale for clinical evaluation. It provides the basis for the re-purposing of Ivabradine and for widening the scope of Olaparib, thus expanding the beneficial population.

Project Number: 07182026

COVID19-01

Workplace safety towards SARS-CoV-2 among non-healthcare workers in Hong Kong, Nanjing and Wuhan: prevention, response and sustainability

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Introduction: A validated tool to assess workplace infection control for SARS-CoV-2 in non-healthcare industries has been lacking. This study aimed to fill this knowledge gap by conducting a large-scale study from three Chinese cities with diverse social-cultural backgrounds and economic development levels.

Objectives: The objectives of this study was to develop a validated workplace safety index for infection control and prevention among non-healthcare workers using confirmatory factor analysis (CFA).

Methods: This study followed a repeated multicenter sequential mixed-method design, incorporating both quantitative and qualitative approaches. In the qualitative Phase I, in-depth interviews and focus group discussions were conducted with 307 and 180 workers, respectively, from various non-healthcare industries in Hong Kong, Nanjing, and Wuhan. These sessions took place from 7/2020-4/2021 and from 7/2021 to 2/2022. For the quantitative Phase II, 21357 workers from diverse industries participated. Workplace safety index for SARS-CoV-2(WSI-SC2) was developed and validated using exploratory factor analysis(EFA) and CFA. CFA was performed using data from the second-year survey.

Results: Through combined EFA and CFA analyses, 14 manifest variables were identified for the WSI-SC2, encompassing three sub-indices: "Workplace infection control measures and prevention," "Company occupational safety and health management and commitment," and "Worker's personal preventive behavior and awareness toward infection control." WSI-SC2 demonstrated good internal consistency reliability(Cronbach's alpha coefficients: 0.76-0.91), good composite reliability(composite reliability:0.70-0.95), and a satisfactory model fit (GFI = 0.95; SRMR = 0.05; RMSEA = 0.07). These indices remained stable across different cities. CFA was repeated using data from the second-year survey, which confirmed that the goodness-of-fit parameters were satisfied.

Conclusion: This multi-city study developed a novel and validated tool to measure workplace safety for SARS-CoV-2 among different non-healthcare working populations and across different years. The tool can be used to monitor spatiotemporal variations in workplace safety for infection prevention, with a warning sign provided when the index score is exceptionally low in a specific year or population.

Project Number: COVID190104

COVID19-02

Investigation of Hong Kong's early detection, assessment and response (S-EDAR) system to the new emerging infectious disease outbreak COVID-19

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Introduction: In an outbreak of a new emerging infectious disease, exemplified by COVID-19, a system of early detection, assessment and response (S-EDAR) is critical for control, which is dynamic and adjustable to new scientific findings, changing transmission scenarios and effectiveness of public health intervention.

Objectives: The aim of the study is to investigate how Hong Kong's S-EDAR can be enhanced for control of an epidemic across a trajectory of different transmission scenarios to inform future preparedness and response.

Methods: This is a sequential multi-level mixed methods study to synthesize evidence from different sources and types of knowledge in the pandemic trajectory from 1) literature and policy documents review on a) the system for early detection, assessment and response and b) effectiveness, calibration and adjustment and impact of public health measures; 2) expert workshops to develop the initial components of the enhanced system, and reviewed by international experts; 3) comparative case studies of control and mitigation policies and measures in 8 jurisdictions; 4) modelling studies for control measures; 5) key informant interviews; 6) focus groups to inform the modified components; and 7) a group Delphi to affirm the importance and feasibility of the components of the final S-EDAR framework.

Results: We developed a S-EDAR framework comprising Preparedness, Readiness, Response and Recovery covering 14

Abstracts for Poster Presentation

domains and 37 recommendations. Preparedness domains are structure, actions and processes needed: surveillance and risk assessment; command structure; regulation; drills; surge capacity and contingency plan. Readiness domain refers to development of capacity and capability for operation preparedness when the outbreak risk is imminent and Response domains are focused on coordination, implementation and engagement of society: case finding, contact tracing and quarantine arrangements; case management, isolation and health care services; social/physical distancing and community quarantine; port health and international movement control; risk communication, public engagement and infodemic management; social and economic mitigation. Recovery domains are recovery plans; review and build back better.

Conclusion: The enhanced S-EDAR, a robust evolutionary system based on a whole-of-society approach, offers a comprehensive and structured framework, applicable to different emergency management phases to strengthen health system and community resilience in a pandemic.

Project Number: COVID190105

COVID19-03

Delineate the prevalence, risk factors, temporal distribution and epidemiological characteristics of hidden novel coronavirus (SARS-CoV-2) infection in the community

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Introduction: The Coronavirus disease (COVID-19), caused by the novel severe-acute-respiratory-syndrome-coronavirus-2 (SARS-CoV-2) infection, was not only detrimental to human health but also socio-economy globally. It was also anticipated that asymptomatic carriers may present in the community. To identify these hidden SAR-CoV-2 infection individuals, we performed a seroprevalence study among the Hong Kong population.

Objectives: To estimate the prevalence of unidentified SARS-CoV-2 infection in the general population of Hong Kong.

Methods: A prospective cross-sectional study was conducted, Hong Kong residents aged>18 with COVID-19-negative volunteers were recruited after the 3 major waves (April 21 – July 7 2020; September 29 – November 23 2020; January 15 – April 19 2021). Their sociodemographic information, symptoms, travel, contact, quarantine, and COVID-19 testing history were collected. The plasma of the volunteers was subjected to an in-house enzyme-linked immunosorbent assay (EIA) based on recombinant SARS-CoV-2 spike (S) protein.

Results: Among the total of 4198 Hong Kong residents recruited, 903 (22%), 1046 (25%) and 2249 (53%) of volunteers participated during the first, second and third waves, respectively. Demographically, participants aged 18-39, 40-59 and ≥60 years were 32%, 39% and 29%; with 60% being female. Half of the volunteers tested negative for SARS-CoV-2 RNA, whilst 58% of them had not travelled abroad since November 2019. Only 4% reported ever contact with confirmed cases, and 5% had been isolated or quarantined. The majority of volunteers were asymptomatic (67%), whilst the others had respiratory (18%), gastrointestinal (5%), or both (9%) symptoms. EIA showed that 6 volunteers were positive for anti-SARS-CoV-2 Ig G, inferring an adjusted prevalence of unidentified infection of 0.15% (95% C.I. 0.06% to 0.32%). ***When extrapolating our findings to the whole population, there were fewer than 1.9 unidentified infections for every recorded confirmed case. The overall prevalence of SARS-CoV-2 infection in Hong Kong before the rolling out of vaccination was less than 0.45%.***

Conclusion: The low prevalence of hidden SARS-CoV-2 infection indicated the success of the stringent pandemic mitigation strategies by the Hong Kong SAR government, without a complete city lockdown. The high (99.5%) SARS-CoV-2 seronegativity of the general population shed light on the urgent need to launch of COVID-19 vaccination program.

Project Number: COVID190108

COVID19-04

Stability and transmissibility of 2019-nCoV

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Introduction: SARS-CoV-2 is a novel human coronavirus and is the causative agent for COVID-19 pandemic. At the early stage of the virus emergence, little was known about the properties of this novel virus and evidence was warranted to determine the control measures against this rapid spreading disease.

Objectives: This project attempted to understand the SARS-CoV-2 stability in different environmental conditions and on surfaces of different materials. We aimed to determine the virus stability on several specially designed surfaces and to validate the methods to decontaminate the virus-contaminated surfaces.

Methods: SARS-CoV-2 cultured from a clinical isolate with Vero E6 cells was used to determine the virus stability at different environmental conditions and on surfaces of different materials. In addition, the effectiveness of different disinfectants against the virus was tested.

Results: We were among the first groups to report the stability of SARS-CoV-2 on different surfaces and environmental conditions and the effectiveness of different disinfectants against the novel coronavirus in the early stage of COVID-19 outbreak (Chin et al.,

Abstracts for Poster Presentation

Lancet Microbe, 2020). We directly communicated our first-hand findings with different health authorities including WHO, who later recommended the guidelines on (i) cleaning and disinfection of environmental surfaces; (ii) water, sanitation, hygiene, and waste management; and (iii) laboratory biosafety guidance related to SARS-CoV-2. Findings from our publication has also been extensively quoted in policy papers issued by different organizations and governmental agencies around the world, such as FAO, Scientific Advisory Group for Emergencies of the U.K. Government, Food & Drug Administration and Homeland Security of the U.S., Food Standard Agency of the U.K., etc., during the early stage of the COVID-19 outbreak. Our findings have also been widely reported by the local and international media to arouse the public's attention to personal hygiene and proper surface disinfection to prevent spreading of COVID-19. Overall, our findings provided timely support to the evidence-based health policies and recommendations for controlling COVID-19 by different governments and health agencies.

Conclusion: This work helped to understand the properties and stability of SARS-CoV-2 and the effective ways in inactivating it. These could contribute to the determination of the evidence-based control measures against the disease.

Project Number: COVID190116

COVID19-05

Longitudinal study of COVID-19 seroprevalence in health care workers in comparison to the general community

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Introduction: In a pandemic, healthcare workers (HCWs) are at a higher risk of occupational exposure to infections compared with individuals in the community. Thus, HCW cohorts are important to provide an accurate assessment of the risk of infection in the community and healthcare settings to support public health policy decisions the community and in healthcare settings.

Objectives: In year 2020, we first aimed to estimate the cumulative incidence of COVID-19 among Hong Kong HCWs. We then aimed to measure immune responses to COVID-19 vaccination and infection. Currently, this cohort is still maintained to measure the level of immunity to newer SARS-CoV-2 variants among HCWs.

Methods: We established a cohort of HCWs in Hong Kong since May 2020 and followed them up with regular blood draws every 6 months. HCWs also volunteered blood samples approximately 3 to 4 weeks after each dose of vaccination or infection. Blood samples were tested for antibodies to SARS-CoV-2 using plaque reduction neutralization assays (PRNT). We estimated SARS-CoV-2 vaccine effectiveness against PCR or rapid-test confirmed infections using Cox proportional hazards models that allow for changes in vaccination status throughout the follow-up period with adjustments for age, sex, comorbidities, direct contact with COVID-19 cases, and previous infections.

Results: Overall seroprevalence of COVID-19 between June – October 2020 and November 2020 – April 2021 among approximately 770 HCWs were 0% (95% CI: 0%, 0.50%) and 0.52% (95% CI: 0.14, 1.32) despite heavy exposure to COVID-19 cases. We observed that mRNA (BNT162b2) vaccines generated very high levels of antibody titers compared with inactivated (CoronaVac) vaccines, which had informed vaccine policies worldwide. Subsequent booster doses increased and sustained antibody titers against the vaccine strain and newer variants. During the fifth COVID-19 wave in February 2022, a third dose of either the mRNA or inactivated vaccine provided between 73% and 94% of protection compared with individuals who only received two doses of either vaccine.

Conclusion: Our findings support the effectiveness of infection control precautions in HCWs locally. The incidence of infection in HCWs has continued to track seroprevalence in the general community, and recent SARS-CoV-2 vaccines continued to provide some protection against infection.

Project Number: COVID190119

COVID19-06

Clinical study of flu-based and PD1-based vaccines for the SARS-CoV2

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Introduction: In response to the SARS-CoV-2 outbreak, two categories of vaccines have been developed: influenza-based DelNS1-RBD vaccines, namely CA4-DelNS1-RBD and HK68-DelNS1-RBD, and a PD1-based RBD DNA vaccine, identified as PD1-RBD-DNA. This study aims to assess the safety and immunogenicity of these vaccines in animal models and healthy adults.

Objectives:
(1) Rapid generation of a safe and effective vaccine to induce strong protective immunity against the new coronavirus (CoV).
(2) Taking advantage of two HKU-patented vaccine platforms, we aim to develop quickly preventive flu-based and PD1-based vaccines targeting the SARS-CoV2 receoptor-binding domain (RBD) for humans.

Methods: We immunized animals with an intramuscular PD1-RBD-DNA prime and an intranasal DelNS1-RBD boost regimen. We then determined immune responses and protection. We also conducted a phase-1 randomized, double-blinded, placebo-controlled study involving healthy and COVID-19 vaccine-naive participants. These participants were enrolled and intranasally immunized with a low

Abstracts for Poster Presentation

(1x 107 EID50) or high (1x 107.7 EID50) dose of DelNS1-nCoV RBD or a placebo in 0.2 ml on days 0 and 28. All participants were monitored for adverse effects, mucosal total immunoglobulin (Ig) in saliva against RBD, and the RBD-specific T cell responses from day 0 to day 56.

Results: The heterologous PD1-RBD-DNA/HK68-RBD-LAIV significantly induced bronchoalveolar lavage IgA/IgG and lung polyfunctional memory CD8+ T cells, providing sterilized prevention of SARS-CoV-2 infection in nasal turbinates and lungs at the memory phase. The PD1-RBD DNA vaccine, used as a booster, also boosted cross-reactive cytotoxic CD8+ T cell responses and prevented SARS-COV-2 Omicron infection. No adverse events of special interest or serious adverse events were reported within 56 days after the first vaccination for all participants. The T-cell response was higher in the high-dose group than in the placebo group 14 days after the first or second vaccination. The total saliva mucosal Ig of the high-dose group was significantly higher than that of the placebo group four days after the second vaccination (p=0.046).

Conclusion: Both the DelNS1-RBD-LAIV and the PD1-RBD-DNA vaccines are safe and induce good immune response. A phase-2 clinical trial to serve as a booster for vaccinated individuals, with a larger sample size, is recommended.

Project Number: COVID190123

COVID19-07

Molecular epidemiological study of COVID-19 cases in Hong Kong

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Introduction: Molecular epidemiology can track the spread of epidemics.

Objectives: We attempted to use next generation sequence (NGS) technology to understand the viral dynamic of SARS-CoV-2 in Hong Kong. Findings from our analyses were reported to the Hong Kong Government on a weekly basis to inform field investigations, epidemiological studies and public health response.

Methods: We obtained SARS-CoV-2 positive respiratory samples from Centre for Health Protection and deduced full-length viral genomes using various NGS platforms (Illumina and Nanopore).

Results: Our studies in Hong Kong focused on understanding the transmission of SARS-CoV-2 through multiple approaches. Although there were numerous importations of SARS-CoV-2 variants, including variants of concern (VOC), only three variant introductions were responsible for 90% of locally acquired cases in the first 4 waves of COVID-19 in Hong Kong, highlighting the importance of strong border control and community surveillance. Surveillance of incoming travelers detected over 200 imported cases with 18 pango lineages between March and July 2021. We provided genetic evidence to demonstrate the world's first reverse zoonotic transmission (humans to pets), SARS-CoV-2 reinfection, and inflight transmission. We also identified certain settings (e.g., hotels and airport) and environmental conditions (e.g., poor ventilation) are potential hotspots for SARS-CoV-2 transmission. Our investigations also revealed possible virus sources, previously unknown transmission chains and misdiagnosed cases. These findings helped to develop or refine evidence-based control policy against COVID-19. While a case study investigating transmission from pet hamsters emphasized the potential role of pets as reservoirs for the virus. Within-host genetic diversity was also studied, revealing that vaccination does not facilitate the emergence of viral variants. Additionally, we identified a recombinant virus between Omicron subvariants, and conducted sewage genomic surveillance.

In addition to local impacts, we used our experiences to draft WHO guidelines for genomic surveillance of SARS-CoV-2 and use our sequencing pipelines to analysis cases for overseas countries.

Conclusion: Overall, this project on the molecular epidemiology of COVID-19 cases in Hong Kong has provided valuable insights and informed strategies for effective public health response during the pandemic. The findings contribute significantly to our understanding of viral transmission dynamics, evolution, and the ongoing importance of robust surveillance and control measures.

