



## Orthopaedic Clinic Versus a Pandemic – Snapshot of Patient Behaviour, Safety Measures and their Impact on Clinic Workload at Six Months after Onset of Covid-19

Dalun LEONG<sup>1</sup>, Hong Lee Terry TEO<sup>1</sup>, Hui-Shan CHAN<sup>2</sup>, Aileen LIM<sup>2</sup> and Sir Young James LOH<sup>1</sup>

<sup>1</sup>Department of Orthopaedic Surgery, Changi General Hospital, Singapore

<sup>2</sup>Department of Health Systems Intelligence, Changi General Hospital, Singapore

### Abstract

**Background:** The initial impact of Covid-19 pandemic has led to drastically reduced outpatient attendances. This resulted in a backlog that potentially overwhelms the existing outpatient clinic capacity. The challenge in addressing this backlog includes a 'new normal' outpatient clinic set-up that mandates safe distancing measures. Our study reviewed the patient behaviour and the clinic workload changes in the first six months after the pandemic onset.

**Methods:** Clinic workload data from January 2020 to June 2020 were compared to that from the same time of the 4 preceding years (2016-2019). These outpatient data were categorised into cancellations, actualised appointments and no-shows. The projected backlog was determined from these data. The necessary resources required to cope with this backlog were projected over the subsequent 6 or 12 months.

**Results:** Our results suggested that the overall decrease in the actualised appointments in the first 6 months of 2020 was mainly due to cancellations and its highest rate was in May at the height of Singapore's Covid-19 pandemic. The cancellation rate initiated by patient remained unchanged compared to previous years. The 20% no-show rate was also similar when compared to previous years.

**Conclusion:** This suggested that patient behaviour in clinic attendance persisted even in the setting of a pandemic. To flatten the backlog curve within 6 months, our outpatient clinic must operate at 160% capacity. The urgency to address the increased workload must be balanced cautiously against the needed safe distancing. Options such as telemedicine are among some of the adjuncts explored to circumvent the challenge.

**Keywords:** Covid-19, Ambulatory, Backlog, Clinic, Telemedicine

### Background

The coronavirus 2019 (Covid-19) pandemic has drastically transformed healthcare services globally. Since the confirmation of the first Covid-19 positive patient [1] on 23rd January 2020, Singapore has progressively ramped up safety measures such as safe distancing to mitigate the rapid spread of the virus. Dorscon Orange Alert [2,3] was implemented on 7th February 2020 in response to the global surge Covid-19 cases. The Singapore government subsequently implemented a 'circuit breaker' [4] on the 7th April 2020 with enforced movement restrictions in the community. This measure was relaxed on 2nd June 2020 with safe distancing measures[5]. The pandemic impacted various aspects of the country including the healthcare sector.

#### \*Correspondence:

Dalun Leong, Department of Orthopaedic Surgery, Changi General Hospital, 2 Simei Street 3, Singapore 528889

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Changi General Hospital serves an approximate 1.6 million population on the east side of the island. The orthopaedic clinic is the busiest clinic in this tertiary hospital, and it has an annual actualised attendance of approximately 68000 in 2019. There was a significant decrease in the actualised attendances due to safety concerns and measures [5]. This resulted in a backlog [6] that potentially overwhelms the existing outpatient clinic capacity. The challenge in addressing this backlog includes a 'new normal' environment that mandates safe distancing measures. The current study reviewed the patient behaviour and the clinic workload changes in the first six months after the pandemic onset.

## Methods

The statistics of the orthopaedic clinic obtained from the Health Systems Intelligence unit was after Institutional Review Board (IRB) approval. The clinic data from January 2016 to June 2020 were obtained. The number of bookings per month were determined. These bookings were then divided into cancelled, actualised and no-shows. An actualised appointment is a booking where the patient attended the appointment. A no-show is a booking where the patient did not attend the appointment. A cancellation is a booking where the clinic or the patient changed it to usually a later date. A comparison of the number of actualised visits, no-show and cancellation for January to June 2020 was made. A comparison of the same period in each year from 2016 to 2019 was made. The period of January to June 2020 was selected to observe the trend in clinic attendance before, during and after the circuit breaker (07 April to 01 June 2020). The decrease during this six-month period was determined and compared with the same period in 2016 to 2019. The referral trend and numbers were determined and correlated to the circuit breaker.

