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Contemporary Practice in Paediatrics

Combating the Coronavirus Disease 2019 Pandemic in the Hong Kong Hospital Authority Paediatric Infectious Disease Centre

PQ ***Mak***, GT ***Chua***, JS ***Rosa Duque***, JSC ***Wong***, ICS ***Lam***, KKY ***Lau***, PSP ***Kong***, CC ***Shek***, J ***Kwok***, KKW ***To***, CB ***Chow***, YL ***Lau***, P ***Ip***, MYW ***Kwan***

Abstract Since the coronavirus disease 2019 (COVID-19) outbreak in late December 2019, and escalation of the public hospital infectious disease outbreak response level to the highest "emergency" level three days after two COVID-19 cases were diagnosed on 22 January 2020, all public hospitals implemented a series of isolation policies, rescheduled clinical services and mobilised resources to support frontline clinical staff. This article reviewed these multi-level policies adopted in the Department of Paediatrics and Adolescent Medicine, Princess Margaret Hospital, which have ensured that the healthcare system was not overwhelmed and frontline staff was not over-stressed and infected.

Key words Coronavirus; Hospital; Infection Control; Paediatrics; Policy

Department of Paediatrics and Adolescent Medicine, Princess Margaret Hospital, 2-10 Princess Margaret Hospital Road, Lai Chi Kok, Kowloon, Hong Kong SAR

PQ **Mak** (麥巧臻)¶ *MBBS*
JSC **Wong** (黃頌智) *MBBS, MRCPCH, FHKAM(Paed)*
ICS **Lam** (林卓燊) *FHKAM(Paed), FHKPaed*
CC **Shek** (石志超) *FHKAM(Paed) FHKCPaed, FRCPCH*
CB **Chow** (周鎮邦) *MD, FRCPCH, FHKCPaed*
MYW **Kwan** (關日華)* *MSc(Applied Epidemiology)CUHK, MRCPCH, FHKAM (Paed)*

Department of Paediatrics and Adolescent Medicine, Queen Mary Hospital, Li Ka Shing Faculty of Medicine, The University of Hong Kong, 102 Pok Fu Lam Road, Pokfulam, Hong Kong SAR

GT **Chua** (蔡宇程)¶ *MBBS, FHKAM(Paed)*
JS **Rosa Duque** (陸俊文)¶ *MD, PhD*
YL **Lau** (劉宇隆) *MD(Hon), FRCPCH*
P **Ip** (葉柏強)* *MBBS, MPH, FHKAM(Paed)*

Hospital Play Service, Playright Children's Play Association, Hong Kong SAR

KKY **Lau** (劉嘉茵) *BSc in Psychology*
PSP **Kong** (江小萍) *B.A. - Pre-primary education*

Division of Transplantation and Immunogenetics, Department of Pathology, Queen Mary Hospital, 102 Pok Fu Lam Road, Pokfulam, Hong Kong SAR

J **Kwok** (郭少燕) *MBBS, PhD, FHKAM(Pathology)*

Department of Microbiology, Carol Yu Centre for Infection, Li Ka Shing Faculty of Medicine, The University of Hong Kong, Hong Kong SAR

KKW **To** (杜啟泓) *MD, FRCPath*

Correspondence to: Dr MYW **Kwan** and Dr P **Ip**
Email: kwanyw1@ha.org.hk, patricip@hku.hk

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*Co-corresponding authors
¶Co-first authors

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has infected and killed millions of globally.[1] Hong Kong has been implementing a series of measures from the Government to individual hospital departments to prepare for the COVID-19 pandemic,[2] based on experiences from previous epidemics, including the Severe Acute Respiratory Syndrome (SARS) epidemic in 2003, H1N1 Influenza in 2009, Ebola Disease in 2014,[3] and Middle East Respiratory Syndrome (MERS). The Princess Margaret Hospital (PMH) is the first government-funded infectious disease centre (IDC) in Hong Kong and has been playing an indispensable role in the management of previous infectious disease outbreaks.[4] This article summarised the experience implemented by the Hong Kong Hospital Authority and PMH in ensuring the safety of healthcare workers while fighting against the COVID-19 pandemic.