Project Number: COVID190205

COVID19-08

Effectiveness of single and combined anti-COVID-19 drugs among hospitalized COVID-19 patients in Hong Kong

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Introduction: Oral antivirals have been used in non-hospitalised patients with COVID-19 to reduce the risks of hospitalisation and death, and hence to reduce the burden on health-care systems. Understanding of the real-world effectiveness of oral antivirals is urgently needed to inform their clinical use in patients with COVID-19, considering patients' vaccination status and the circulating variant of concern.

Objectives: This study aimed to assess the clinical effectiveness of molnupiravir or nirmatrelvir-ritonavir among community-dwelling COVID-19 outpatients in Hong Kong.

Methods: In this observational study, we used data from the Hong Kong Hospital Authority to identify an unselected, territory-wide cohort of non-hospitalised patients with an officially registered

Abstracts for Poster Presentation

diagnosis of SARS-CoV-2 infection between Feb 26 and June 26, 2022, during the period in which the omicron subvariant BA.2.2 was dominant in Hong Kong. We used a retrospective cohort design as primary analysis, and a case-control design as sensitivity analysis. We identified patients with COVID-19 who received either molnupiravir or nirmatrelvir-ritonavir. Outpatient oral antiviral users were matched with controls using propensity score (1:10) according to age, sex, date of SARS-CoV-2 infection diagnosis, Charlson Comorbidity Index score, and vaccination status. Study outcomes were death, COVID-19-related hospitalisation, and in-hospital disease progression (in-hospital death, invasive mechanical ventilation, or intensive care unit admission). Hazard ratios were estimated by Cox regression.

Results: Risk of all-cause death was reduced by 24% with molnupiravir and by 66% with nirmatrelvir-ritonavir initiated within 5 days of symptom onset, compared with not using any oral antivirals. Nirmatrelvir-ritonavir use was also associated with a reduced risk of COVID-19-related hospitalisation by 24%. We consistently found reduced risks of death and hospitalisation associated with early oral antiviral use among older patients. Both oral antivirals were effective in reducing the risk of in-hospital death.

Conclusion: This study shows real-world effectiveness of oral antivirals in reducing the mortality risk of community-dwelling patients with COVID-19, consisting mostly of older patients and those who had not been fully vaccinated. In terms of impact to the Government's policy, our findings supported the prescriptions of oral antivirals for patients who have sought care in the designated HA COVID clinics, isolation centres, as well as the private sector.

Project Number: COVID190210

COVID19-09

Blended Gaming COVID-19 Training System with WHO guidelines for staff in residential care homes: a cluster randomised controlled trial

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Introduction: In view of the demand for infection control training for staff in residential care homes and the significant gaps in knowledge about infection control practices, "Blended Gaming COVID-19 Training System" was developed in 2020, incorporating both World Health Organization and local infection control guidelines for care facilities.

Objectives:
a. To assess whether more staff in the intervention group (IG) perform infection control practices than the staff in the control group (CG) after receiving the BGCTS;
b. To assess whether more staff in the IG have higher self-reported compliance rates and higher infection control knowledge than the staff in the CG.

Methods: This is a 2-arm single-blinded cluster randomized controlled trial, including 212 staff from 13 RCHs. Staff working in the same RCHs were grouped as one cluster. Randomization was made on RCH (not individual staff). IG used the BGCTS training for 2 weeks while CG received usual care. BGCTS was a blended mode of training, involving a 120-minute web-based gamified system, covering 8 topics, and two 30-minute F2F or zoom sessions. The web-based system can be operated in laptops or mobile phones. The BGCTS was developed in consultation with the RCH staff.

Results: A total of 5168 non-participatory on-site observation moments were observed to monitor the changes in ICP. 'Proper use of gloves and personal protective equipment (PPE)' in the IG was significantly higher than that in the CG ($F=43.206$, $p<0.001$). Although there was no significant difference between groups in hand wash/rub, self-reported infection control practices (SICP) scores in IG were significantly higher than that of CG ($\beta= 2.619$, Wald $\chi2 =9.43$, 95% CI [4.291, 9.426], $p < 0.01$) after the intervention.

Conclusion: BGCTS improved staff's performance in ICP, specifically in gloves and PPE use, and SICP. The short duration of training using BGCTS was most welcomed by the RCH staff because it did not take up much time from their work. Besides, it was less demanding in manpower and more flexible and user-friendly for staff of different schedules or education level. BGCTS has good potential to be adopted as regular training in Hong Kong.

Project Number: COVID190218

COVID19-10

Immunogenicity and reactogenicity of SARS-CoV-2 vaccines BNT162b2 and CoronaVac in healthy adolescents

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Introduction: Achieving a comprehensive understanding of vaccine-induced humoral and cellular immune responses is important for future development and approval of novel immunisation platforms and boosters. Comprehensive comparative immunogenicity analyses of different vaccines allow us to investigate the contribution of different arms of the immune system to vaccine efficacy. These studies are rare in younger age group.

Objectives: We present an interim analysis of a registered clinical study (NCT04800133) to establish immunobridging with various antibody and cellular immunity markers and to compare the immunogenicity and reactogenicity of 2-dose BNT162b2 and CoronaVac in healthy adolescents as primary objectives. One-dose BNT162b2, recommended in some localities for risk reduction of myocarditis, is also assessed.

Methods: We compared various humoral and cellular response outcomes and reactogenicity in adolescents to BNT162b2 and CoronaVac head-to-head, which are the top 2 most used COVID-19 vaccines in the world.

Abstracts for Poster Presentation

Results: Antibodies and T cell immune responses are non-inferior or similar in adolescents receiving 2 doses of BNT162b2 (BB, N = 116) and CoronaVac (CC, N = 123) versus adults after 2 doses of the same vaccine (BB, N = 147; CC, N = 141) but not in adolescents after 1-dose BNT162b2 (B, N = 116). CC induces SARS-CoV-2 N and N C-terminal domain seropositivity in a higher proportion of adolescents than adults. Adverse reactions are mostly mild for both vaccines and more frequent for BNT162b2. We find higher S, neutralising, avidity and Fc receptor-binding antibody responses in adolescents receiving BB than CC, and a similar induction of strong S-specific T cells by the 2 vaccines, in addition to N- and M-specific T cells induced by CoronaVac but not BNT162b2, possibly implying differential durability and cross-variant protection by BNT162b2 and CoronaVac.

Conclusion: The data demonstrated that most antibody and T cell responses for 2 doses of mRNA-based BNT162b2 and inactivated CoronaVac vaccines in 11- to 17-year-old children were non-inferior compared to adults. Between vaccines, the antibody levels were higher for adolescent BB than CC. Taken together, vaccination elicits robust immune responses and remains a key method for providing host protection against COVID-19 in adolescents.

Project Number: COVID19F02

COVID19-11

Epidemic Intelligence and a data informed risk assessment system to inform policy decisions critical for maintaining systems control of COVID-19 in strategies to enhance recovery

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Introduction: In an outbreak of new or emerging infectious disease exemplified by SARS-CoV-2, little is known of the novel agent. Public health agencies and governments have to make decisions based on limited and/ or uncertain scientific knowledge and contested expert advice.

Objectives:
(1) Identify evidence gaps in the different transmission stages of the epidemic, and
(2) Develop an epidemic intelligence and risk assessment system and identify tools to source near-time data from operational systems and multiple sources in diverse disciplines which can be collated, analysed and synthesised to generate "epidemic intelligence" (EI) to inform policy decisions.

Methods: The iterative multi-stage mixed methods design, included: literature review to analyse evidence needs and gaps for policy decisions, international visits to learn risk assessment and outbreak management systems; secondary data analysis on epidemiological characteristics and health service utilisation; surveys to understand public perceived susceptibility and protective behaviour; individual interviews to understanding perceived risks and resilience; mathematical modelling for risk assessment and surge capacity; and artificial intelligence to generate epidemic intelligence of impact and surge capacity.

Results: We developed a contextualised EI System for risks detection, characterisation and assessment. The system captures data from diverse types and sources of data at global, national, local and individual levels from both Indicator-based (IBS) and Event-based Surveillance (EBS), linked and structured to enable analysis, interpretation, verification, characterisation and assessment of risk and the impact. Epidemic intelligence is generated from contemporary sciences. The contributions from epidemiological modelling, big data analytics of user, generated social, media content and novel artificial intelligence tool, applying neural network algorithms for risk quantification were researched and found invaluable. Pandemic risks are dynamic and changing, a continuous process for risk characterization and assessment in the different pandemic phases is critical for control. Risk communication and community engagement strategies serve as control strategies and sources for EI.

Conclusion: Hong Kong needs to invest in capacities and capabilities for IBS and EBS surveillance systems and collaboration with animal health surveillance, guided by One Health perspective. Investments in data linkage infrastructures and automation modernization is critical for early detection and risk assessment of health hazard to inform decision making.

Project Number: COVID19F03

COVID19-12

Quantifying the impact of different public health and social measures on population mixing vis-à-vis contact matrices in Hong Kong

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Introduction: COVID-19 pandemic was a severe global health event during the previous few years. Public health and social measures (PHSMs) were effective non-pharmaceutical interventions (NPIs) in slowing the spread of the disease in the community by reducing contact between people. The context-specific social mixing pattern which describes the contact pattern among people in the population would be a key to estimating the potential impact of PHSMs.

Abstracts for Poster Presentation

Objectives:
This study aimed to
(i) evaluate the change in population mixing, under different PHSMs;
(ii) monitor the contact patterns throughout the pandemic;
(iii) assess psychological, social, and economic factors associated with differences in contacts; and
(iv) assess the knowledge, uptake, and perceived efficacy of specific interventions among the public.

Methods: We conducted a population-based contact survey in Hong Kong over 28 months of the COVID 19 pandemic from September 2021 to December 2023, including the fifth wave in early 2022 of which the highest number of infections was observed. Participants reported their daily contacts over a 24-hour period using a diary format. Every participant was invited to respond twice to the contacts made on a weekday and a weekend. To ensure the sample reflects the overall Hong Kong population, we reweighted data collected from oversampled key groups to correspond to the 2023 census population structure.

Results: Over 10,000 Hong Kong residents were surveyed. They made an average daily contact of 6.86 with an interquartile range of (4, 9). Strong age-assortative was observed in the contacts. Younger individuals reported more contacts than older individuals. The frequency of contact decreased during the fifth COVID-19 wave, with a rebound observed later after December 2022, especially among the older populations and in non-work/school/home settings.

Conclusion: Social contacts in Hong Kong changed throughout the COVID-19 pandemic, with significant drops observed during the fifth wave due to restricted public health measures. The increase in contacts was observed after restrictions eased in December 2022. The findings suggest that the implementation of PHSMs effectively reduced contact made in the community.

Project Number: COVID19F05

COVID19-13
Profiling of SARS-CoV-2 Subgenomic RNAs in Clinical Specimens

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Introduction: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes novel coronavirus disease 2019 (COVID-19). Replication of the viral genome generates a complementary negative-sense genome length RNA that serves as a template for the synthesis of positive-strand genomic RNA (gRNA) and subgenomic RNAs (sgRNAs). The role of sgRNA to identify active infection is largely unknown.

Objectives: The study aimed at examining of clinical value of subgenomic viral RNA profiling from serial respiratory and stool specimens.

Methods: Prospective studies were performed on hospitalized COVID-19 patients. Respiratory samples collected from individual COVID-19 patients were analyzed using using probe hybridization RNA-seq. RT-PCR assays targeting the 9 canonical sgRNAs were used for serial upper and lower respiratory swabs and stool samples from COVID-19 patients.

Results: A total of 375 SARS-CoV-2 complete genomes, with a mean genome coverage of 99.6% +/- 1.7% (85.4% to 100.0%) were obtained from the respiratory samples using probe hybridization RNA-seq. The majority of the sgRNAs were canonical transcripts with N being the most abundant (36.2%), followed by S (11.6%), open reading frame 7a (ORF7a; 10.3%), M (8.4%), ORF3a (7.9%), ORF8 (6.0%), E (4.6%), ORF6 (2.5%), and ORF7b (0.3%); but ORF10 was not detected. The profile of most sgRNAs, except N, showed an independent association with viral load, time of specimen collection after onset, age of the patient, and S-614D/G variant with ORF7b and then ORF6 being the most sensitive to changes in these characteristics.

Monitoring of 124 serial samples from 10 patients using sgRNA-specific real-time RT-PCR revealed respiratory samples harboring a full set of canonical sgRNAs were mainly collected early within 1 to 2 weeks from onset. Furthermore, most of the stool samples (90%) were negative for sgRNAs despite testing positive by diagnostic PCR targeting genomic RNA. ORF7b was the first to become undetectable and again being the most sensitive surrogate marker for a full set of canonical sgRNAs in clinical samples.

Conclusion: Our study found sgRNAs as potential biomarkers for monitoring infectivity and progression of SARS-CoV-2 infection, which provides an alternative target for the management and treatment of COVID-19 patients.

Project Number: COVID19F06

Abstracts for Poster Presentation

COVID19-14

Effects of Gut Microbiome Modulation on Reducing Adverse Health Outcomes among Elderly and Diabetes Patients during the COVID-19 Pandemic: A Randomised, Double-Blind, Placebo-Controlled Trial (IMPACT Study)

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Introduction: Worldwide, the COVID-19 pandemic has posed a substantial challenge to the general population. Patients with diabetes and elderly individuals are particularly vulnerable during the pandemic. They are not only more susceptible to various infections but also develop more severe illnesses, as compared to subjects without diabetes and the young population. Strategies to protect these two groups of vulnerable subjects, which are particularly prone to develop adverse health outcomes during the pandemic, represent a priority in healthcare policy.

Objectives: This study aimed to assess the efficacy of a novel microbiome immunity formula (SIM01) in reducing adverse health outcomes in the elderly and patients with type two diabetes mellitus during the COVID-19 pandemic. We also assessed whether the use of SIM01 could improve quality of life and gut dysbiosis.

Methods: In this single-centre, double-blind, randomised, placebo-controlled trial, we recruited subjects aged ≥65 years or with type two diabetes mellitus. Eligible subjects were randomised in a 1:1 ratio to receive three months of SIM01 or placebo (vitamin C) within one week of the first COVID-19 vaccine dose. Both the researchers and participants were blinded to the groups allocated.

Results: The rate of adverse health outcomes was significantly lower in the SIM01 group than the placebo at one month (6 [2.9%] vs. 25 [12.6], $p < 0.001$) and three months (0 vs. 5 [3.1%], $p = 0.025$). At three months, more subjects who received SIM01 than the placebo reported better sleep quality (53 [41.4%] vs. 22 [19.3%], $p < 0.001$), improved skin condition (18 [14.1%] vs. 8 [7.0%], $p = 0.043$), and better mood (27 [21.2%] vs. 13 [11.4%], $p = 0.043$). Subjects who received SIM01 showed a significant increase in beneficial Bifidobacteria and butyrate-producing bacteria in faecal samples and strengthened the microbial ecology network. SIM01 reduced adverse health outcomes and restored gut dysbiosis in elderly and diabetes patients during the COVID-19 pandemic.

Conclusion: These findings provide significant societal implications for strategies that could protect these vulnerable individuals during the COVID-19 pandemic. We recommend that future research should compare different measurable markers between the SIM01 group and the control group. [Published in Nutrients 2023, 15(8), 1982; https://doi.org/10.3390/nu15081982]

Project Number: COVID19F07

COVID19-15

The long term spill-over impact of COVID-19 on health and healthcare of patients with non-communicable diseases: an in-depth outcome and health economic evaluation

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Introduction: The spillover effects of the COVID-19 pandemic have had significant impact on health outcomes in patients with non-communicable diseases (NCDs).

Objectives: We aimed to investigate the changes in the annual all-cause mortality and incidence of major complications among patients with diabetes mellitus (DM), hypertension (HT), cardiovascular diseases (CVD), chronic kidney disease (CKD) and chronic respiratory disease (CRD) who had never been diagnosed with COVID-19 infection from 2019 to 2021 in Hong Kong.