The backlog was determined from the cancellations and rejections of a new appointment. The clinic resources from July 2020 onward was determined from historical data and the backlog was projected onto it. The backlog was categorised into new cases and follow-ups. The number of follow-ups generated from a new case was by using new case: follow-up ratio in financial year 2019 workload statistics over 6 months. The number of follow-ups generated from an existing follow-up was by the total number of financial year 2019 follow-up appointments divided by the number of unique patients. The historical workload for radiological and rehabilitation services support for each clinic session is obtained. The ratio of physician consultation to rehabilitation and radiology appointments were analysed. The data was analysed by R and the figures were visualised with Tableau.

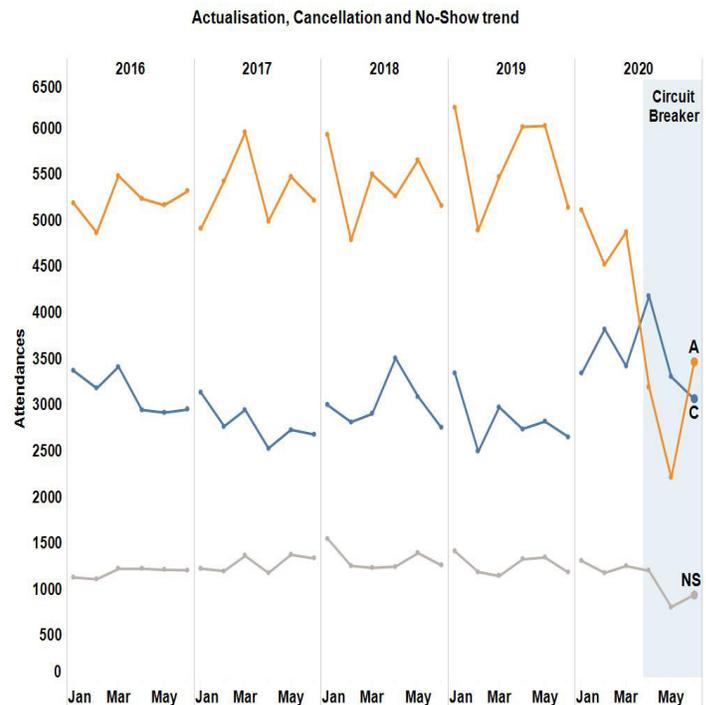


Figure 1: Yearly comparison of clinic attendance from 2016 to 2020 for January to June. The actualised appointment (A) decreased. The cancellation (C) increased and the no-show (NS) remained the same.

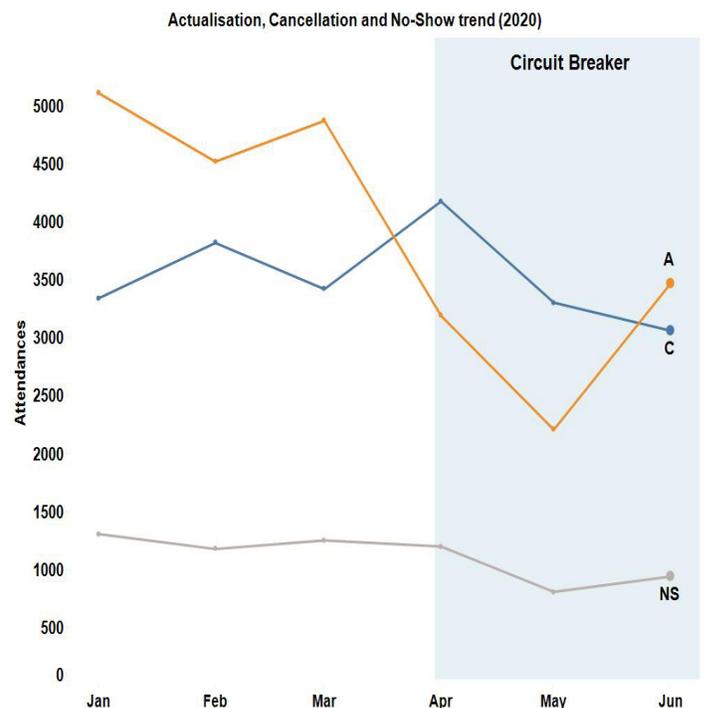


Figure 2: Monthly comparison of clinic attendance by the month from January to June 2020. This corresponded with an average decrease of 30% in actualised appointment (A). The sharpest decrease of 50% was during the 'circuit breaker'. The trends in cancellation (C) and actualised appointment (A) have an inverse correlation. The no-show (NS) rate remained the same at 20% during this period.

