Appendix

3R rehabilitation management for COVID-19 survivors using centre-based and online-based approaches

The research team will explore the temporal relationships between physical fitness, psychosocial functions, and health-related quality of life (HRQoL) in COVID-19 survivors over the first 18 months.400 COVID-19 survivors from five local hospitals will be recruited at 6-month post-disease onset. Centre-based (CBR) or online-based cardiopulmonary rehabilitation (OBR) will be provided and reassessments will be conducted at 12- and 18-month post-disease onset. By examining the physical fitness and psychological conditions of the survivors, researchers can assess their changes in "3R", i.e. "Rebuild fitness", "Regain confidence" and "Resume normal life".

Whole-genome sequencing of COVID-19 cases in Hong Kong: Development of a geophylogenetic database and characterisation of SARS-CoV-2 variants circulating in the community

The team's previous study reported the genomic characteristics of SARS-Co-V-2 strains and phylogenetic relatedness of COVID-19 cases during the initial outbreak in Hong Kong. Back in March and July this year, Hong Kong experienced a spike of COVID-19 cases during the second and third waves of outbreak. More phylogenomic data are needed to track the transmission routes of SARS-CoV-2 variants in the community.

The project aims to develop a phylogenomic database linked to a geographic information system (GIS) to reveal the transmission linkage of COVID-19 cases in Hong Kong and to characterise the clinical and functional impact of genetic variants of SARS-Co-V-2 through structure-based mechanistic studies.

Whole-genome sequencing of at least 500 cases of SARS-CoV-2 will be conducted. The phylogenomic database will be integrated with GIS to yield a clear view of the genomic diversity of SARS-CoV-2 variants and their distributions across Hong Kong, with a focus on the clustering of cases based on phylogenetic proximity. Factors such as patients' onset date and travel records will also be considered to infer the transmission chain of the virus in the community.

AI-empowered chest X-ray and CT quantitative analysis for COVID-19 patient management

Researchers will develop and evaluate artificial intelligence (AI) techniques for enhancement, and quantitatively analyse chest X-ray and CT images for more effective COVID-19 diagnosis and patient management. The team will collect imaging and clinical data of COVID-19 patients and divide them into training, validation and testing cohorts. The training and validation cohorts will be used to develop multiple AI techniques for enhancing and quantitively analysing chest X-ray and CT images. The testing cohort will be used to evaluate the developed AI techniques in multiple COVID-19 clinical applications.

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

The primary aim of the project is to achieve rapid screening of patients in whom COVID-19 infection is suspected in decentralised settings such as airports, quarantine centres and private clinics. Another aim is to achieve early detection of potentially overwhelming host response to improve patient prognosis.

The research team will develop a handheld device, making use of real-time reverse transcription-loop-mediated isothermal amplification (real-time TR-LAMP) with gold nanoparticle (AuNP)-based colourimetric probes to enable on-site detection of SARS-CoV-2. The team will collect samples for screening and validation, and compare them with blood samples from patients with various degrees of severity for pulmonary inflammation for prognosis validation.

By developing this handheld rapid screening device, the research team hopes to help reduce the spread of COVID-19, and assist with hospitalisation/quarantine decisions when the number of infected cases exceeds hospital capacity.

Characterisation of the distribution of aerosols released from drainage ventilating pipe of public housing buildings

The project aims to investigate the dispersion pattern of aerosols released from drainage ventilating pipes of public housing buildings, so as to develop a risk assessment model based on the contributing parameters.

This 18-month study will be conducted in public housing buildings with four different layouts. For each layout, four residential units in different directions will be studied. Pseudovirus and tracer gas Freon R134a will be employed to investigate the aerosol distribution from the discharge of drainage ventilating pipes to top-floor residential units. Upon collection of the data, computational fluid dynamic (CFD) simulations will be used to analyse the key contributing parameters (such as weather, airflow, pipe configurations and washroom ventilation) influencing the spatial distribution of aerosols and its subsequent effects on the residents.

Data collected will help to modify the design of the ventilating system, and to determine the best combination of physical parameters (such as washroom ventilation and configuration of drainage ventilating pipe) for reduction of infection risks.

Psychological trauma and unsafe behaviour during the COVID-19 epidemic: A mixed-design study of people's emotion, knowledge, attitude and behavior

People's lives have been affected by the COVID-19 pandemic in various ways, for example with regard to their health, employment, education and in social aspects. This project aims to gauge the effects of this pandemic and to mitigate its impact on the citizens of Hong Kong.

Researchers will conduct a mixed-method study involving a 3,000-person survey of the general adult population and 240 in-depth interviews with subsets of the sample: a high-risk group,

people who are compliant and non-compliant with the recommended precautionary measures, and socially disadvantaged groups. The study is to examine people's current level of psychological trauma, their level of knowledge about and attitudes to COVID-19, their behaviours regarding infection prevention and the reasons they do not adopt appropriate preventative actions.

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

The project will assess the effect of the Blended Gaming COVID-19 Training System (BGCTS) on infection control practices, compliance rates and knowledge of standard precautions among the staff in residential care homes (RCHs).

BGCTS is a blended mode of training (e-health mode blended with face-to-face sessions), with the content derived from *"The COVID-19 Risk Communication Package For Healthcare Facilities"* developed by the World Health Organization. 188 staff from 20 RCHs will be invited for training and divided into the intervention or the control group. The intervention group will be trained with BGCTS, using designated short-clip videos and games covering eight topics in two weeks, and two face-to-face 30-minute interactive sessions will be arranged for clarifying concepts, while the control group will attend the prevailing basic training seminars.

Researchers hope to obtain data on how BGCTS could improve RCH staff performance at infection control practices, and subsequently promote the training to other local RCHs.

Public compliance with disease prevention and public health measures to control COVID-19

Researchers will conduct a three-month cross-sectional telephone survey with 1,200 local residents aged 18 or above, to understand the degree of public compliance with COVID-19 disease-prevention measures (DPM) (e.g. voluntary self-quarantine, social distancing and surgical mask wearing) in Hong Kong and the barriers to DPM compliance. The team will also examine factors that may affect compliance with DPM, such as health, contextual, social and an individual's perceived susceptibility to COVID-19.

The results of this project will identify modifiable factors to facilitate compliance with DPM, and inform public-health strategies for the development of more effective practices to control future infectious diseases.

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