Methods: Using data from electronic medical records, this retrospective cohort study included patients aged 20 years or older with a documented diagnosis of DM, HT, CVD, CKD and CRD from January to December 2010, and without any documented complications before January 2012. Subjects were censored when confirmed diagnosis of COVID-19. Outcomes include all-cause mortality, CVD, end-stage renal disease (ESRD), pneumonia and acute respiratory failure (ARF), as applicable to the respective NCD. We compared the age-standardized incidence rates of 2020 and 2021 (post-COVID-19) with the rate of 2019 (pre-COVID-19) to evaluate the changes of outcomes, by calculating the incidence rate ratios.

Results: Compared with the rates in 2019, there was a drop in CVD incidence in 2020 but an increase in CVD incidence and all-cause mortality rate in 2021 among patients with DM. In patients with HT,

Abstracts for Poster Presentation

the CVD incidence decreased significantly in 2020 but rebounded in 2021, while the all-cause mortality rate had the opposite trend. CVD recurrence and all-cause mortality rate declined in 2020 and 2021 in patients with CVD. The incidence of ESRD and CVD decreased significantly in both 2020 and 2021 in patients with CKD, but the all-cause mortality rate increased in 2021. The incidence of pneumonia and ARF and all-cause mortality rate decreased significantly among patients with CRD in both 2020 and 2021.

Conclusion: The COVID-19 pandemic in 2020 may have delayed the diagnosis of complications among patients with DM, HT and CKD, which could explain the decreased rates of complications in 2020 but an excessive rebound of of complications and mortality rates in 2021. The findings stress the need to maintain routine health services for patients with NCD during public health crisis.

Project Number: COVID19F08

COVID19-16

Antibody and T cell responses against wild-type and Omicron SARS-CoV-2 after third-dose BNT162b2 and CoronaVac in adolescents

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Introduction: The high effectiveness of the third dose of BNT162b2 and CoronaVac in healthy adolescents against Omicron BA.1 has been reported in some studies, but immune responses conferring this protection are not yet elucidated.

Objectives: In this analysis, our study aims to evaluate the humoral and cellular responses against wild-type and Omicron (BA.1, BA.2 and/or BA.5) SARS-CoV-2 before and after a third dose of BNT162b2 or CoronaVac in healthy adolescents.

Methods: With an immunobridging design, our study (NCT04800133) tested the non-inferiority of the binding and neutralizing antibodies and T cell responses induced by a third dose of BNT162b2 or CoronaVac in healthy adolescents compared to adults. Responses against wild-type and BA.1 SARS-CoV-2 were compared in adolescents. Safety and reactogenicity were also monitored.

Results: For BNT162b2, at 5 months after 2 doses, S IgG, S IgG Fc receptor-binding, and neutralising antibody responses waned significantly, yet neutralising antibodies remained detectable in all tested adolescents and S IgG avidity increased from 1 month after 2 doses. The antibody responses and S-specific IFN-γ+ and IL-2+ CD8+ T cell responses were significantly boosted in healthy adolescents after a homologous third dose of BNT162b2. Compared to adults, humoral responses for the third dose were non-inferior or superior in adolescents. The S-specific IFN-γ+ and IL-2+ CD4+ and CD8+ T cell responses in adolescents and adults were comparable or non-inferior. For CoronaVac, a homologous third dose further enhanced antibody response in adolescents compared to just 2 doses. Adolescents mounted non-inferior antibody and T cell responses compared to adults. Although S IgG and neutralizing antibody responses to BA.1 were lower than to WT, they remained detectable in 96% and 86% of adolescents. T cell responses to peptide pools spanning only the mutations of BA.1 S, N and M in adolescents were preserved, increased, and halved compared to WT respectively. No safety concerns were identified.

Conclusion: Our study found high antibody and T cell responses, including potent cross-variant reactivity, after three doses of BNT162b2 or CoronaVac vaccination in adolescents in its current formulation, suggesting that current vaccines can be protective against symptomatic Omicron disease.

Project Number: COVID19F10

COVID19-17

Strengthening sewage surveillance for SARS-CoV-2

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Introduction: Sewage surveillance is a cost-effective and timely tool to provide pandemic trajectory and identify variant lineages in the community. This project developed rapid and sensitive testing methods and applied them in local sewage to control COVID-19 during the 5th pandemic wave.

Objectives:

- To develop methods for the quantification of SARS-CoV-2 virus and its variants.
- To track citywide pandemic trends by sewage surveillance.
- To identify new variants in local sewage samples.

Methods: Sewage samples were conducted virus enrichment, RNA extraction, and detection via PCR and genomic sequencing (Illumina and Nanopore).

Results:

1. Develop a high-throughput, rapid and sensitive sewage testing method

We developed a high-throughput and sensitive PEG-precipitation method for quantification of virus in sewage. Expect for SARS-CoV-2, this method has been applied to other infectious viruses (i.e., influenza virus, norovirus, rotavirus, mpox virus, etc). This method scaled up the testing capacity in Hong Kong sewage surveillance network and has been recommended as a standardized protocol in China National Sewage Surveillance Guidelines.

2. Track the pandemic trajectory through longitudinal monitoring in local sewage

We conducted a 25-months longitudinal monitoring by sampling at 12 wastewater treatment plants (WWTPs) in Hong Kong. Sewage

Abstracts for Poster Presentation

surveillance captured two pandemic peaks three days earlier than the reported cases by clinical surveillance during the 5th wave of COVID-19. In the post-pandemic era, sewage surveillance still served as an accurate indicator of pandemic fluctuations, especially when compulsory individual testing and reporting were ceased.

3. Reveal the variants trends ahead of clinical surveillance
Using customized testing protocols, we adopted sewage genomic sequencing to identify the replacement of Delta variants by Omicron variants, and the development trends of three Omicron sublineages in local community. Importantly, sewage surveillance provided the variants trends 16 days before clinical surveillance. The established methods enhanced the utility of sewage genomic sequencing to offer early detection of new variants for timely public health responses.

Conclusion: Sewage surveillance is a cost-effective tool to improve public health practices in following aspects: (1) Providing early warning signals of new variants; (2) Serving as a timely indicator of the virus transmission trend; and (3) Providing insights to potential occurrence/co-occurrence of infectious viruses.

Project Number: COVID1903015

COVID19-18

Strength and durability of antibody responses to BNT162b2 and CoronaVac (COVAR study)

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Introduction: Unprecedented research was conducted to expedite COVID-19 vaccine development to control the novel pandemic. In Hong Kong, novel COVID-19 vaccines introduced under emergency approval to the general community in 2021 included the mRNA vaccine BNT162b2 (Fosun Pharma-BioNTech, also known as Pfizer-BioNTech) and inactivated virus vaccine CoronaVac (Sinovac).

Objectives: To compare the strength and durability of antibody responses between different COVID-19 vaccines used locally in Hong Kong.

Methods: We are conducting a longitudinal observational cohort study (COVAR study) in Hong Kong on the immunogenicity, reactogenicity and potential effectiveness of COVID-19 vaccination by enrolling adults ≥18y of age from the general community and Community Vaccination Centres. Individuals who had never received any COVID-19 vaccination but planned to do so, and individuals who had received 1-2 doses with the last dose received latest within 6 months before enrolment were eligible. We asked participants to provide blood samples before and 28 days after each COVID-19 vaccination, as well as 6, 12, 24 and 36 months after the second dose of COVID-19 vaccination. We assessed mean antibody levels in sera measured by surrogate neutralisation test (sVNT) (% inhibition).

Results: Between 2021-22, we enrolled 995 adults who reported receiving the primary series of two-dose COVID-19 vaccines, including 659 (66%) adults with BNT162b2 and 330 (33%) adults with CoronaVac. 608 participants had provided at least one post-vaccination blood sample by 23 December 2021. The mean sVNT antibody levels measured against ancestral virus at 14-42 days after the second dose for CoronaVac were 54% (95% confidence interval, CI: 51, 56) and for BNT162b2 were 94% (95% CI: 94, 95), with significant differences between the two vaccines overall and within each age group. 4-6 months after second dose, sVNT antibody levels fell to below the threshold of 30% inhibition in 84% of participants who received CoronaVac, versus none among those who received BNT162b2.

Conclusion: Antibody levels increased to moderate levels following two doses of CoronaVac compared to very high levels following BNT162b2. Antibody levels started to decline starting from one month after receipt of the second dose for both vaccines, with faster waning from those receiving CoronaVac.

Project Number: COVID1903001- Study A

COVID19-19

A community-based longitudinal observational cohort study on COVID-19 vaccination in older adults (PIVOTe study)

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Introduction: Older adults are known to be at the highest risk of contracting COVID-19. In comparison to younger individuals, elderly population receiving COVID-19 vaccines might generate diminished immunity responses which might lead to a lower vaccine effectiveness.

Objectives: To examine the rate of laboratory-confirmed COVID-19 infections and estimate vaccine effectiveness in different type of vaccines among vaccinated older adults.

Methods: Older adults aged 69-86 years were recruited from a previous enhanced influenza vaccine trial and followed up from September 2021 to date. During the study period, update on information on COVID-19 vaccination was collected around winter seasons. Active surveillance to identify self-reported COVID-19 infection was carried out via weekly calls.

Results: Of the 1221 enrolled elderly participants, 1093 (90%) provided data on COVID-19 vaccination history as of late 2023. Among these participants, 23 (2%) reported have not received any COVID-19 vaccines, 5 (<1%) reported received 1 dose, 44 (4%) received 2 doses, 512 (47%) received 3 doses, 364 (33%) received 4 doses, 125 (11%) received 5 doses, and 17 (2%) already received 6 COVID-19 vaccine doses, with various vaccine types and their combinations in the same individuals, i.e. self-reported homologous and heterologous COVID-19 vaccination. During the

Abstracts for Poster Presentation

largest wave of COVID-19 in Hong Kong between January and May 2022, 190 infections were reported, of which 77 (41%) received two (homologous) doses of BioNTech or CoronaVac, and 44 (23%) received three homologous doses. Vaccine effectiveness (VE) of BioNTech booster dose was 59% (95% CI 23%, 78%), while that of CoronaVac booster dose was not significant.

Conclusion: Administration of a third (booster) dose of BioNTech could further reduce COVID-19 infections in addition to the primary series. Comparison between VE and serology results will generate hypotheses on the immune mechanism of vaccine-induced protection in older adults.

Project Number: COVID1903001- Study B

COVID19-20

Prospective cohort study for early detection of new-onset chronic diseases in recovered COVID-19 patients using population-based datasets

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Introduction: Long COVID is a new global threat characterized by persistent symptoms after clearance of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Its impact on healthcare resource utilization is unclear.

Objectives: We aimed to determine the real-world impact of long COVID on healthcare by evaluating the prevalence of medication use and clinic attendance in COVID-19 survivors and matched non-COVID controls before and after COVID-19.

Methods: This was a territory-wide, real-world study of COVID-19 patients and non-COVID controls in the first four waves of COVID-19 pandemic in Hong Kong in 2020-2021. 9,027 COVID-19 patients and 9,027 matched non-COVID controls after propensity score matching were included. Medication use and clinic utilisation one year before and after COVID-19 diagnosis (cases) or a negative SARS-CoV-2 assay (controls) were analysed.

Results: Increased medication use over time was observed in both COVID-19 patients and non-COVID controls. Acid suppressants and analgesics were more increasingly used in COVID-19 patients than controls. Antihistamines, mucolytics, hypnotics and anxiolytics were also used more frequently after COVID-19 recovery. Bronchodilators, inhaled corticosteroids, antipsychotics and antidepressants were more commonly used in both COVID-19 patients and non-COVID controls. Attendance at medical specialist clinics quadrupled in the early months of post-COVID, whereas non-COVID controls visited family medicine and psychiatry specialist clinics more frequently.

Conclusion: There is significant impact of long COVID on medication use and clinic utilisation in both COVID-19 and non-COVID patients. Policymakers should allocate adequate resources to manage long COVID as this is going to be an ever-growing health problem.

Project Number: COVID1903002 - Program 1

COVID19-21

Association of Gut Dysbiosis on Cognitive Functions and Working Memory in Individuals with Post-COVID Condition

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Introduction: Brain fog, memory loss, difficulty concentrating, and sleep disturbances are common post-COVID neuropsychiatric symptoms, with over 60% of infected patients reporting persistent issues, notably memory loss. Individuals with Post-COVID Condition (PCC) show poor cognitive outcomes. The established role of gut microbiota in cognition during midlife and older age contrasts with the underexplored interaction between microbiota dysbiosis and cognitive functions in PCC patients.

Objectives: This study explores features of gut dysbiosis and cognitive impairment in PCC patients compared to COVID-recovered individuals without PCC and healthy controls, examining potential underlying mechanisms.

Methods: This cohort study recruited 338 individuals recovered at least 3 months after covid infection and 338 age- and sex-matched controls. Participants completed questionnaires assessing common post-COVID symptoms and underwent varied cognitive function tests. Baseline metagenomics data from 646 participants were analyzed, and alpha diversity indices and beta-diversity were calculated to evaluate gut dysbiosis in PCC. Linear regression models tested correlations between cognitive functions and microbiota diversity. Interaction analyses explored the effect of PCC status on the gut microbiota-cognitive performance relationship.

Results: The demographic characteristics, including mean age and sex distribution, were consistent across the three groups. The PCC group had a mean age of 54 years old, with 32% male participants. In PCC, 47% reported persistent memory loss, and 23% had concentration challenges. Overall, PCC participants' cognition, attention, and working memory were impaired relative to controls. Regarding microbiome features, alpha diversity did not differ significantly among the groups; beta diversity analyses indicated significant dissimilarity between PCC and non-PCC groups compared to controls, though not between PCC and non-PCC groups. Interaction analysis indicated that PCC status significantly influences the relationship between microbiota diversity and cognitive performance. Subgroup analysis showed that a higher Shannon index in the PCC group was only associated with better cognitive scores in specific tasks. These findings have significant implication to inform clinical practice related to post COVID management.

Conclusion: Gut microbiota composition was notably altered in PCC individuals, correlating with reduced cognitive performance. These findings suggest that microbiota alterations could impact cognitive functions, particularly in PCC. Future longitudinal studies are needed to confirm these associations and consider intra-individual variability.

Project Number: COVID1903002 - Program 3

Abstracts for Poster Presentation

COVID19-22

To examine the health status of COVID-19 patients who have recovered from different levels of disease severity

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Introduction: There is a lack of local data on the medium to long-term recovery on spirometry, 6-minute walking distance (6MWD) and health-related quality of life (HRQoL) among COVID-19 survivors.

Objectives: To assess the medium to long-term recovery on spirometry, 6MWD and HRQoL in COVID-19 survivors

Methods: We performed a 12-month prospective study on COVID-19 survivors, with evaluation on the changes in dynamic lung volumes at spirometry (%predicted FEV1, %predicted FVC), 6MWD and HRQoL at 1-3, 6 to 12 months. The residual radiological changes in HRCT in COVID-19 survivors were correlated with their functional capacity.

Results: 108 COVID-19 survivors (48.1% male, mean age 48.1±16.4 years) of various disease severity (asymptomatic 2.9%, mild 33.3%, moderate 47.2%, severe 8.3%, critical 8.3%) completed both 6 and 12-month follow-ups. At 6 and 12 months, they had %predicted FEV1 and %predicted FVC within or above the normal range. Their mean 6MWD were 397.4±64.5m and 415.2±58.4m, and HRQoL were generally lower than normal. The mean 6MWD of COVID-19 survivors increased between follow-ups (3.5m to 32.1m from 1-3 to 6 month, p=0.015; 7.5m to 28.1m, p=0.001). The mental component of HRQoL also improved between 6 and 12 months. They did not experience significant changes in dynamic lung volumes and physical component of HRQoL between follow-ups. Forty (44.0%) out of 91 COVID-19 survivors had residual abnormalities on HRCT at 12 months, with a negative correlation between the severity scores of parenchymal changes and 6MWD (r=-0.239, p<0.05).

Conclusion: COVID-19 survivors demonstrated progressive recovery in exercise capacity in the convalescent phase. Their dynamic lung volumes remained within or above the normal range. The severity of parenchymal changes in HRCT was negatively correlated with the 6MWD of COVID-19 survivors. Publication: BMC Pulm Med. 2023 Nov 14;23(1):441.