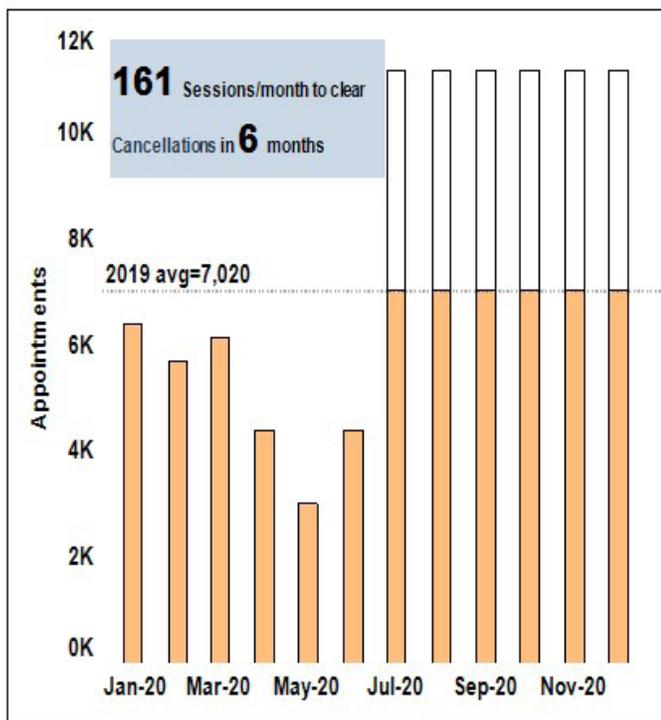


Figure 3: New clinic workload at 160% of its pre-covid-19 workload per month to address the backlog in six months.

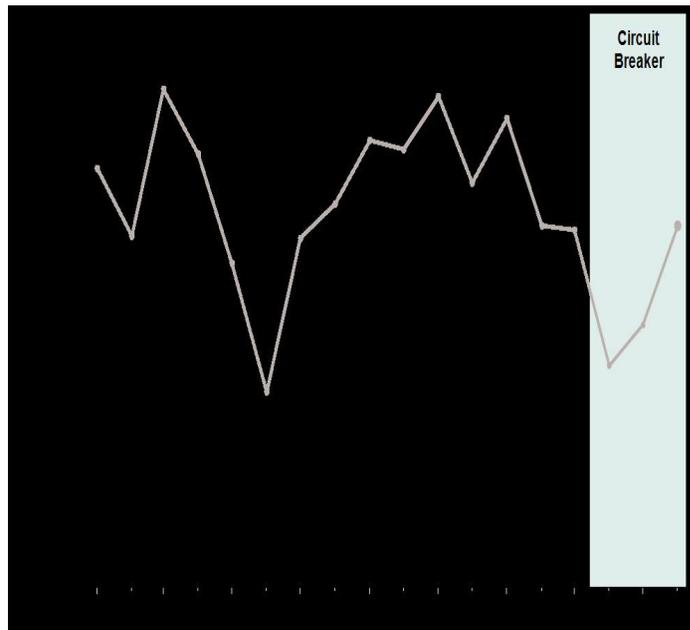


Figure 4: Change in referral trend. The 'lead time' pertains to waiting time of a referral to clinic of more than 60 days from the day of booking. The decrease in Mar 2020 coincided with the institution of safe distancing for covid-19 and the circuit breaker. The numbers gradually climb back to the pre-circuit breaker level. This suggests changes in doctor and patient behaviours that affect referrals.



Figure 5: Downstream support services workflow from clinic. Every 10 consultations generates 6 physiotherapy referrals, 6 radiology referrals and 1 occupational therapy referral.

### Results

There is a significant change in the actualised attendance, with an average decrease of 30% from January to June compared to previous years 2016 to 2019 (Figure 1). The most significant decrease of 50% compared to previous years was in April to June 2020 and coincided with the 'circuit breaker' (07 April to 01 June 2020) (Figure 2). There was more follow-up affected than the new cases. The no-show rate remained constant at 20% similar to previous years. The number of cancellations inversely relates to the number of

actualised appointments. The cancellations were by either patient or the clinic. The number of patient cancellation remained the same compared to previous years. The clinic cancellations followed a clinical records review to identify chronic stable patients who did not require any urgent or emergent care in accordance to prevailing ministry guidance. The backlog (Figure 3) was determined by the number of cancellations of new cases and follow-ups. A new case on a historical average resulted in 3 more follow-up visits in one year and a follow-up visit resulted in 2 more visits in one

year. This is approximately 25,000 cases. When this number is converted into clinic sessions (3.5 hour per session), an additional 967 sessions are required. This equates to about 40 additional sessions per week if the backlog is cleared in 6 months. The referrals decreased in number for a limited period (Figure 4) and reflected a possible change in the behaviour of the patient and doctor that governs a referral. This resulted in a decrease in 'lead time' during the circuit breaker. The 'lead time' is a criterion to monitor referrals that exceeds a waiting time of more than 60 days. For every 10 consultations, there are 6 x-rays orders, 6 physiotherapy referrals and 1 occupational therapy referral (Figure 5).