Government Preparedness and Hospital Authority Response Levels

The Chief Executive of Hong Kong launched the Preparedness and Response Plan for Novel Infectious Disease of Public Health Significance on 4 January 2020, and escalated the three-tier public hospital response level for infectious disease outbreak from "alert" to "serious".[5] However, there was a rapid increase in the number of suspected cases fulfilling the reporting criteria of "Severe Respiratory Disease associated with a Novel Infectious Agent" under the Prevention and Control of Disease Ordinance (Cap. 599). Eventually, the first two COVID-19 imported cases were diagnosed on 22 January 2020, and the response level was further escalated to the highest "emergency" level on 25 January 2020.[6-8]A series of public health measures was subsequently enforced by the Hong Kong Government, including travel bans, closure of schools and recreational facilities, mandatory quarantine and testing of returning travellers, contact tracing, and enhanced laboratory surveillance of SARS-CoV-2.[9,10] Strict infection control measures were implemented in all public hospitals, which include limiting patient visits, volunteer services and clinical attachments; requiring staff and patients to wear surgical masks in all hospital areas; temperature checking at hospital entrances; and reinforcing hand hygiene.[11] Non-emergency services, elective surgeries, routine appointments and investigations including endoscopy and radiological scans, were rescheduled. In addition, stockpiling and regular auditing of personal protective equipment (PPE) supply has become an important policy to ensure the safety of the frontline staff. Accommodation allowance was provided to healthcare workers who opted to stay away from their families while working in high-risk areas. These measures promoted social distancing, whilst mobilising healthcare workers and resources, especially PPE, to combat the COVID-19 pandemic.

Departmental Diversions

At the beginning of the first wave in late January 2020, the Department of Paediatrics and Adolescent Medicine in PMH mobilised manpower and resources to the IDC by reallocating medical staff from other clinical areas to the Paediatric Infectious Disease (PID) Team. Selective paediatric outpatient clinics and services were temporarily suspended, such as elective appointments for echocardiogram, lung function study and dynamic endocrine function tests. One of the general paediatric wards in PMH was converted into a surveillance ward for the screening and management of children with fever or respiratory illnesses but not fulfilling the admission criteria for single room airborne isolation. As emerging clinical evidence has demonstrated that a significant proportion of paediatric patients was asymptomatic,[12,13] children with epidemiological links requiring isolation were thereafter admitted to the PID ward in PMH for testing of SARS-CoV-2, as obtaining respiratory specimen is potentially aerosol-generating. The surveillance ward and another paediatric ward were temporarily closed to facilitate the redistribution of nurses to take care of children with COVID-19.

Towards the peak of the outbreak, a designated team of doctors was established within the department in April 2020 to ensure a focused care for the rapidly growing number of paediatric COVID-19 patients. Apart from increasing the number of medical staff joining the PID Team, doctors responsible for the management of COVID-19 patients were excused from other elective clinical duties to reduce their workload so that they could have adequate rest, prevent cross-infection to other patients, and have sufficient time for hygiene measures such as proper donning of PPE. As the majority of COVID-19 patients recovered and discharged in late April 2020, routine clinical duties and

services were gradually resumed in line with the Hospital Authority and Government's plans for phased resumption of public services.

Online departmental meetings have substituted the conventional face-to-face format to maintain social distancing. An instant messaging group was created for rapid communication and information sharing amongst the doctors within the department. There were daily updates on the number of COVID-19 patients in the IDC, names of buildings with confirmed cases of COVID-19,[14] and medical literature published on COVID-19 to facilitate academic discussion between different paediatric subspecialties. These combined effort has led to the success of zero COVID-19 – related mortality and morbidity among our hospital personnel since the pandemic began.[15]

Teaching, Training and Research

The appropriate use of PPE has been proven to be effective in protecting healthcare workers with high-risk exposures to COVID-19 patients.[16] PPE training was arranged for all healthcare workers since the early phase of the outbreak. Fit testing of new N95 respirator models was for prioritised for staff working in high-risk areas. Paediatric and neonatal resuscitation drills and simulations were supported with online resources and hands-on simulation training. Open suctioning and the use of aerosol-generating devices for non-invasive ventilation were discouraged. Specific equipment, including viral filters and video laryngoscopes, were made available. Preparations were made to cater pregnant women who were suspected or confirmed with COVID-19 infection to deliver safely in a negative pressure delivery suite in the IDC. A simulated run-through of attending neonatal standby and resuscitation in the negative pressure delivery suite was created, along with the introduction of specific equipment, including laryngeal mask airway and scavenger system for bag-valve-mask, and micro-cuffed endotracheal tubes. Ad-hoc training was provided for staff to practice the steps of resuscitation and intubation. These measures were regularly reviewed to ensure that they reached international standards.[17-19]