Project Number: COVID1903003

COVID19-23

Differential prolonged multiomic responses to mRNA and inactivated virus COVID-19 vaccines

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Introduction: The COVID-19 pandemic has highlighted the critical role of vaccination in controlling infectious diseases.

Objectives: Understanding the long-term host responses to different types of vaccines is essential for optimizing vaccination strategies.

Methods: We conducted a prospective cohort study involving 553 adults in Hong Kong (n=274 for BNT162b2 and n=279 for CoronaVac). Blood samples were collected at baseline, one month, and six months after the second dose of vaccination. Comprehensive multiomic analyses, including metabolomics, lipidomics, transcriptomics, and cytokine profiling, were performed to investigate the molecular mechanisms underlying vaccine responses.

Results: BNT162b2 recipients exhibited significantly higher antibody responses (sVNT: 96.08% vs 55.02%, p<0.001) compared to CoronaVac recipients. BNT162b2 was associated with more pronounced changes in adaptive immunity, while CoronaVac induced stronger innate immune responses. Notably, BNT162b2 altered neurological pathways, with effects persisting up to six months post-vaccination. Gene set enrichment analysis revealed distinct immunological pathways activated by each vaccine, highlighting a shift towards adaptive immunity in BNT162b2 and innate immunity in CoronaVac. An AI model was established to determine the relative contribution of pre-vaccination omics data in predicting post-vaccination immune responses.

Conclusion: This study underscores the divergent biological impacts of mRNA and inactivated virus vaccines on the immune system, providing valuable insights for future vaccine development and public health strategies. The strengths of this study include a large cohort, standardized sample collection, and parallel assays, enhancing the robustness and comparability of the results. Further research is required to validate these findings and explore their implications for long-term vaccine efficacy and safety.

Project Number: COVID1903003 - Study 3

COVID19-24

Dynamics of the risk of SARS-CoV-2 transmission by exposure setting and the implications for public health policy development in Hong Kong

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Introduction: The epidemiological pattern of COVID-19 has evolved over time, varying across different exposure settings and in response to various interventions implemented. Longitudinal data on contact history, vaccination uptake, and trend in adoption of precautionary measures at both facility and individual levels can provide evidence-based updates on infection control practices.

Abstracts for Poster Presentation

Objectives: This study aims to support the development of SARS-CoV-2 control policy based on the assessment of the evolving dynamics of exposure risk.

Methods: A cross-disciplinary approach is adopted to address the epidemiological risk of SARS-CoV-2 in different exposure settings and potential intervention to reduce risk by employing longitudinal cohort survey and randomized controlled trial (RCT). A prospective population cohort of 5,321 households completed monthly surveys on social contact patterns, and a subset of 949 participants provided blood samples for seroprotection status. The effectiveness of an educational intervention program was evaluated in improving acceptance of COVID-19 booster shots and reducing breakthrough infection among 282 non-healthcare workers. A first round of seroepidemiology survey was conducted to investigate the level of neutralizing antibodies in residential care homes of elderly.

Results: During the initial outbreaks of the fifth wave in Hong Kong, a higher number of individuals living in larger households and working continually on-sit were infected. Outbreaks were concentrated in those with higher daily and social exposure risks. Based on a median of daily contacts, the modelled per-contact probability of transmission was lowest in workplace (4.9%) and highest in households and leisure activities (30.7% and 30.2%). Effective seroprotection was detected in 74%. Results of RCT showed that health behavioural intervention had a higher booster uptake rate (76.1% vs 67.9%) and a lower rate of breakthrough infection (52.8% vs 57.9%) compared to the control. Seropositivity rate (defined by ≥30% inhibition) for SARS-CoV-2 antibodies among 683 elderly home residents was 65.9%. After receiving post-primary infection vaccination, residents experienced a 0.05-unit increase in percentage inhibition with one day of exposure interval.

Conclusion: Our findings provided evidence for developing setting-specific implementation of non-pharmacological measures to reduce transmission risk of respiratory viruses. The effectiveness of educational intervention in raising booster uptake and the protection provided by vaccines for the elderly were demonstrated.

Project Number: COVID1903008

COVID19-25

Antibody response against Omicron BA.2 among residents in residential care homes for the elderly: a seroepidemiology study in February-November 2022

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Introduction: There has been a paucity of serosurveys to inform the kinetics of corelates of protection, including neutralizing antibodies (nAbs), beyond the acute phase of COVID-19 infection in residential care homes of elderly (RCHEs). Besides, the existing literature which supported extending vaccine intervals to enhance humoral responses was based on Comirnaty. In RCHEs where the predominant vaccine was CoronaVac, it was unclear whether such strategy, which depended on the vaccine effectiveness, remained effective.

Objectives: To report the level of nAbs among RCHE residents within six months of an explosive Omicron BA.2 outbreak, and investigate the immunogenic exposures associated with it.

Methods: A cross-sectional seroepidemiology survey was conducted in RCHEs in Hong Kong in February-November 2022. As all COVID-19 infections were statutory notifiable in 2022, this study provided accurate infection data. Blood samples underwent the surrogate virus neutralization test. A percentage inhibition of ≥30% defined seropositivity. An exposure interval was the time between the first and last SARS-CoV-2 exposure. A multilevel regression model was applied to identify factors associated with percentage inhibition.

Results: Among 683 residents from 43 RCHEs, immunologic exposures were hybrid (67.3%), vaccination-only (16.5%) (homologous CoronaVac: 93/113), and infection-alone (6.6%). The median exposure interval was 84 days. The seropositivity rate was 65.9% (450/683) (median percentage inhibition: 47.0). Infection significantly increased the nAb level by 33.02-38.65 units in the two-exposure group. In the three-exposure group, the latest infection augmented significantly higher humoral response (by 42.37 units [95% CI:31.17-53.58]) than the earliest infection (by 21.45 units [95% CI:12.09-30.80]). In the four-exposure (or more) group, the nAb level elevated by recent infection was comparable to Comirnaty vaccination. Among residents who received post-primary-infection vaccination, one day of exposure interval increased the percentage inhibition by 0.05 units ($p<0.05$).

Conclusion: The moderate level of seroprotection after an explosive Omicron outbreak foretold common COVID-19 infections in RCHEs in the endemic era. Vaccinating residents with Comirnaty impacted the infection prevention and control in RCHEs positively. The schedule of subsequent boosters should be optimized with the pre-existing exposure interval, though the small effect size might be attributable to the low CoronaVac effectiveness against infection among older adults.

Project Number: COVID1903008 - Project D

COVID19-27

Pre-emptive detection and tracking of SARS-CoV-2 variants through bioinformatic analysis of global virus genomic & epidemiological data

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Abstracts for Poster Presentation

Introduction: Since the coronavirus disease 2019 (COVID-19) pandemic started, the virus has developed a significant number of genetic mutations, leading to the emergence of different variants with variable rates of transmission. The transmissibility of different SARS-CoV-2 variants is a concern of the government and public community. However, real-time tracking and estimation of the variant-specific transmission have posed unique challenges to health authorities.

Objectives: To this end, we constructed the genomic and phylogenetic databases of SARS-CoV-2 circulating locally and globally, allowing us to detect and track the evolution and transmission of the virus variants. This is facilitated by a novel bioinformatics tool we developed to enable huge phylogenetic tree construction.

Methods: We developed a new mathematical modelling framework that enables joint estimation of the transmissibility of multiple SARS-CoV-2 variants circulating in a region. The effective reproduction numbers of competing variants were estimated using the SIR compartment model with observed samples following a multinomial distribution. Infections by variants were approximated with the proportion of viral sequence samples multiplied by the total cases. We parameterized the mutation contributions to the growth advantage of each variant.

Results: A total of 1,527 SARS-CoV-2 genomes from Hong Kong were also included in the analysis. Local transmission clusters from 8 variants in Hong Kong were analysed, including Delta, BA.2.2, BA.2.3.20, BA.2.12.1, BA.2.75, BA.4, BA.5, and BQ.1. Relative transmissibility of BA.2.2 over Delta in HK was 1.12 (50% Highest Posterior Density interval: 1.02 - 1.18); that of BQ.1 over Delta was 1.41 (50%HPD: 1.23 – 1.56). We have also developed EiGENO, an online platform that offers a scalable and interactive interface for visualising and exploring both genomic and epidemiological information associated with ultra-large phylogenetic trees of SARS-CoV-2. This allows us to better track the evolving characteristics of emerging SARS-CoV-2 viruses.

Conclusion: We developed bioinformatic methods and platform to facilitate the detection and tracking of SARS-CoV-2 variants evolving and transmitting locally and globally. We anticipate that this bioinformatics system could also be applied to influenza A viruses and dengue viruses which are some priority pathogens that require sufficient monitoring in surveillance.

Project Number: COVID1903011 - WP1

COVID19-28
VAS-Track (Vaccine Allergy Safety Track) to COVID-19 Vaccination

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Introduction: The general population, particularly in Hong Kong, lacked awareness and access to clinical services for drug allergies. Unfounded fears of potential allergic reactions to COVID-19 vaccines resulted in vaccine hesitancy, severely hampering Hong Kong's COVID-19 vaccination program. To counteract this, we have launched the Vaccine Allergy Safety (VAS)-Track, aiming to facilitate vaccination among patients perceived to be at a higher risk of vaccine-associated allergies. Furthermore, it boosted confidence in the vaccination campaign and improved the overall care of drug allergy patients.

Objectives:
(1) Establish the VAS-Track pathway to enable vaccinations for patients deemed at risk of vaccine-associated allergies.
(2) Pioneer the first publicly available excipient database, allowing healthcare professionals to screen for potential allergens among patients with suspected excipient allergies.
(3) Build capacity through a "Hub-and-Spoke" model between primary care providers and allergists, empowering non-specialists to independently assess patients with low-risk drug or vaccine allergies.

Methods: By partnering with all clusters of the Hospital Authority, we setup a "Hub-and-Spoke" VAS-Track service with non-specialists to assess patients with low-risk drug or vaccine allergies. Based on our excipient database and updated VAS consensus statements, individuals deemed at "higher risk" of COVID-19 vaccine-associated allergies and drug allergies were assessed by allergists and non-allergists.

Results: We updated Hong Kong's COVID19 VAS consensus statements, resulting in 10,412 (76%) of referrals suitable for direct vaccination. Thereafter, 2,725 patients were assessed, of which 2,324 (85.3%) were recommended vaccination. Among these, 652 patients had history of drug allergy and 648 (99.4%) were safely vaccinated. Opportunistic delabelling further removed 257 (15.7%) previously mislabelled drug "allergies".

Vaccination completion rates between non-specialists and additional Allergist review were similar (90% vs. 89%, p=0.617). Seropositive COVID19 neutralizing antibody levels (≥15 AU/mL) increased from 20% to 92% after vaccine completion (6.0±13.5 AU/mL vs. 778.8±337.4 AU/mL, p>0.001).

Feasibility of the VAS-Track "Hub-and-Spoke" model pioneered establishment of the Hong Kong Drug Allergy Delabelling Initiative (HK-DADI) and the Asia Pacific's clinical pathway on penicillin allergy delabelling.

Conclusion: This "Hub-and-Spoke" multidisciplinary model was extremely effective in enabling vaccination and improved longitudinal COVID19 protection. VAS-Track also enhanced public confidence and paved the development of novel allergy services in Hong Kong and Asia Pacific.

Project Number: COVID1903011 - WP3

Abstracts for Poster Presentation

COVID19-29

Economic evaluation of VAS-Track (Vaccine Allergy Safety Track) to improve COVID-19 vaccination coverage and health outcomes

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Introduction: Concerns about new COVID-19 vaccines played a key role in vaccine hesitancy and hampered population uptake. Hong Kong initiated a Vaccine Allergy Safety Track (VAS-Track) program to assess potential COVID-19 vaccine-associated allergies. A 'Hub-and-Spoke' model of predominately non-specialists supported by the allergist hub was established to meet overwhelming demand in the face of limited specialists.

Objectives: To assess the cost-effectiveness of VAS-Track as a pre- and post-vaccination assessment service for individuals potentially at high risk of COVID-19 vaccine-related allergy.

Methods: An individual-level decision-analytical model was constructed using data from VAS-Track participants supplemented by published literature. Analyses were from a health service provider perspective over a 12-month timeframe. We calculated the incremental cost-effectiveness ratio (ICER) to estimate the cost per quality-adjusted life years (QALYs) gained. Willingness-to-pay threshold was based on local GDP per capita (US$ 49,590). Sensitivity analyses were conducted to examine the robustness of findings.

Results: Cost-effectiveness varied widely across age groups. VAS-Track was cost-saving for older adults (dominant strategy for age ≥50) compared with standard practice across a range of sensitivity analyses. VAS-Track was not cost-effective for younger groups (age 18-49: ICER: US$ 410,914/QALY for pre-vaccination and US$ 213,786/QALY for post-vaccination assessments). Infection rate, cost of treating severe infection, and vaccination rate were most influential on cost-effectiveness estimates. The study findings support evidence-based policymaking to offer widespread vaccine allergy assessment services with only limited allergy specialist resources – a common constraint in both low-income and high-income regions. These services increase public confidence and vaccine uptake during a pandemic. The VAS-Track 'Hub-and-Spoke' model for COVID-19 vaccine allergy assessments could also potentially be extended to other contexts such as anaphylaxis, food allergy, and drug allergy since many places face a shortage of allergy specialists.

Conclusion: VAS-Track was cost-effective both as a pre- and post-vaccination assessment service for adults over 50. The 'Hub-and-Spoke' model using non-specialists with limited allergy specialist resources to provide vaccine allergy assessment services can boost public confidence in vaccines and provide high economic value compared to usual care in older adults.

Project Number: COVID1903011 - WP4

HHS-01

Efficacy, safety and response predictors of adjuvant Astragalus therapy for diabetic kidney disease – an open-label randomised controlled trial with responder regression analysis

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Introduction: Diabetes leads to chronic kidney disease (CKD) and kidney failure, requiring dialysis or transplantation. Astragalus, a common herbal medicine and US pharmacopeia-registered food ingredient, is shown kidney protective by retrospective and preclinical data but with limited long-term prospective clinical evidence. This trial aimed to assess the effectiveness of astragalus on kidney function decline in macroalbuminuric diabetic CKD patients.

Objectives:

1. To evaluate the effect of adjuvant astragalus treatment on type 2 diabetic patients with stage 2 to 3 chronic kidney disease and macroalbuminuria.

2. To collect preliminary data on treatment effect, variance, recruitment rate and attrition rate for parameters optimisation and feasibility assessment for a subsequent phase III randomised controlled trial.

3. To assess predictive factors of response, including efficacy and safety, among type 2 diabetic patients with stage 2 to 3 chronic kidney disease and macroalbuminuria treated with add-on stragalus.

Methods: This randomized multi-center clinical trial randomly assigned 118 patients with estimated glomerular filtration rate (eGFR) of 30-90 ml/min/1.73m2 and urinary albumin-to-creatinine ratio (UACR) of 300-5000 mg/g from 7 GOPCs between 2018 and 2022 to add-on oral astragalus granules or to continue standard care alone as control for 48 weeks. Primary outcomes were the slope of change of eGFR and UACR of the intention-to-treat population. Secondary outcomes included blood pressures, biochemistry, and adverse events. (ClinicalTrials.gov: NCT03535935)

Results: During the 48-week period, the estimated difference in the slope of eGFR decline was 4.6 ml/min/1.73m2 per year (95 %CI: 1.5 to 7.6, p = 0.003) slower with astragalus. For UACR, the estimated inter-group proportional difference in the slope of change was insignificant (1.14, 95 %CI: 0.85 to 1.52, p = 0.392). 117 adverse

Abstracts for Poster Presentation

events from 31 astragalus-treated patients and 41 standard care-controlled patients were documented. The 48-week endpoint systolic BP was 7.9 mmHg lower (95 %CI: -12.9 to -2.8, p = 0.003) in the astragalus-treated patients. The results from the study provide evidence on the adjuvant use of Chinese medicine in improving kidney parameters and prognosis in patients with diabetic kidney disease.