## Discussion

The overall decrease in the actualised appointments in the first 6 months of 2020 was mainly due to cancellations and was at its highest rate of 50% in May (middle of circuit breaker). The cancellation rate by patient remained unchanged compared to previous years. The 20% no-show rate was similar to previous years [7,8]. Studies [9,10] showed no-show correlates with the patient profile such as age group, waiting time to appointment and socio-economic status. The current study suggests such patient behaviour persists in a pandemic. We postulate that the transient period of referral decrease (Figure 4) was due to a variety of reasons such as patient health seeking behaviour, threshold to refer, decreased attendances at the emergency department, polyclinics and general practices. The triaging of essential and non-essential follow up is to create capacity for the hospital to cope for a COVID 19 surge in the community. It also facilitated the implementation of safe distancing measures in the clinic during the circuit breaker period.

Conversely, the resumption of clinic services after the circuit breaker was constrained by safe distancing measure. The clinic utilized all available consultation rooms, expanded its physical space by sitting attendees outside its boundary, staggered the appointments and optimized the clinic staffing. Staff optimization included 'rationing' of annual leave with planned call back due to service exigency and recalling staff deployed at other frontline facilities. The downstream care providers such as radiology and rehabilitation services were enhanced to prevent a chokepoint. To flatten the backlog curve, the clinic aimed to function at 160% clinic workload over a 6-month period to maintain timely patient care. This needs an additional 40 clinic sessions per week with extension of consultation hours each day or weekend clinic concomitantly with locum physicians and support staff. These measures were initiated and the clinic adhering closely to ministry guidelines, had resumed 80% of its pre-pandemic workload at the time of writing. Despite readied

resources, the urgency to address the increased workload was balanced cautiously against the needed safe distancing and innovative new model of care such as telemedicine are being reviewed for implementation.

Telemedicine [11-13] is an option for discussing investigation reports, follow-up attendances of stable conditions and rehabilitative purposes. Other advantages include reduction of no-show rate, monitor homebound patients and helps a patient who has difficulty taking time off work. Amongst the challenges to its expedient application and effectiveness are technology savviness, adaptation, cost of setting up and medico-legal clearance. The nature of orthopaedic consultation requires imaging studies but telemedicine is applicable for selected conditions. There are limitations in the current study. The clinic sessions are assumed to be identical. However, a session can be entirely for follow-up or new case or a mixture. The number of appointments per session is dependent on this and the subspecialty. The strategy is on the assumption of full clinic staffing and support services.

## Conclusion

During a pandemic, there was no significant change in patient cancellation, no-show, and a transient period of referral decline during the circuit breaker was observed. The main factor that effectively achieved the safe distancing instructed by the ministry was postponement of stable cases with return advice. Despite stretching the clinic resources to match an above normal workload to achieve timely patient care, the effectiveness is constrained by the same safe distancing measures, and new ways of patient care such as telemedicine is deployed. These factors that affect clinic workload warrants a future review to establish a clinic workflow for a pandemic.

## Ethics Approval

The statistics of the orthopaedic clinic obtained from the Health Systems Intelligence unit was after Institutional Review Board (IRB) approval.

## Consent for Publication

Authors have agreed to submit it at its current form for consideration of publication in this Journal.

## Data and Materials

The data that support the findings of this study are available from Changi General Hospital but restrictions apply to the availability of these data, which were used under permission for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Changi General Hospital.

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## Competing Interests

None of the authors has competing interests to declare.

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## Author Contributions

This article resulted from the need to analyse the impact of the clinic backlog and to address it to provide continuity of timely and optimal care in the new 'normal' environment. The orthopaedic surgeons collaborated with the department of Health Systems Intelligence to address this challenge resulting from the Covid-19 pandemic. Dr Dalun LEONG is nominated as the guarantor of the article. The clinicians provided the ground information and the Health Systems Intelligence department supported with statistical analysis. The relevant data was obtained from the hospital. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

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