THE IMPACT OF MOVEMENT CONTROL ORDER DURING COVID-19 PANDEMIC ON HEALTHCARE UTILISATION: HOW DOES THE PROJECTED PATIENT WORKLOAD COMPARED TO THE ACTUAL NUMBER OF PATIENTS IN CARE?

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Abstract

The rising healthcare demand during COVID-19 outbreak may endanger patients and forces hospital to plan for future needs. Predictive analyses were conducted to monitor hospital resources at one of the gazetted COVID-19 hospitals in Malaysia. Simultaneously, a real-time observation on patient's volume was conducted to understand the actual trend of healthcare resource utilisations. All the projections were directly compared to the actual number of patients in-care. This predictive study was done at University Malaya Medical Centre (UMMC) using various sources of data. The projections revealed a steady increase in the number of cumulative cases until April 2020 followed by an exponential increase in the number of cumulative positive cases in Malaysia. When a comparison between the projection and actual data was done, it was found that the initial projections estimated a range that is 50% to 70% higher during the first three phases of Movement Control Order (MCO) compared to the actual number of COVID-19 patients at UMMC. Subsequent projections were done by using recent estimations from the national database and it was estimated that the number of patients treated will be less than 10 each day up until the end of May 2020. The accuracy of this estimation is 95% when compared to the actual number of COVID-19 patients in care. In conclusion, the practice of continuous projections and real-time observation through predictive analysis using mathematical calculations and algorithms is one of the useful tools to facilitate hospital management to allocate adequate resource allocations.

Keywords: COVID-19, Predictive analysis, Healthcare utilisations, Malaysia

Introduction

In a bid to manage the COVID-19 situation in the country, the Malaysian government has effectively implemented the movement control order (MCO), by shutting down non-essential services in governmental and private sectors, extending school holidays and travel ban besides imposing strict standard operating procedures (SOP) for services that remained open. The MCO comprises of several staggered phases, each aimed at flattening the COVID-19 curve yet maintain the economic and social stability of the country. The first phase was enforced from the 18th to the 31st of March 2020. The inevitable second phase subsequently took place from the 1st to the 14th of April 2020. This was followed by the third phase from the 15th to the 28th of April 2020. The fourth phase of MCO was initially planned for

the 29th April until the 12th of May 2020. Nevertheless, with the downward trajectory of cases, on the 1st of May 2020, the government announced a slight loosening of MCO restrictions. This includes allowing most businesses and government offices to reopen by adhering to strict SOPs. This phase was termed as the 'conditional MCO' (CMCO) phase. The CMCO was further extended for several weeks until the 9th of June 2020. It is also important to note that during the implementation of the MCO, several areas were put under 'enhanced MCO' (EMCO) due to the high number of COVID-19 cases recorded in these areas (1).

Many countries have benefited following the implementation of MCO (2, 3). In Malaysia, the implementation of MCO has contributed to the significant reduction in the number of positive cases which occurred gradually over the phases of MCO (4). Even massive screenings have been conducted, the numbers of diagnosed patients were found to be continued to decline. A dramatic reduction can also be seen in the volume of patients treated at various inpatient facilities, which recorded high discharge rate and low admission rate. In addition, the MCO has also resulted in the significant reduction of hospital visits at both public and private healthcare facilities for non-COVID related cases (5).

Methodology

University Malaya Medical Centre (UMMC) is one of Kuala Lumpur's healthcare facilities chosen to manage and treat COVID-19 patients. The hospital is located in a densely populated area housing numerous businesses and commerce-related activities. Patients at UMMC are mostly from surrounding areas as well as from the capital city since the next nearest hospital that receives COVID-19 cases, Hospital Kuala Lumpur, is at least 15 kilometres away from UMMC. Prior to MCO, several projections were conducted to estimate the national and UMMC's COVID-19 disease burden. Findings of these projections were published elsewhere (6). Following the announcement of MCO, this series of projections were conducted at different points of time to predict the healthcare resource utilisation in UMMC. The main objective of these projections was to monitor hospital resources during the pandemic. Besides these projections, real-time observation on patient's volume was conducted as part of data collection to understand the trend of healthcare resource utilisations in UMMC as well as to monitor the hospital's capacity in managing the disease. All the projections were directly compared to the actual number of COVID-19 patients in UMMC.