Conclusion: In patients with type 2 diabetes and CKD, add-on astragalus for 48 weeks further stabilized kidney function on top of standard care.

Project Number: 14151731

HHS-02

Striking a balance between cost, effectiveness and efficiency of emergency departments in Hong Kong: An integrated approach of data analytics, simulation, and system optimization

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Introduction: Emergency department (ED) overcrowding is a longstanding issue worldwide. This can lead to public safety at risk, prolonged pain and suffering, long waits, and patient dissatisfaction. ED overcrowding blocks timely patient access to emergency care and can be life-ending (causing undue injuries and unnecessary death of emergency patients). In this project, we applied operations research techniques, more specifically data analytics, system simulation, mathematical modelling, and optimization, for analyzing and improving operations of EDs in Hong Kong.

Objectives: Our specific primary objective in this project was to investigate possible solutions, using a systematic approach based on a scientific foundation, that could relieve the overcrowding situation. For our long-term goal, we demonstrated with this project that our integrated approach of data analytics, simulation, and system optimization is beneficial to other healthcare systems as well.

Methods: Four machine learning models – (i) stepwise multiple linear regression; (ii) artificial neural networks; (iii) support vector machines; and (iv) gradient boosting machines – were developed and applied for patient waiting time prediction. A simulation model was developed to assess the impacts of the adoption of a fast-track system. A workforce optimization model was developed to suggest optimal physician schedules. Heuristics based on variable neighbourhood search (VNS) were proposed for dynamic patient scheduling. Case studies and numerical experiments were conducted based on hospital data in Hong Kong.

Results: Machine learning algorithms can potentially improve patient waiting time prediction. Reductions of 17 – 22% in mean-square error due to the utilization of systems knowledge were observed. With simulation experiments, a fast-track system could reduce the number of patients in the ED and overall patient waiting time, though there was a trade-off between the waiting times of urgent and non-urgent patients. Optimal physician staffing levels had a similar pattern with the arrival rate but shifted around two hours behind. Using the proposed scheduling heuristic could improve dynamic patient scheduling while being cost-effective.

Conclusion: An integrated approach powered by data analytics, simulation, and system optimization is effective in evaluating solutions to improve ED operations. The integrated approach is helpful for hospital administrators and senior management for decision-making.

Project Number: 14151771

HHS-03

A double-blind, randomised, placebo-controlled trial of berberine as an adjuvant to treat antipsychotic-induced metabolic syndrome in patients with schizophrenia spectrum disorders

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Introduction: Weight gain and metabolic syndrome (MetS) are highly prevalent side effects associated with antipsychotic therapy, especially second-generation antipsychotics. Berberine, a natural compound derived from the Chinese medicine Coptis chinensis, exhibits body weight-lowering, anti-diabetic, and anti-hyperlipidemic effects.

Objectives: The aim of this study was to evaluate the efficacy and safety of berberine on antipsychotic-associated weight gain and MetS in patients with schizophrenia spectrum disorders.

Methods: In this double-blind, randomized, placebo-controlled trial, 113 eligible subjects were randomly assigned to berberine (600 mg/day, N=58) and placebo (N=55) groups, in a 1:1 ratio, for 12 weeks. The primary outcome was the net weight gain from baseline. Secondary outcome measures included body mass index (BMI), waist circumference, blood pressure, serum glucose and lipid profiles, and the severity of psychotic symptoms evaluated by the Positive and Negative Syndrome Scale.

Results: Of the 113 randomized participants, 88 (77.8%) completed the study. Compared with placebo, berberine treatment produced a remarkably greater reduction in weight gain at 9 weeks (mean difference [MD]=-0.75, 95% confidence interval [CI]: -1.42 to -0.07, P=0.031, d=0.41) and 12 weeks (MD=-1.08, 95% CI: -1.76 to -0.40,

Abstracts for Poster Presentation

P=0.002, d=0.59). Patients who received berberine also showed statistically significant improvements in BMI (MD=-0.41, 95% CI: -0.65 to -0.17, P=0.001, d=0.64), total cholesterol (MD=-0.58, 95% CI: -0.74 to -0.41, P<.001, d=1.31), low-density lipoprotein (MD=-0.52, 95% CI: -0.68 to -0.35, P<.001, d=1.19), and glycated hemoglobin (MD=-0.09, 95% CI: -0.18 to 0, P=0.05, d=0.37). Berberine was well tolerated overall without serious adverse events or aggravation of psychotic symptoms.

Conclusion: These findings suggest that berberine is effective in attenuating antipsychotic-associated weight gain and MetS, without aggravating psychotic symptoms or generating adverse side effects.

Project Number: 14151891

HHS-04

The cost-effectiveness and effects of a music-paced physical activity intervention on clinical outcomes and physical activity maintenance of post-cardiac rehabilitation patients with coronary heart disease

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Introduction: Physical activity contributes to cardiovascular benefits among patients with coronary heart disease (CHD), yet its maintenance poses a great challenge to healthcare professionals. Incorporating music in physical activity may be a potential approach to address this issue. Furthermore, developing an intervention guided by the Information-Motivation-Strategy model and Self-Determination Theory could help to maximize the maintenance of physical activity changes.

Objectives: This study aimed to examine the effects and cost-effectiveness of a theory-guided, music-paced physical activity intervention on cardiac health among post-cardiac rehabilitation patients with CHD.

Methods: An assessor-blinded, randomized controlled trial was conducted from August 2017 to September 2021. 130 CHD patients attending the cardiac rehabilitation centre were recruited and randomly allocated into intervention (n=65) or control groups (n=65). The intervention group received theory-based education session and music-paced physical activity practice and telephone follow-up sessions. Study outcomes included exercise capacity, cardiovascular parameters, physical activity level, psychological outcomes and total cost. Data were collected at baseline, three-month, six-month, and 15-month after study entry.

Results: The intervention group demonstrated significantly greater improvements in exercise capacity (p=0.034) at three-month and exercise self-efficacy at six-month (p=0.043) and 15-month (p=0.015) when compared to the control group. No significant group differences were found in other outcomes. The cost-effectiveness analysis showed that the intervention cost HK$60,182 (approximately US$7,716) per one quality-adjusted life year gained. This cost was lower than the recommended threshold of three times the gross domestic product per capita (US$49,660.6 in 2021) set by the World Health Organization. Therefore, the intervention can be considered cost-effective. This study provided new evidence for health policymakers and healthcare personals on developing economically-friendly exercise-based cardiac rehabilitation program in clinical settings. The findings suggested nurses and other healthcare professionals on the application of motivation theories and music to exercise training courses to provide high-quality care for patients with cardiac conditions.

Conclusion: The study provides new evidence that a theory-guided music-paced physical activity intervention led to positive changes in exercise capacity for a short-term period and exercise self-efficacy for a long-term period among CHD patients. Strategies to enhance the positive effects on cardiac outcomes and its sustainability needed to be further explored.

Project Number: 14152621

HHS-05

Risk of hepatocellular carcinoma in patients with chronic hepatitis B achieved complete viral suppression – role of on-treatment hepatitis B surface/core-related antigen (HBsAg/HBcrAg) levels

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Introduction: Serum hepatitis B virus (HBV) DNA level is correlated with the risk of liver cirrhosis and hepatocellular carcinoma (HCC), which is independent of hepatitis B e antigen (HBeAg) status and serum alanine aminotransferase (ALT) level. For NA-treated patients, HBV DNA level has a less important role as it is usually undetectable in the majority of patients after treatment. Hepatitis B core-related antigen (HBcrAg) is a novel serum viral marker. Recent studies showed that its level correlates with the risk of hepatocellular carcinoma (HCC) in patients with chronic hepatitis B (CHB).

Objectives: We aimed to evaluate the accuracy of serum HBsAg and HBcrAg levels at baseline to predict HCC.

Methods: From 2005 onwards, we identified CHB patients who had received oral nucleos(t)ide analogues (NA) therapy with stored samples. Their earliest stored serum samples were retrieved for serum HBsAg and HBcrAg assays. CHB patients received nucleos(t)ide analogues (NA) treatment since December 2005 were included. Their stored serum samples at baseline were retrieved to measure HBsAg and HBcrAg levels. All patients were followed at the medical clinics with regular monitoring of clinical and laboratory parameters

Abstracts for Poster Presentation

every 3 to 6 months. The primary endpoint was the cumulative incidence of HCC.

Results: 1,400 CHB patients were included in the final analysis. 85 (6.1%) patients developed HCC during a mean (±SD) follow-up duration of 45±20 months. Serum HBcrAg level above 2.9 log10 U/mL at baseline was an independent factor for HCC in hepatitis B e antigen (HBeAg)-negative patients by multivariable analysis (adjusted hazard ratio 2.13, 95% CI 1.10-4.14, P=0.025). HBcrAg above 2.9 log10 U/mL stratified the risk of HCC in HBeAg-negative patients with high PAGE-B score (P=0.024 by Kaplan-Meier analysis), and possibly in cirrhotic patients (P=0.08). HBcrAg had sensitivity of 80.0%, specificity of 31.9%, PPV of 7.1% and NPV of 96.1% to predict HCC in all patients which were similar for HBeAg-negative patients with a sensitivity of 81.2%, specificity of 31.9%, PPV of 7.8% and NPV of 96.0%.

Conclusion: Serum HBcrAg level predicts the risk of HCC accurately in NA-treated HBeAg-negative CHB patients. Clinicians may use HBcrAg for more specific surveillance method which may save medical resources.

Project Number: 15160551

HHS-06

Effectiveness of a Professional-supported Problem-solving-based Self-learning Program for Family Carers of People with Recent-onset Psychosis

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Introduction: Psychosis is a major disabling and disruptive mental illness, accounting for over 30% of psychiatric patient populations worldwide, often having high risks of relapses in the first 3-5 years of illness. Many families caring for their family member with early stage psychosis have expressed difficulties in regularly participating in intervention group sessions because of time constraints and feeling of stigma and/or disempowerment in using mental healthcare services. In response to these caregivers' need for continuous support and health resources, an innovative self-learning or self-help approach to family intervention with health professionals as resource person may be useful and effective in addressing their long-term caregiving needs. This study was to test the effectiveness of a five-module problem-solving based self-learning program (PBSP) manual based on an Australian self-help family program for early-stage psychosis.

Objectives: This randomized controlled trial aimed to investigate the PBSP on family carers' and patients' outcomes over 12-month follow-up, compared with a family psychoeducation group (FPG) and usual psychiatric care only (TAU).

Methods: This was a multi-center RCT with repeated-measures, 3-arm design. A total of 198 families of a relative with recent-onset psychosis at six Integrated Community Centers for Mental Wellness (n=33/center) were randomly selected and then randomly assigned into the 5-month PBSP, family psychoeducation or treatment-as-usual group (n=66/group). Primary outcomes were family caregivers' burden and problem-solving ability. Based on intention-to-treat principle, treatment effects were compared between groups over 12-month follow-up, using Generalized Estimating Equation and subsequent contrasts tests.

Results: Compared to other two study groups, PBSP participants had significantly greater improvements in families' caregiving burden, problem-solving and caregiving experiences, and patients' psychotic symptoms, recovery and duration of re-hospitalizations over 12-month follow-up. The PBSP found effective can be disseminated to local/overseas mental healthcare services/organizations for family-focused early psychosis care, and further tested in diverse patient groups.

Conclusion: The PBSP can be effective to improve both family caregivers' and psychotic patients' health outcomes, and patient recovery over 12-month follow-up. Participants' qualitative feedbacks have provided areas of improvements of the intervention.

Project Number: 15161091

HHS-07

Self-administered Acupressure for Insomnia Disorder: A Randomized Controlled Trial

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Introduction: Insomnia is a significant health problem in the community. Self-administered acupressure is a possible alternative strategy to alleviate insomnia. Although previous studies suggested its improving effect on sleep quality, the conclusion on its influence on patients with insomnia was limited due to the lack of standardized subjective and objective sleep assessments.

Objectives: This study aimed to evaluate the effects of self-administered acupressure delivered by a training course for insomnia treatment.

Methods: A randomized controlled trial was conducted on 200 subjects with insomnia disorder (mean age: 48.0 years; 75.0% female) from the community. All eligible subjects were randomized

Abstracts for Poster Presentation

into the self-administered acupressure or SHE group in a 1:1 ratio. The self-administered acupressure group attended an acupressure training course (two sessions, 2 hours each) to learn self-administered acupressure, which they then performed every night for 4 weeks. The comparison group received SHE (two sessions, 2 hours each, same as the treatment group) and was reminded to follow the sleep hygiene practice daily for 4 weeks. The primary outcome was the Insomnia Severity Index (ISI). Other measures included a 7-day sleep diary and actigraphy, Hospital Anxiety and Depression Scale (HADS), and Short-form Six-dimension (SF-6D).

Results: The self-administered acupressure group had significantly lower ISI score than the SHE group at weeks 4 (Cohen's d = 0.51, p < 0.001) and 8 (d = 0.67, p < 0.001). The self-administered acupressure group had higher sleep diary-derived total sleep time and sleep efficiency than the SHE group at week 4 (d = 0.32 and 0.32, respectively, all p = 0.03). In addition, the self-administered acupressure showed great improvement in HADS anxiety (d = 0.35, p = 0.02), HADS depression score (d = 0.28, p = 0.049), and SF6D (d = 0.32, p = 0.02) at week 8 but not at week 4.

Conclusion: The findings suggested that self-administered acupressure taught in a short training course is a feasible and effective approach to improve sleep and related daytime impairment and mood problems in individuals with insomnia disorder in the short-term (weeks 4 and 8).

Project Number: 15161181

HHS-08

Determination of No-Observed-Adverse-Effect-Level of Fuzi for its clinical safe and effective use

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Introduction: Although Fuzi is a well-known traditional Chinese medicine for treating cardiovascular diseases and rheumatism arthritis, its induced poisoning cases have been widely reported with toxicity mechanisms largely unknown. No-Observed-Adverse-Effect-Level (NOAEL) as the well-accepted non-clinical risk assessment indicator in drug development has barely been applied to toxic herbs like Fuzi.

Objectives: The current study was then designed aiming to 1) provide toxicity profiles of the two frequently prescribed processed Fuzi preparations (Heishunpian and Paofupian) in rats and 2) investigate the related toxicity mechanisms for their safe clinical use.

Methods: We evaluated the tissue distributions of the six major toxic aconitum alkaloids after bolus and two-week oral administrations of Heishunpian/Paofupian in rats. After bolus or two-week oral administrations to rats at descending doses of 30/15/7.5g/kg, NOAEL of Heishunpian/Paofupian were determined based on comprehensive toxicity assessments in heart/liver/kidney/brain. Toxicity assessments of Fuzi containing formula (Sini Tang/ Fuzi Lizhong Tang) were compared with that from their corresponding Fuzi preparations (Heishunpina/Paofupian).

Results: After oral administrations of Heishunpian or Paofupian, the six tested toxic alkaloids mainly distributed in liver and kidney. The NOAEL for both bolus and two-week treatments of Heishunpian and Paofupian in rats was designated to be 7.5 and 15 g/kg, respectively, based on which and the safety factors (3~10), their maximum human dose (Heishunpian:7.5-25 g/person/day and Paofupian:15-50 g/person/day) were recommended. After Fuzi preparations treatment, liver and kidney have demonstrated extensive adverse effects with dilated central vein in liver tissue, bleeding area in kidney medulla, and elevation of LDH/AST/Urea/Creatinine. Comparing to Heishunpian/Paofupian, Sini Tang/Fuzi Lizhong Tang demonstrated changes in ventricular repolarization with no detectable hepato- and nephron- toxicity.