The PMH IDC also provided timely updates to the local and regional medical community. Online lectures related to paediatric COVID-19 infection have been conducted through the Hong Kong College of Paediatricians, the Hong Kong Paediatric Society, the Hong Kong Society for Paediatric Immunology Allergy and Infectious Diseases and the Asian Society for Paediatric Infectious Diseases. The PMH IDC has also played a significant role in the coordination of COVID-19-related paediatric research, both locally and internationally. A comprehensive literature search of the PubMed and Google Scholar databases using "children", "paediatrics", "COVID-19" and "Hong Kong" as keywords at the time of writing revealed that the PMH ID team has significantly contributed all local COVID-19 paediatric clinical studies. The PMH ID team reported one of the first case series of anosmia and ageusia as a common presentation of COVID-19 infection in children and adolescents.[20] We collaborated with other paediatric units and the University of Hong Kong to centralise our clinical data collection system and biological specimen collection for analysis. We reported three children with Kawasaki Disease but proven to have false-positive SARS-CoV-2 serology, emphasizing the importance of the use of micro-neutralisation assay to confirm their serological status,[21] and we also reported that saliva viral load better correlates with clinical and immunological profiles than NPS viral load in children.[22] We provided nasopharyngeal and saliva samples to help with the development of novel SARS-CoV-2 detection techniques.[23] We collaborated with the Wuhan Children Hospital and South Korea and compared the clinical and laboratory profiles between SARS paediatric patients in 2003 and COVID-19 paediatric patients in South Korea, Wuhan and Hong Kong for a better understanding of the clinical characteristics of COVID-19 infection.[12,24-26] We reported four children with COVID-19 who had weeks of prolonged viral shedding in stool despite mild symptoms.[27] We also investigated the psychosocial impact of the COVID-19 pandemic to children and families in Hong Kong, particularly to those with special education needs.[28] The PMH IDC has also managed the first patient with paediatric multisystem inflammatory syndrome temporarily associated with SARS-CoV-2 (PIMS-TS), which was successful managed with intravenous immunoglobulin. An in-depth analysis of his immunological profile was performed with the collaboration of different experts to help us better understand the disease. Hong Kong has also contributed data to the registry which is part of the **B**est **A**vailable **T**reatment **S**tudy for the Paediatric Inflammatory Multisystem Syndrome temporally associated with SARS-CoV-2 **(BATS)**, and participated in multinational research projects studying type 1 interferonopathies in patients with

severe COVID-19 phenotypes.[29,30] Finally, we have also been communicating closely with other Asian and European countries, including the Republic of Korea, the United Kingdom and Spain, in clinical experience sharing and research collaboration.

Interim Guidelines

The second wave of the COVID-19 local outbreak began in March 2020 as a wave of overseas students returned to Hong Kong, contributing to the rapid increase of paediatric COVID-19 patients.[31] In anticipation of this, the PMH IDC played a pivotal role in the coordination of the clinical management of paediatrics COVID-19 patients among all admitting Hospital Authority (HA) hospitals. The Interim Recommendation on Clinical Management of Paediatric Patients of Coronavirus Disease 2019 Infection was prepared by the Hong Kong Hospital Authority Central Committee on Infectious Diseases and Emergency Response (CCIDER), taking reference from the adult, national and World Health Organization (WHO) interim guidelines.[32-34] To educate the public on reducing community transmission, the "Prevention of Coronavirus Disease 2019 (COVID-19), Recommendations for Parents" was jointly prepared by the Hong Kong College of Paediatricians and Hong Kong Society of Paediatric Immunology Allergy and Infectious Diseases, made available in English, Chinese, and Tagalog.[35]

Accommodating for All

The PMH IDC has also received and accommodated several family clusters with up to three generations of family members infected with COVID-19 nursed in the same isolation room. Experience from SARS has taught us that extreme infection control procedures have a negative emotional impact on the children and their parents. Healthcare workers witnessing the separation of young children with their parents could also bear significant distress.[36] The PMH paediatrics and adult medical teams worked together and adopted a family-centred care approach to alleviating the harsh reality of isolation. Parents were allowed to nurse their young children, while adolescent patients helped to take care of their parents and grandparents. These young adults also helped to communicate with the medical team to receive updates related to their family members' conditions and conveying the messages to their relatives outside the hospital. Play packs for different age groups were delivered to children under isolation, and hospital play specialists arranged online play sessions with these children according to their developmental needs.[37] The medical team also provide daily telephone updates to the parents about their children's progress.

Conclusion

Policies and measures implemented at the Government, hospital, and departmental levels were all crucial in preparing for the COVID-19 pandemic. All COVID-19 patients in Hong Kong were admitted to the public hospitals for isolation and management until their recovery and clearance of the virus. The early efforts in flattening the curve were evidenced by 21 days without local cases reported in Hong Kong from 14 June to 4 July 2020. However, since the reopening of businesses and schools and relaxation of social distancing measures, the third and fourth wave of outbreak emerged since 5 July 2020 and 3 December 2020. The upcoming challenge now is how we may control and prevent further community transmission while schools and businesses reopen again.

Conflict of Interests

None

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