Results

It was initially estimated that the number of COVID-19 patients will steadily increase during the second phase of MCO onwards and will reach approximately 120 patients by the end of April 2020 if the MCO is rendered unsuccessful. The initial projections used parameters from available international and national database which includes the basic reproduction number (R^0), median growth rate, growth acceleration and other relevant probabilities related to COVID-19. When a comparison between the projection and actual data was done, it was found that the initial projections estimated a range that is 50% to 70% higher during the first three phases of MCO compared to the actual number of COVID-19 patients in UMMC.

A revised projection was done in the third phase of MCO after the MCO compliance rate among Malaysian was recorded to be more than 90%. The new projection estimated a lower number of confirmed cases and patient in care. A total of 45 COVID-19 patients were expected to be treated in UMMC by the end of April 2020 as compared to 120 patients in the initial projection. Subsequent projections were done by using recent estimations from the national database. It was estimated that the number of patients treated in UMMC would be less than 10 each day up until the end of May 2020. The accuracy of this estimation is 95% when compared to the actual number of COVID-19 patients in care. The projected number of patients in care and the actual number of patients were presented in Figure 1.

Nevertheless, the third COVID-19 wave that occurred in September 2020 has pushed Malaysia's healthcare system to a breaking point due to daily increase in the cases number and over-utilisation of hospital resources especially in the Klang Valley. A premature lift of interstate travel restriction on December 2020 and also the detection of a new COVID-19 variant among local patients had worsened the situation in 2021 and led to the proclamation of a national state of emergency by the Yang di-Pertuan Agong of Malaysia, which was later lifted on August 2021.

Discussion

This study demonstrated that the use of predictive analysis to estimate the hospital burdens could facilitate decision making to ensure adequate healthcare resources. The accuracy or the model fitness based on the up-to-date local data was 95%, which made the model a useful tool to facilitate hospital managers to plan effective policy in a timely manner. As described earlier, when majority of the model parameters or inputs were based on other countries' data, the estimations were not very accurate for Malaysia setting. This shows that the differences in the health policy, healthcare systems and compliance rates play significant impacts to populate the model. During the initial projections, majority of the model parameters were gathered from data in Italy, United States as well as other developed countries. As those countries have different polices, healthcare systems and demographic characteristics, these affected the model and predicted over utilisations of the resources.

During the peak of the COVID-19 outbreak, many tertiary hospitals in Malaysia, including UMMC, have cancelled or rescheduled the elective surgeries and follow-up appointments for non-coronavirus patients. Although