Conclusion: Our study for the first time identified the NOAEL of Heishunpian/Paofupian in rats and recommended their maximum human doses to be 7.5-25 g/person/day (Heishunpian) and 15-50 g/person/day (Paofupian). Comparing to Heishunpian/Paofupian, Sini Tang/Fuzi Lizhong Tang could reduce hepatotoxicity, however, aggravated cardiotoxicity.

Project Number: 15161541

HHS-09

Return to work and work productivity in breast cancer survivors: a longitudinal study

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Introduction: Returning to work (RTW) following cancer diagnosis and treatments is a prevalent unmet need in working-age cancer patients, especially in women with breast cancer (BCW). Even after successful work resumption, persistent residual symptoms could reduce patients' regular activity and productivity at work. Employment and RTW likely vary across different regional contexts due to healthcare provision and employment policy differences. The local employment experience after breast cancer therefore remains unexplored, despite accumulating evidence done in Western settings.

Abstracts for Poster Presentation

Objectives: This longitudinal study documented RTW-rate, time-to-RTW, work productivity, and activity impairment during the initial recovery stage following primary breast surgery for 12 months among local Chinese BCW and identified its potential correlates.

Methods: This study recruited 371 Chinese BCW who were employed/self-employed at the time of diagnosis at 4-week post-surgery (baseline) and assessed on their RTW-status and time-to-RTW at baseline (T1), 4-month (T2), 6-month (T3), and 12-month (T4) post-baseline. Work productivity loss and activity impairment were assessed at T4 using the Work Productivity and Activity Impairment (WPAI) questionnaire. Demographics, medical characteristics, work satisfaction, perceived work demand, work condition, RTW self-efficacy, B-IPQ illness perception, COST financial well-being, EORTC QLQ-C30 and QLQ-BR23 physical and psychosocial functioning, and HADS psychological distress were assessed at baseline as potential covariates.

Results: An upward trend of RTW-rate was observed over time, with 68.2% resuming work at 12-month post-surgery. The median duration of work absence due to breast cancer was ~183 days. Work productivity loss (20%) and activity impairment (26%) in RTW BCW were also common. Undesired work-related outcomes were associated with blue-collar work, lower household income, poorer financial well-being, lower RTW self-efficacy, negative illness perception, greater physical symptom distress, impaired physical functioning, lower job satisfaction, and unfavourable work conditions (e.g., physically heavy work).

Conclusion: It is clear that BCW requires additional support in facilitating RTW and improving other work-related outcomes, particularly during the early stages of recovery. However, RTW after cancer is a complex process involving multi-faceted factors. In addition to symptom management, an effective RTW intervention should also address psychosocial and work-environmental issues at the organisational or even policy levels.

Project Number: 15161641

HHS-10

A combined cessation intervention with brief advice, nicotine replacement therapy sampling and active referral (BANSAR) for smoking fathers: a multicenter, single-blinded, pragmatic randomised controlled trial

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Introduction: Pregnancy presents a teachable moment to motivate expectant fathers to quit smoking, but evidence from randomised controlled trials is limited.

Objectives: To test the effectiveness of a combined brief intervention in promoting smoking cessation among expectant fathers who smoke.

Methods: This 2-arm, pragmatic randomised controlled trial was conducted in prenatal clinics of 7 public hospitals in Hong Kong. Participants were male daily smokers whose partners were pregnant and non-smoking. All participants received nurse-led brief cessation advice at baseline. The intervention group additionally received 1-week sample of nicotine replacement therapy (NRT) and active referral to an external smoking cessation service of their choices. The primary outcome was biochemically validated tobacco abstinence confirmed by an exhaled carbon monoxide level of <4 parts per million at 6 months after randomisation. The secondary outcomes included self-reported abstinence, use of NRT and cessation services at 3 and 6 months. Intention-to-treat analyses were used, assuming participants with missing data were non-abstinent. The trial was registered with ClinicalTrials.gov (NCT03671707).

Results: From October 2018 to February 2020, 1053 participants were randomised to the intervention (n=527) or control (n=526) group. Of these, 86.3% of the participants were aged 26 to 45 years; 31.1% had moderate to high heaviness of smoking, 38.4% had never tried to quit and 79.8% were not ready to quit in 30 days. The retention rate at 6-month follow-up was 80.7%. By intention-to-treat, biochemical validated quit rate was significantly higher in the intervention than control group (6.8% [36 of 527] vs 3.6% [19 of 526]; OR=1.96; 95% CI 1.11–3.46; P=0.02). The intervention group also showed significantly higher self-reported 24-week continuous abstinence, 7-day point-prevalence abstinence, use of NRT, but not use of smoking cessation service. A formative evaluation study guided by implementation science frameworks is being conceived to examine the implementation potential of the intervention.

Conclusion: A proactive, combined brief intervention nearly doubled the odds of biochemically validated abstinence among expectant fathers who smoked. This trial provides new evidence of a simple and low-cost brief intervention that can be readily implemented in routine prenatal care to promote the health and well-being of childbearing families.

Project Number: 15162691

HHS-11

The effectiveness and cost-effectiveness of a virtual multidisciplinary stroke care clinic for community-dwelling stroke survivors and caregivers: a randomised controlled trial

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Abstracts for Poster Presentation

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Introduction: Although telerehabilitation might be a useful strategy to overcome accessibility barriers, stroke telerehabilitation has not been adequately evaluated in terms of effectiveness and cost-effectiveness.

Objectives: To develop and evaluate the effectiveness and cost-effectiveness of a Virtual Multidisciplinary Stroke Care Clinic (VMSCC) service for community-dwelling stroke survivors.

Methods: A 2-arm randomised controlled trial was conducted. Participants were recruited from 10 public hospitals. The intervention group participants received the VMSCC service, which included access to a multidisciplinary stroke care online platform and consultations with health professionals, along with usual care. The VMSCC service was evaluated for its effects on stroke survivors' outcomes including self-efficacy, self-management behaviours, social participation, and depression measured at baseline, and 3 and 6 months after commencing the intervention. Cost-effectiveness analyses were performed on total cost (service and medical costs) incurred in both intervention and control groups and incremental cost-effectiveness ratios expressed as incremental cost per emergency admission reduced and day of hospitalisation reduced over the 6-month study period.

Results: A total of 274 participants completed the study. Most had first-ever stroke (85%). The results showed significant improvements in self-efficacy, depressive level, and social participation in the intervention group at 6-month follow-up. The VMSCC service resulted in a greater reduction in the number of emergency admission and fewer days of hospitalisation, but incurred a higher total cost compared with the usual care. As for research translation to improve practice, we continue to work with nurse consultants from five hospital clusters within the Hospital Authority to integrate our novel service delivery model to support stroke recovery. Three acute hospitals' stroke units have already adopted our service model to develop their virtual stroke care services. As for knowledge generation, four peer-reviewed publications have been published in top cerebrovascular and rehabilitation journals, along with 12 conference and invited presentations. One presentation also won the International Scholar Award. The study findings and methodology also generated subsequent funded research on personalised stroke self-management support.

Conclusion: The study demonstrates evidence of health benefits for community-dwelling stroke survivors and economic benefits in reducing health service use. The study also inform the development of virtual stroke clinic services in acute settings.

Project Number: 15162991

HHS-12

Advancing adolescent bedtime by using motivational interviewing and text reminders - a randomized controlled trial

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Introduction: Sleep deprivation is a prevalent problem among adolescents which is closely related to various adverse outcomes. The lack of efficacy of current sleep education programs among adolescents argues the need to refine the content and format of the intervention.

Objectives: This study aimed to evaluate the effectiveness of group-based sleep intervention using motivational interview plus text reminders in changing sleep habits in sleep deprived adolescents.

Methods: A randomized controlled trial comparing motivational group-based sleep intervention with nonactive control group. The primary outcomes were sleep-wake pattern as measured by both sleep diary and actigraphy at post-intervention, 3- and 6-month after the intervention. The trial was registered with the Clinical Trial Registry (NCT03614572).

Results: A total of 203 adolescents with school day sleep duration less than 7 hours (mean age: 15.9 ± 1.0 yr; males: 39.9%) were included in the final analysis. Sleep diary and actigraphy data both showed that adolescents in the intervention group had earlier weekday bedtime at post-intervention (sleep diary: estimated mean difference: 33.55 min, P = .002; actigraphy: 33.01 min, P = .009) and later wake up time at 3-month follow up compared to the control group (sleep diary: -28.85 min, P = .003; actigraphy: -30.01 min, P = .01), and the changes in diary measured weekday bedtime were sustained up to 6-month follow up. In addition, adolescents in the intervention group had longer sleep diary reported weekday sleep duration at 3- (35.26 min, P = .003) and 6-month follow-up (28.32 min, P = .03) than controls. Adolescents in the intervention group also reported improved daytime alertness post-intervention, which was maintained at the 6-month follow-up. The findings have a potential to inform public health policies, and policymakers to put more emphasis on sleep health and overall well-being among the adolescent population, ultimately leading to improved educational outcomes, reduced mental health risks, and a healthier society.

Conclusion: The motivational group-based sleep intervention is effective in advancing bedtime with improved sleep duration and daytime alertness in sleep-deprived adolescents.

Project Number: 15163071

Abstracts for Poster Presentation

HHS-14

Effects of immersive virtual reality for preventing and managing anxiety, nausea and vomiting among paediatric cancer patients receiving their first chemotherapy: An exploratory trial

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Introduction: Paediatric cancer patients often experience anxiety, nausea and vomiting during chemotherapy. Emerging evidence suggests that immersive virtual reality (IVR) may improve anxiety and distress in this vulnerable group.

Objectives: To assess the feasibility and acceptability of IVR for the prevention and management of anxiety, nausea and vomiting in paediatric cancer patients undergoing first chemotherapy.

Methods: An exploratory trial supplemented with a qualitative approach.
Paediatric cancer patients (6-12 years old) undergoing first chemotherapy at the Hong Kong Children's Hospital were recruited. They were randomly assigned to the intervention group (three IVR sessions) or the control group (standard care). The main outcome measures included (1) feasibility parameters; (2) anxiety, nausea and vomiting; and (3) satisfaction with the chemotherapy process. Qualitative data were collected through semi-structured interviews with patients, parents and nurses.

Results: A total of 19 patients, 19 accompanying parents and 9 nurses were included in the study. Results showed that the intervention was feasible, with high consent rates and low withdrawal and attrition rates. Generalised estimating equation analyses showed that the intervention group had significantly better anxiety improvements than the control group (time-by-group interaction, T2: β, −5.61 [95% CI, −9.41 to −1.81; p=.004]; T4: β, −6.14 [95% CI, −8.96 to −3.33; p<.001]). Mann–Whitney U test showed that after the second chemotherapy, the degree of acute nausea in the intervention group was significantly lower than that in the control group (p=0.02). Qualitative interview data yielded three categories, namely, 'Positive experiences with IVR intervention', 'perceived benefits of the IVR intervention' and 'suggested improvements'.

Conclusion: This study demonstrated the potential effectiveness, feasibility and acceptability of IVR for managing anxiety and acute nausea in paediatric cancer patients undergoing first chemotherapy. The findings provided insight to optimise the development of a definitive trial in clinical practice.

Project Number: 16170321

HHS-15

Development and Validation of Ethnic- and Sex-Specific Hip Fracture Prediction Models Using Machine Learning Approach and Electronic Health Records in Hong Kong

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Introduction: In Hong Kong, hip fracture cases were projected to reach approximately 10,000 cases annually by 2050 if its incidence does not change substantially. Due to limited availability of dual-energy X-ray absorptiometry (DXA) in public hospitals, ethnic-specific prediction models not using bone mineral density (BMD) data are essential.

Objectives: We aim to develop and validate 10-year ethnic- and sex-specific hip fracture risk prediction models using electronic health records (EHR) without BMD.

Methods: Derivation cohort comprised 161,051 public healthcare service users in Hong Kong aged≥60 as of 31 December 2005. Sex-stratified derivation cohort was split into 80% training and 20% testing cohorts. External validation cohort comprised 3,046 community-dwelling participants from Hong Kong Osteoporosis Study. With age, diagnosis and drug prescription records, prediction models were developed using stepwise selection by logistic regression (LR), and four machine learning (ML) algorithms in training cohort. Model performance was evaluated in internal and external validation cohorts by AUC (discrimination), Brier score, Spiegelhalter Z-test, calibration slope and intercept (calibration). Whether ML models had improved performance over LR model were assessed by integrated discrimination improvement (IDI) and category-less net reclassification index (NRI).

Results: In internal validation of female prediction models, the LR model had the highest AUC (0.815 [0.805-0.85]) and adequate calibration. The negative IDI and NRI of the ML models indicated that the LR model had the best discrimination performance. Similar findings were observed in external validation, indicating the applicability of the model at both public healthcare setting and community-dwelling individuals at population-level. In internal validation of the male prediction models, the LR model had high AUC (0.818 [0.801-0.834]) and adequate calibration. Its discrimination performance outperformed other ML models as suggested by their negative IDI and NRI. In external validation, the LR model had high AUC of 0.898 (0.857-0.939) comparable to other ML models. Despite inadequate calibration, reclassification metrics indicated LR model was among models with the best discrimination performance.

Abstracts for Poster Presentation

Conclusion: With further validation, hip fracture prediction models using EHR may be integrated into routine clinical workflow in identifying people at high risk for DXA scan.

Project Number: 17181381

HP-01

Promoting advance care planning in persons with early dementia and their family caregivers in the community

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Introduction: Advance care planning (ACP) allows people with early-stage dementia to plan for their own future care with their family members and healthcare professionals before they lose mental capacity.

Objectives: To assess the uptake of a dyadic-based ACP intervention in the Chinese community care setting and to evaluate its effects on the ACP engagement level of people with early-stage dementia and their dyadic concordance on preferences of end-of-life care with their family caregivers.

Methods: This was a multi-centre, single-group quasi-experimental, pretest-posttest study. A theory-guided, dyadic ACP intervention ('Have a Say [HAS]' programme) for people with early-stage dementia—family caregiver dyads was developed and tested. Staff members of participating elderly centres received ACP facilitator training and served as interventionists. To assess the uptake of the HAS programme, participants' satisfaction and intervention completion rates were assessed. To evaluate the effects of the HAS programme, outcomes were measured at baseline (T0), immediately post-intervention (T1), and one-month post-intervention (T2) and were analysed using generalised estimating equation models.

Results: A total of 100 participant dyads recruited from 17 participating centres consented to and participated in this study; 90% of them completed the ACP intervention, and 89% of them completed the satisfaction survey. The proportion of participants with early-stage dementia and family caregivers satisfied with the intervention was 77% and 83%, respectively. Participants with early-stage dementia demonstrated a significant increase in the overall ACP engagement score and subscale scores in 'self-efficacy' and 'readiness' at both T1 and T2 relative to T0 (all ps < .001). Participant dyads also demonstrated higher dyadic concordance on preferences of end-of-life care at both T1 and T2 relative to T0 (all ps < .001).

Conclusion: The HAS programme was a feasible and acceptable approach to engaging people with early-stage dementia and their family caregivers in ACP in a Hong Kong community care setting. The findings demonstrated positive effects on engaging people with early-stage dementia in ACP and their dyadic concordance on preference of end-of-life care with their family caregivers immediately and at 1-month after the intervention. More services are needed to support the completion of advance directives for people with early-stage dementia.

Project Number: 03180198

HP-02

Promoting brain health among people with suboptimal cognitive functioning in Hong Kong: A Brain Vitality Enhancement (BRAVE) programme

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Introduction: The cognitive benefits of physical activity have proven to be effective for people with cognitive impairment. However, motivating this vulnerable cohort to remain physically active is challenging.

Objectives: To examine the effects of a peer-assisted mobile app-supported exercise programme titled "Brain Vitality Enhancement (BRAVE)" on the cognitive and well-being outcomes of persons with mild cognitive impairment (PwMCI), and to explore participants' satisfaction and engagement experience in the programme.

Methods: The programme comprised three components: a mobile app, peer volunteer training and a peer-supported exercise programme for PwMCI. The app provided information on brain health, benefits of exercise and an exercise video bank, and served as an activity scheduler, tracker and social networking platform. A sequential mixed-methods study with a two-arm randomized controlled trial and a qualitative study was adopted to evaluate the programme effectiveness. Community-dwelling PwMCI were randomized to the BRAVE group or the waitlist control group. A battery of validated tools was administered at 3 timepoints.

Results: A total of 46 volunteers were trained and 229 PwMCI were randomized. Compared with the control group (n=113), the BRAVE group (n=116) showed significantly greater improvements in processing speed and attention (β=6.281, 95%CI=2.106–10.456, p=0.003) and working memory (β=0.540, 95%CI=0.199–0.881, p=0.002) immediately post-intervention. The effects were sustained at 3 months post-intervention. Significantly greater improvements in sequencing and mental flexibility were observed in the BRAVE group at 3 months post-intervention (β=6.979, 95% CI=3.375–10.584, p<0.001). Participants were highly satisfied with the programme as indicated by high satisfaction score (46.2/50) and positive qualitative comments. The number of logins to the app and views to exercise videos were 23,957 and 42,519, respectively. The app was nominated by users for the Meritorious Healthy Mobile Apps Contest 2022 organized by the Office for Film, Newspaper and Article Administration. The deliverables of this project have linked to several ongoing large-scale research implementation projects to address the global advocacy on healthy aging promotion.

Abstracts for Poster Presentation

Conclusion: The BRAVE programme is well received and effective at sustaining improvements in various cognitive domains of PwMCI. The programme also demonstrates an effective model to support senior volunteers in developing self-fulfilling experience and to promote active aging in our society.

Project Number: 01170728

HP-03

Effect of a family-based multimedia intervention on the uptake of colorectal cancer screening among South Asian older adults in Hong Kong: a cluster-randomised control trial

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Introduction: Colorectal cancer (CRC) screening is an effective means of CRC prevention. However, there is a low rate of utilisation of CRC screening among older adults in South Asian ethnic minorities in Hong Kong. Tailored education and appropriate messaging has potential to convey to this population group the importance of CRC screening.

Objectives: To assess the acceptability and effectiveness of a family-based multimedia intervention to raise awareness of CRC screening and increase the uptake of faecal immunochemical tests (FIT) among South Asians aged 56-75 in Hong Kong.

Methods: A cluster-randomised controlled trial was conducted. Three-hundred and twenty dyadic participants (an adult aged 56-75 and his/her younger family member) were recruited from six districts of Hong Kong and randomised. Intervention dyads received a family-based multimedia intervention involving a health talk provided with the aid of a PowerPoint presentation, the viewing of a video clip, and the receipt of a health information booklet. The adults were also accompanied by their younger family member or our site coordinator to attend an FIT appointment with a family doctor. Control dyads received the intervention after data were collected at post-intervention. Data were collected at baseline and post-intervention. The primary outcome was the proportion of adults aged 56-75 who had undergone an FIT after the intervention.

Results: After the intervention, a significantly higher proportion of adults aged 56-75 in the intervention group than in the control group underwent an FIT (71.8% vs 6.8%; $p<0.001$). The level of willingness of younger family members to encourage these adults to undergo an FIT and their readiness to assist them to collect a stool sample for the test remained high at post-intervention among the intervention dyads. In contrast, there was a significant decrease for both outcomes among control dyads at post-intervention. The majority of the intervention dyads (>86%) were satisfied with the intervention and perceived it to be effective in enhancing their knowledge of CRC screening.

Conclusion: Our findings demonstrate the acceptability and effectiveness of using the family-based multimedia intervention in enhancing FIT uptake among South Asians aged 56-75. Implementation of the intervention as a component of usual care within South Asian communities is recommended.

Project Number: 01170848

HP-04

Building capacity to promote winter health in elderly: co-production of a volunteer-based home care programme for post-discharged elderlies by medical-social-academic sector

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Introduction: As older adults' needs grow more complex, the existing volunteer home visit programs must enhance their community health strategies and include comprehensive evaluations for service improvement. Expanding volunteer capacity can help older adults access integrated medical and social services in the community. Strengthening volunteer home visits can complement community home-based programs in improving elders' health-related quality of life.

Objectives: This study aimed to enhance volunteer home visits by optimizing the Winter Health Programme and evaluating the effectiveness of volunteer-based home care for older adults. The study objectives included: (1) developing a tailor-made assessment toolkit for volunteer-based home care; (2) recruiting and structural training community health ambassadors; (3) delivering effective health care interventions to empower older adults for self-care management; and (4) assessing the applicability and effectiveness of the volunteer-based home care model locally.

Methods: The study was divided into three phases: (1) developing a local WINTER health ambassador toolkit and recruiting ambassadors; (2) conducting WINTER health ambassador training workshops; and (3) providing home care through the WINTER health ambassador-led home visit program. The evaluation used pre-test and post-test repeated measures to analyse the outcomes for care recipients.

Results: The program was well-received and appreciated by both health ambassadors and older adults (care recipients). Participants had a better understanding towards healthy lifestyles, especially in the cold seasons. Approximately 20% of visits were identified by health ambassadors as involving clinical or social issues, or both. These cases were followed up by the research nurse and

Abstracts for Poster Presentation

social workers to reduce unnecessary health service use. The measurement outcomes confirmed a positive effect in reducing healthcare service utilization among care recipients who living with chronic conditions. There is a good potential to improve health outcomes by reducing emergency room visits and the number of hospitalized days for inpatient admission. Findings also showed that the care services had a beneficial psychosocial impact, reducing loneliness and improving health-related quality of life after the program.

Conclusion: An enhanced volunteer-based home care model was established to increase self-care continuity, chronic disease management, emotional well-being, and quality of life for post-discharged older adults in Hong Kong.

Project Number: 01170948

HP-05

A community health worker-led multimedia intervention to increase cervical cancer screening uptake among South Asian women: a randomized controlled trial

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Introduction: Utilization of cervical cancer screening services is lower among South Asian ethnic minorities compared with the general women in Hong Kong. Multimedia interventions led by community health workers may increase cervical cancer screening rates in this vulnerable population.

Objectives: To examine the effects of a community health worker (CHW)-led multimedia intervention on the uptake of cervical cancer screening, readiness to undergo screening and beliefs regarding screening among South Asian women.

Methods: South Asian women from Pakistan, India, or Nepal aged ≥ 25 years, sexually active, with no history of cancer, and who had not taken a pap test in the past five years were recruited from six local non-governmental organizations. These organizations were randomly assigned to the intervention or wait-list control groups. Intervention participants received a three-month CHW-led multimedia intervention that included multimedia health education, monthly telephone follow-ups, and navigation assistance.

Results: Of the 402 participants recruited and randomized, 387 participants completed the study. At three months post-intervention, cervical cancer screening uptake (97.9%) and readiness to undergo screening (99.5%) were significantly higher in the intervention group compared with the control group (52.6%; 83.9%) (p=0.005; p<0.001), respectively. In addition, the intervention group reported significant reductions in perceived barriers to cervical cancer screening immediately post-intervention [-0.68; 95% confidence interval (CI): -1.35, -0.01; p=0.047] and three months post-intervention [-0.86; 95% CI: -1.69, -0.04; p=0.041] compared with the control group.

Conclusion: The study findings support that the CHW-led multimedia intervention is effective in promoting uptake and readiness to undergo screening and reducing perceived barriers to cancer screening among South Asian women in Hong Kong.

Project Number: 01170958

HP-06

Promoting Cognitive & Psychosocial Well-being of Demented Elders by Cognitive Stimulation Therapy Hong Kong Version (CST-HK)

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Introduction: Cognitive Stimulation Therapy (CST), a non-pharmacological interventions, showed benefits in thinking and memory function in persons with dementia (PwDs) (Woods et al. 2012). With Spector's standardized protocol of CST, non-professional healthcare workers were found to be able to administer effective intervention after training (Paddick et al. 2017). It was then used globally, and a Hong Kong version (CST-HK) was devised in 2015 (Wong et al. 2017).

Objectives: This project investigated the efficacy of CST-HK delivered by trained non-professionals on quality of life (QoL) and cognitive function among older people with mild-to-moderate cognitive impairment.

Methods: 129 older people with mild-to-moderate cognitive impairment were recruited from community or residential care units to receive CST-HK administered by 38 non-professionals trained through a 26-hour train-the-trainer program. A single blind RCT was conducted to compare an experimental group (n=65), who received twice-weekly CST-HK for seven weeks, with a wait-list control group (n = 64), who received usual care for seven weeks, followed by a 7-week CST-HK program. Data on self-reported QoL rated by participants and cognition assessed by the researchers were collected for analysis at three time points: baseline (T0), seven weeks (T1, post-intervention for the experimental group), and fourteen weeks (T2, post-intervention for the wait-list control group).

Results: No interaction effect was found between groups. Within group analysis showed a significant improvement in cognition between T0 and T2 for the experimental group, and between T1 and T2 for the wait-list group. Comparing post-intervention data from the whole sample (n = 129) with usual care (n=64), there was a higher

Abstracts for Poster Presentation

likelihood of achieving clinically significant cognitive outcomes (improved or maintained ADAS-Cog; OR = 2.482, p = 0.025). Five tractable factors: (1) "non-professionals having experience in CST-HK implementation", (2) "non-professionals' facilitating skills", (3) "non-professionals having dementia caregiving experience", (4) "group size of eight participants" and (5) "non-professionals having previous dementia-related training", were correlated to the outcomes in regression analysis.

Conclusion: CST-HK delivered by non-professionals following a standardized 26-hour training was effective in improving or maintaining cognitive performance of older people with mild to moderate cognitive impairment. Providing a feasible solution with the increasing number of patients in an aging population.

Project Number: 01171138

ID-02

Exploring the arbovirus diversity among the Aedes and Culex mosquitoes in Hong Kong

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Introduction: In the past decades, emergence or re-emergence of RNA arboviruses have led to severe illness and death. The major mosquito vectors under Aedes and Culex genera are widely distributed in Hong Kong, posing public health threats. However, little was known about these mosquitoes and their arbovirus diversity in Hong Kong, hindering our preparedness for outbreaks of new or introduced arboviruses.

Objectives:
1. To detect and identify the arbovirus species present in the Aedes and Culex mosquito populations.
2. To study genetic and evolutionary relationships between the local and foreign arboviruses.
3. To compare the arbovirus prevalence and diversity between habitat regions close to human, domestic and wild animal populations.
4. To create a database describing the RNA arbovirus found in different Aedes and Culex species in Hong Kong.

Methods: This study conducted a one-year longitudinal mosquito sampling in 20 different locations in Hong Kong. BG-Sentinel traps were used to collect Aedes and Culex mosquitoes. Molecular screening of arboviruses by qPCR was conducted and positive samples were sequenced to identify the virus species. Phylogenetic analyses were used to resolve the genetic and evolutionary relationships of detected arboviruses. Metatranscriptomics was conducted to profile the mosquito viromes.

Results: A total of 24,660 female Aedes and Culex mosquitoes were collected. Some of their sample pools have obtained positive screening results for Flavivirus, Alphavirus, Negevirus and Alphamesonivirus, including an alphavirus called Getah virus that is known to transmit and cause diseases among the swine and equine populations. Diverse infection rates were observed in different mosquitoes and viruses. Metatranscriptomics sequencing indicated distinct virome profile among Aedes and Culex mosquitoes. We constructed a database to store the variety of data associated with the arboviruses detected in this study, allowing public interactive access to these arbovirus data.

Conclusion: Hong Kong Aedes and Culex mosquitoes harbour diverse types of arboviruses, including pathogenic Getah virus, indicating a potential of arboviral transmission in Hong Kong. Continuous surveillance on mosquito populations is recommended to promote disease responsiveness, control policy, and to enhance monitoring and prevention of emerging arboviruses.

Project Number: 18170432

ID-03

Development of an antigen capture assay for melioidosis, a fatal disease caused by Burkholderia pseudomallei

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Introduction: Melioidosis is an emerging, potentially fatal disease caused by Burkholderia pseudomallei. The current "gold standard" for laboratory diagnosis of melioidosis is by culture isolation, which is time-consuming and has low sensitivity. There is an urgent need for a rapid diagnostic method for the detection of B. pseudomallei infection.

Objectives: To generate monoclonal antibodies (mAbs) targeting the lipopolysaccharide (LPS) of B. pseudomallei; to characterize the antibodies using enzyme-linked immunosorbent assay (ELISA) and immunofluorescence techniques; to evaluate the binding specificity of the mAbs using standard and clinical strains of B. pseudomallei and other closely related species; and to develop a mAb based-antigen capture assay for the detection of melioidosis.

Methods: Anti-LPS antibodies were generated by mice immunization and hybridoma production. Presence of anti-LPS antibodies was determined using indirect ELISA and immunofluorescence techniques. Binding specificity of mAbs was evaluated using standard and clinical strains including B. pseudomallei, other Burkholderia species and Gram-negative pathogens. An antigen capture assay for the detection of B. pseudomallei was developed using negative urine samples to determine the cutoff value and using melioidosis-positive and melioidosis-negative urine samples to evaluate the sensitivity and specificity of the assay.

Abstracts for Poster Presentation

Results: We generated and evaluated three anti-LPS mAbs with high reactivity to the LPS of B. pseudomallei. The mAb with the highest reactivity was used to develop a simple, reliable and rapid antigen capture assay which was able to detect for melioidosis with high specificity (100%) and sensitivity (85%).

Conclusion: The developed antigen capture assay is a user-friendly, fast and inexpensive assay for laboratory diagnosis of melioidosis. Potentially, the generated antibodies can be used for the development of specific lateral flow immunoassays in the form of point-of-care test strips and cassettes for rapid on-site diagnosis of melioidosis in human and animals.

Project Number: 18170712

ID-04

Forecasting influenza epidemics in Hong Kong using multiple streams of syndromic and laboratory surveillance data

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Introduction: There is a growing literature on the prediction and forecasting of influenza epidemics in temperate locations, but much less work on prediction and forecasting in tropical locations, where the epidemics have weaker seasonality and more variation in timing and size.

Objectives: Our overall aim was to develop methodology that can be used to forecast in real-time, the attack rate, peak magnitude and peak timing of influenza epidemics in sub-tropical settings such as Hong Kong.

Methods: We developed the methods to forecast multiple outcomes of an epidemic, typically weekly case counts (short-term 1-4 weeks ahead forecasting) peak timing, peak magnitude and attack rate (long-term, up to 52 weeks ahead forecasting). We developed two frameworks based on (1) statistical modelling and (2) mechanistic modelling to construct the respective multiple streams data driven predictive models. We applied these frameworks to assess the impact of the COVID-19 pandemic on seasonal influenza transmission in Hong Kong.

Results: We found the influenza activity/transmissibility had the significant non-linear associations with humidity (U-shaped), ozone (negative power) in Hong Kong. Our frameworks could forecast 2019/20 winter season with peak week on 16th -22nd February, 2020, peak magnitude up to 1.17% (95% PI: 1.09%, 1.24%) per week, and a smaller (0.5-fold) summer peak on 19th -25th July, 2020, accounting total annual attack rate of 28.61% (95% PI: 27.23%, 30.03%) in whole year. We estimated a reduction up to 87% (95% CrI: 86%, 88%) in influenza attack rate and 50% (95% CrI: 42%, 60%) in transmissibility of 2019/20 season. We found the mechanistic framework based forecast of the outcomes are comparatively robust (with smaller uncertainty bound). Our forecasting frameworks for influenza can proactively inform the healthcare authority and agency the upcoming infection burden and suggest for better preparedness in advance.

Conclusion: Our study provided an integrated framework to identify the potential drivers influenza transmission with the form of their association and to predict and forecast the intensity (attack rate and peak magnitude) and peak timing of seasonal influenza virus infection in Hong Kong. This ability to predict outcomes of influenza epidemics in a timely manner can be instrumental to assist the public health planning strategies.