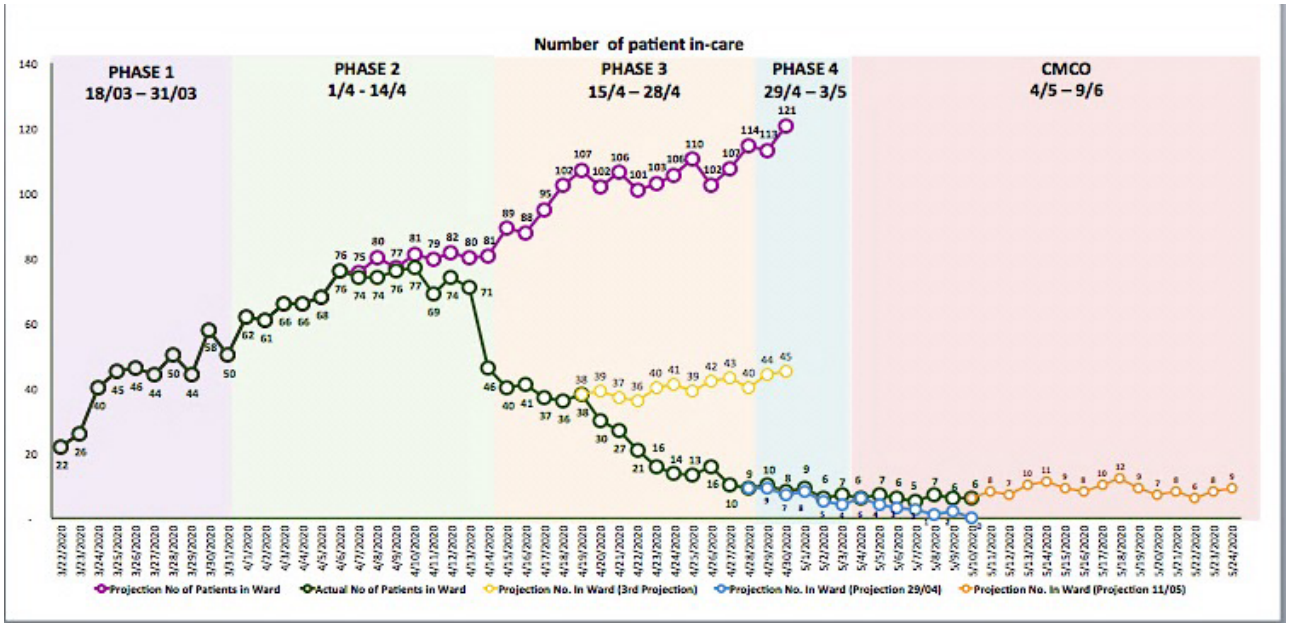

Figure 1: Projected number of patients based on the predictive analysis and the actual number of patients in care (year 2020)

the current healthcare system is focus on continuously treating COVID-19 patients, the system must also resume in catering patients with other health problems. Hospitals must continue to meet the health care needs of the general community by providing the full portfolio of patient care services.

The introduction of the national COVID-19 immunisation programme has given a new hope to reduce the transmission and spread of COVID-19 in Malaysia. Although the implementation was a bit late compared to our neighbouring countries, our vaccination rate per population was among the fastest. To date, about 90% of adult population had completed their vaccination. Currently, the newly formed COVID-19 Immunisation Task Force-Adolescent is targeting for 80% of Malaysian teenagers to be fully vaccinated before school reopens in March 2022.

The great success of Malaysia's COVID-19 immunisation programme and vaccine coverage rate was one of the indicators in the newly introduced National Recovery Plan (NRP). Many states have moved to the Phase 4 of NRP, and with the lift of interstate travel ban in October 2021, Malaysia is moving towards the endemic phase of COVID-19. Reduction in daily hospital admission, utilisation of intensive care unit (ICU) bed and number of COVID-19 category 4 and 5 patients are really good signs for all Malaysians who got themselves fully vaccinated and followed all the SOPs introduced by the government since the first MCO.

Conclusion

The practice of continuous projections and real-time observations on patient's volume could potentially aid many healthcare centres including UMMC in planning the restoration of their medical services for non-COVID-19 patients while continuing efforts in battling the pandemic. Findings from this study have also been used to guide the UMMC management to take proper actions in managing COVID-19 cases and other cases accordingly. This report highlights the efficacy of the ongoing monitoring system, which incorporates both the projected and actual workload. It allows healthcare facilities to be better informed of the efficiency of their healthcare deliveries besides enabling the development of relevant hospital policies that require timely and practical decisions, particularly during a pandemic. Therefore, the monitoring of hospital services is proven to be of utmost importance in facilitating hospital management to make clear and precise decisions, based on the current and relevant facts.

Competing interests

The authors declare that there is no conflict of interest.

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Ethical Clearance

This study received special approval from the Director of University of Malaya Medical Centre on December 22, 2020.

References

1. National Security Council Malaysia. COVID-19. 2020. Available at: https://www.mkn.gov.my/web/ms/. Accessed 19 May 2020.

2. Kirby T. News South America prepares for the impact of COVID-19. Lancet Respir. 2020;S2213-2600(20)30218-6.
3. Figueiredo A, Codina A, Moreira D, Figueiredo M, Saez M, León A. Impact of lockdown on COVID-19 incidence and mortality in China: an interrupted time series study. Bull World Health Organ. Preprint. 2020.
4. Salim N, Chan WH, Mansor S, Bazin NEN, Amaran S, Mohd Faudzi AA, *et al.* COVID-19 epidemic in Malaysia: Impact of lock-down on infection dynamics. MedRxiv. Preprint. 2020.
5. Khor V, Poraviappan AA, Azli SM, Asri KM, Fahmy O. Experience from Malaysia During the COVID-19 Movement Control Order. Urology. 2020;141:179-80.
6. Azzeri A, Hakim NFA, Jaafar H, Dahlui M, Othman S, Kamarul T. Prediction of disease burden and healthcare resource utilization through simple predictive analytics using mathematical approaches, an experience from university of malaya medical centre. JUMMEC. 2020;Special Issue COVID-19:10–5.