Project Number: 18171202

ID-05

SaeR as a novel target for antivirulence therapy against Staphylococcus aureus

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Introduction: Staphylococcus aureus is a major human pathogen responsible for a wide range of clinical infections. SaeRS is one of the two-component systems in S. aureus that modulate multiple virulence factors. Although SaeR is required for S. aureus to develop an infection, inhibitors have not been reported.

Objectives: To discover an inhibitor of SaeR, investigate the mechanism of HR3744 inhibiting SaeR, and evaluate the efficacy in vivo.

Methods: Inhibitors of SaeR can be identified by high-throughput screening; the targetability of SaeR was evaluated by in vivo knockdown approach; the mechanism of HR3744 inhibiting SaeR were investigated by genetic, chemical genetics, and mutagenesis approaches; the optimized analogue was studied by structure-activity relationship approach; the in vivo efficacy was evaluated by bacteremia mouse infection model.

Results: Using an in vivo knockdown method, we demonstrated that SaeR is targetable for the discovery of antivirulence agent. HR3744 was discovered through a high-throughput screening utilizing a GFP-Lux dual reporter system driven by saeP1 promoter. The antivirulence efficacy of HR3744 was tested using Western blot, Quantitative Polymerase Chain Reaction, leucotoxicity, and haemolysis tests. In electrophoresis mobility shift assay, HR3744 inhibited SaeR-DNA probe binding. WaterLOGSY-NMR test showed HR3744 directly interacted with SaeR's DNA-binding domain. When SaeR was deleted, HR3744 lost its antivirulence property, validating the target specificity. Virtual docking and mutagenesis were used to confirm the target's specificity. When Glu159 was changed to Asn, the bacteria developed resistance to HR3744. A structure–activity relationship study revealed that a molecule with a slight modification

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did not inhibit SaeR, indicating the selectivity of HR3744. Interestingly, we found that SAV13, an analogue of HR3744, was four times more potent than HR3744 and demonstrated identical antivirulence properties and target specificity. In a mouse bacteraemia model, both HR3744 and SAV13 exhibited in vivo effectiveness.

Conclusion: Collectively, we identified the first SaeR inhibitor, which exhibited in vitro and in vivo antivirulence properties, and proved that SaeR could be a novel target for developing antivirulence drugs against S. aureus infections.

Project Number: 19180692

ID-06

Determining meteorologically favourable zone for the activities of seasonal influenza A and B in Hong Kong

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Introduction: An accurate system for a risk alert of influenza epidemics is able to promote public awareness of the infection risk of influenza. Investigations of simple and accurate meteorology classification systems for influenza epidemics, particularly in subtropical regions, are limited.

Objectives: To assist in preparing for potential upsurges in the demand on healthcare facilities during influenza seasons, our study aims to develop a set of meteorologically-favorable zones for epidemics of influenza A and B, defined as the intervals of meteorological variables with prediction performance optimized.

Methods: We collected weekly detection rates of laboratory-confirmed influenza cases from four local major hospitals in Hong Kong between 2004 and 2019. Meteorological and air quality records for hospitals were collected from their closest monitoring stations. We employed classification and regression trees to identify zones that optimize the prediction performance of meteorological data in influenza epidemics, defined as a weekly rate > 50th percentile over a year.

Results: A combination of temperature > 25.1^{o}C and relative humidity > 79% was favorable to epidemics in hot seasons, whereas either temperature < 16.4^{o}C or a combination of < 20.4^{o}C and relative humidity > 76% was favorable to epidemics in cold seasons. The area under the receiver operating characteristic curve (AUC) in model training achieved 0.80 (95% confidence interval [CI], 0.76-0.83) and was kept at 0.71 (95%CI, 0.65-0.77) in validation. The meteorologically-favorable zones for predicting influenza A or A and B epidemics together were similar, but the AUC for predicting influenza B epidemics was comparatively lower.

Conclusion: Our findings provide an assurance for the meteorological favourable zones that could be potentially used in an alert system for an upsurge of influenza activity. The system provides not only an awareness promotion of infection risk to public but also informs healthcare officials for an early preparation of resources for influenza seasons.

Project Number: 19181132

ID-07

A randomized controlled trial evaluating an online intervention based on the Trans-Theoretical Model in increasing seasonal influenza vaccination among community dwelling people aged ≥65 years

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Introduction: Receiving seasonal influenza vaccination (SIV) is important for adults. There are few robust evaluations of tailored interventions for improving SIV uptake among older adults.

Objectives: To evaluate the relative efficacy of a stage-of-change (SOC)-tailored online intervention compared with a standard, non-SOC-tailored online intervention in increasing SIV uptake among Hong Kong residents 65 years or older.

Methods: This partially blinded (outcome assessors and data analysts) parallel-group randomized controlled trial was conducted between December 1, 2021, and July 31, 2022. Eligible participants were 65 years or older, had Cantonese- and/or Mandarin-speaking skills, were community-dwelling, had Hong Kong residency, were smartphone users, and had not received SIV for the 2021/2022 influenza season. Participants were recruited through random telephone calls and were randomized to either the intervention or control group. In the intervention group, a rule-based Chatbot first assessed participants' SOC related to SIV uptake and then automatically selected and sent participants SOC-tailored online health promotion videos or messages through WhatsApp once every 2 weeks for 4 sessions. In the control group, the Chatbot sent a standard online health promotion video covering general SIV information through WhatsApp every 2 weeks for 4 sessions. The primary outcome was self-reported SIV uptake at Month 6, which was validated by the research team. Intention-to-treat (ITT) analysis was performed.

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Results: A total of 396 participants (mean [SD] age of 70.2 [4.3] years; 249 females [62.9%]) were randomized into the intervention (n=198) or control (n=198) group. The ITT analysis showed that the validated SIV uptake rate was higher in the intervention group than the control group (50.5% vs. 35.3%, p=.002). The mean (SD) SOC score was higher in the intervention group than the control group (2.8 [1.4] vs 2.4 [1.4], p=.02). More participants in the intervention group completed at least one episode of intervention than in the control group (77.3% vs. 62.6%, p<.001). Approximately 80% of participants in the intervention group found it easy to interact with the Chatbot and were satisfied with the online interventions.

Conclusion: SOC-tailored online intervention was more effective than the non-SOC-tailored intervention and may be a sustainable new method in increasing SIV uptake among older adults.

Project Number: 19181152

ID-08
Inhaled Endolysin Therapy against 'Superbug' Lung Infections

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Introduction: Respiratory infection caused by multidrug-resistant bacteria is a major health problem worldwide. Bacteriophage-encoded endolysins digesting cell wall to induce lysis of bacteria are promising alternatives to antibiotics.

Objectives: In this study, we aimed to develop stable endolysin formulations to be delivered directly to lungs via nebulization to treat bacterial lung infections.

Methods: The activity of purified recombinant endolysins was first determined by antibacterial assays. Promising endolysins were characterized in co-culture systems with human lung epithelial cells and macrophages to mimic the in-vivo environment. Finally, promising endolysins were carried forward for formulation studies to examine their stability upon storage and nebulization using a vibrating-mesh nebulizer.

Results: Two antistaphylococcal enzymes, lysostaphin and LysGH15, and one G-ve endolysin, LysAB2, used concomitantly with colistin or modified with a cationic peptide (KWKLFKKI) at the C-terminal (LysAB2-KWK) were characterized in detail. They all demonstrated potent antibacterial efficiency in both lung cell-free and lung cells presented culture systems. All studied enzymes showed good robustness against the mechanical stress upon mesh nebulization, suggesting this is a feasible approach to deliver them directly to lungs. The phosphate-buffered saline dissolved enzymes had different storage stability at 4 °C, with lysostaphin and colistin+LysAB2 combination being the most stable and no activity loss was noted for at least 12 months.

Conclusion: Endolysins could demonstrate excellent storage stability with minimum formulation development and they are sufficiently robust to be delivered directly to lungs via a vibrating mesh nebulizer. Our findings warrant further in-vivo investigation of these antibacterial enzymes to confirm their therapeutic potential in treating bacterial lung infections.

Project Number: 20190102

ID-09
Assessing the impact of influenza epidemics in Hong Kong

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Introduction: Assessing influenza thresholds and impact can help evaluate seasonal changes in influenza impact during potential influenza pandemics. However, methodology for assessment of impact of influenza virus infection is not standardized. As a result, there is a need to examine the validity of the methodology for the assessment of impact developed by the World Health Organization.

Objectives: The overall aim of our study was to examine the validity of the WHO PISA framework in assessing the impact of influenza virus infections. Specific objectives of our study include estimating and comparing the PISA metrics of impact by virus type and subtype in each influenza season in Hong Kong in 2009-2019.

Methods: We used a linear regression model to estimate influenza-associated excess all-cause and pneumonia and influenza mortality from 2009 to 2019 in Hong Kong. We also estimated the weekly number of hospitalizations and ICU admissions associated with influenza infections. We assessed the influenza impact using the World Health Organization's Pandemic Influenza Severity Assessment framework. Thresholds under the WHO averaging method and moving epidemic method were estimated using data from 2014 to 2018 and applied to data in 2019.

Results: When thresholds were applied to the data in 2019, there was good agreement between impact metrics and methods, particularly among the excess mortality metrics. When stratified by age, impact was characterized as low to moderate for individuals in ≥65 years but high to extraordinary for individuals in 0-64 years at the seasonal peak of 2019.

Conclusion: Substantial mortality burden was detected in Hong Kong, with highest burden identified among ≥65 years and when associated with influenza A(H3N2). The Pandemic Influenza Severity Assessment framework can reliably assess seasonal influenza impact using different data sources. The framework used in the project allowed us to perform an overall timely assessment of the impact associated with influenza viruses. Assessment results will be useful in informing local responses during influenza seasons, especially during a novel pandemic.

Project Number: 20190982

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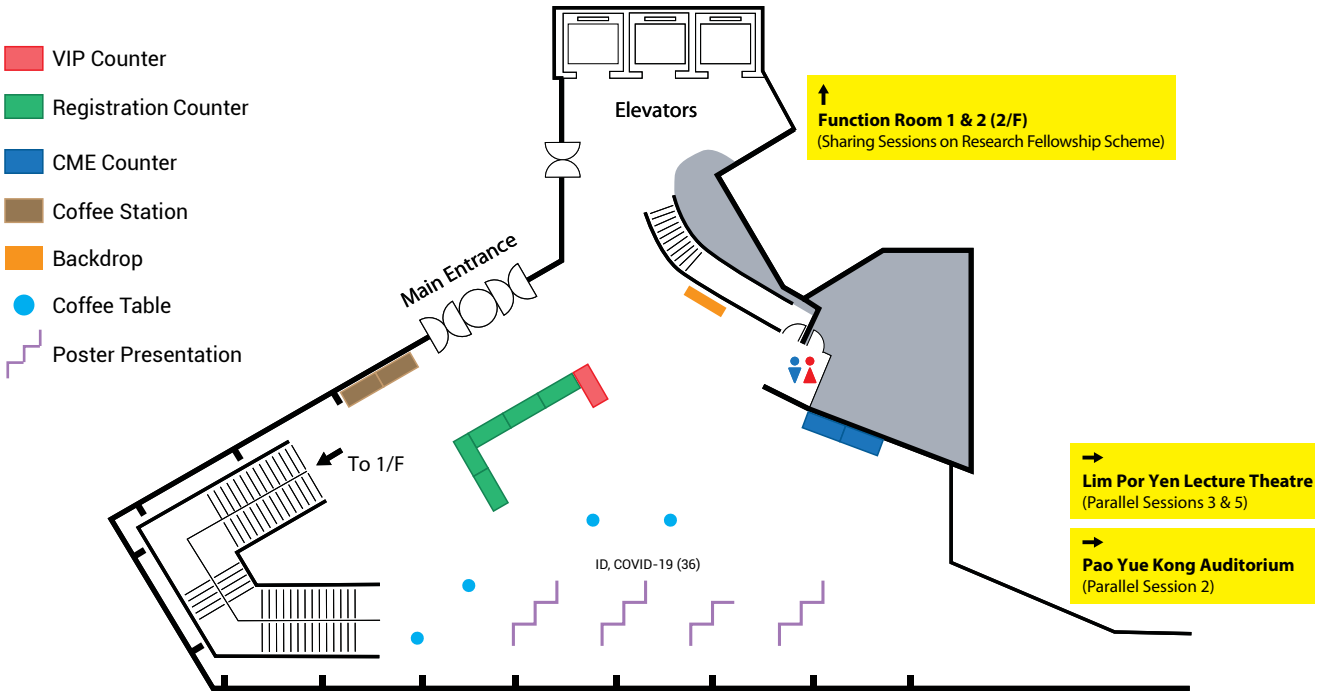
Applications are subject to peer review according to the established assessment criteria. Guidance notes and supplementary information, the abstracts and the budget of approved projects are available at Research Fund Secretariat's website at https://rfs.healthbureau.gov.hk

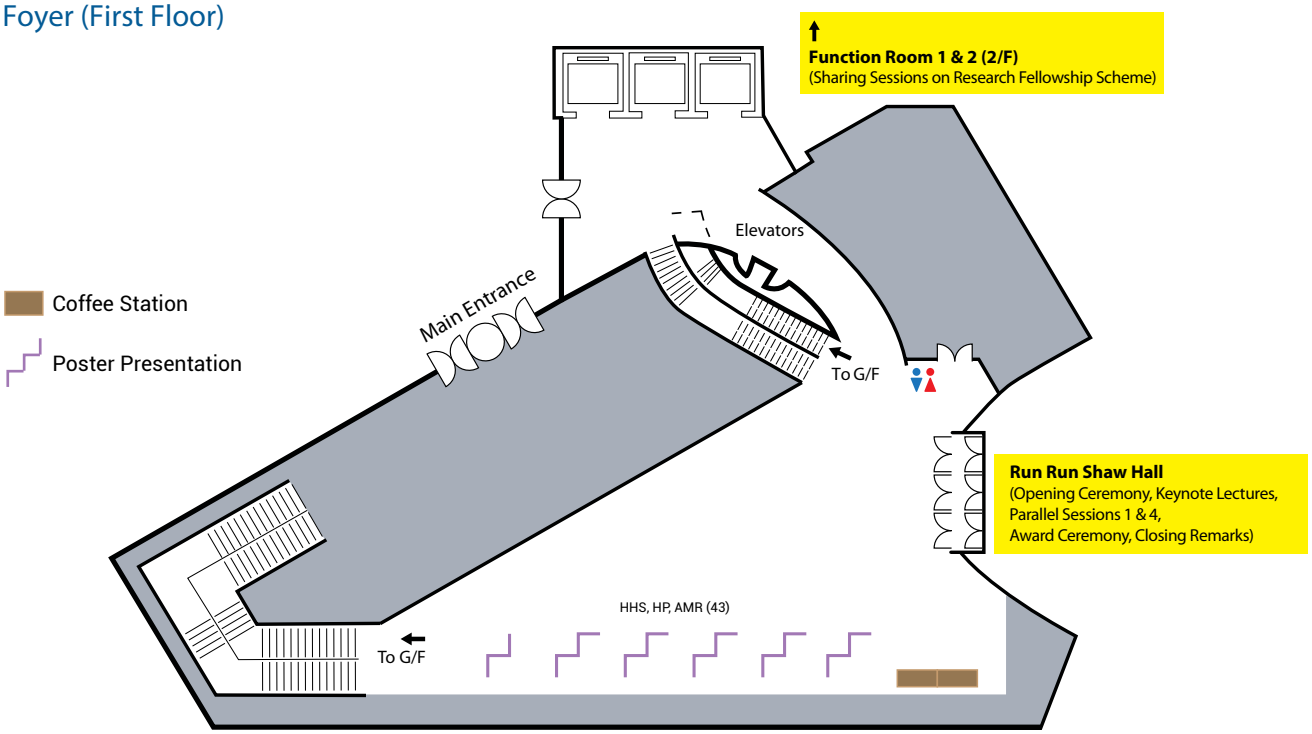
Venue Floor Plan

Hong Kong Academy of Medicine Jockey Club Building

Exhibition Hall (Ground Floor)



Foyer (First Floor)



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