



My Thoughts/My Surgical Practice



# Restructuring the surgical service during the COVID-19 pandemic: Experience from a tertiary institution in Singapore

The COVID-19 pandemic has taken the world by storm and overwhelmed healthcare institutions even in developed countries. As one of the earliest countries to experience the outbreak,<sup>1</sup> Singapore has had the advantage of refining and reflecting on its response so far. We describe the impact of the pandemic on the structure of the surgical service in a tertiary teaching hospital in Singapore.

Nationwide planning commenced even before the first COVID-19 case was reported on our shores on 23 January 2020.<sup>1</sup> Within the hospitals, surgical services were perhaps the most dramatically affected, given its high procedural workload<sup>2</sup> and perioperative considerations.<sup>3</sup> Our goals were threefold: (1) To mobilize resources and free up hospital infrastructure; (2) to decrease staff cross-infection rates; and (3) to maintain essential surgical services for as long as possible.

Our pandemic preparedness plan was initiated only after sustained community spread was confirmed. This was because (a) surgical patients would inherently be of lower risk due to their presentation; high-risk patients would first be admitted to general

medicine for evaluation and transferred to us only after clearance; (b) we needed to maintain surgical care delivery to prevent a sizeable backlog of surgeries; (c) we were careful to conserve resources and prevent burnout as the situation is likely to be protracted.

In anticipation of a spike in COVID-19 cases, measures were adopted to decrease the elective clinical workload to mobilize manpower and marshal resources to augment our response. A preliminary two-month delay before the resumption of routine clinical work was assumed, with a view to extend this period as the outbreak unfolded. Therefore, with the exception of cancer and emergency cases, all major surgical and endoscopic procedures were postponed until after May 2020, with a view for further postponement as the situation unfolded. Non-urgent outpatient visits were similarly postponed. All meetings were shifted online via video-conferencing and overseas leave was suspended.

Designated pandemic wards managed confirmed or high-risk cases, providing natural segregation among nursing staff, who are ward-based. Within clean wards, further geographic segregation

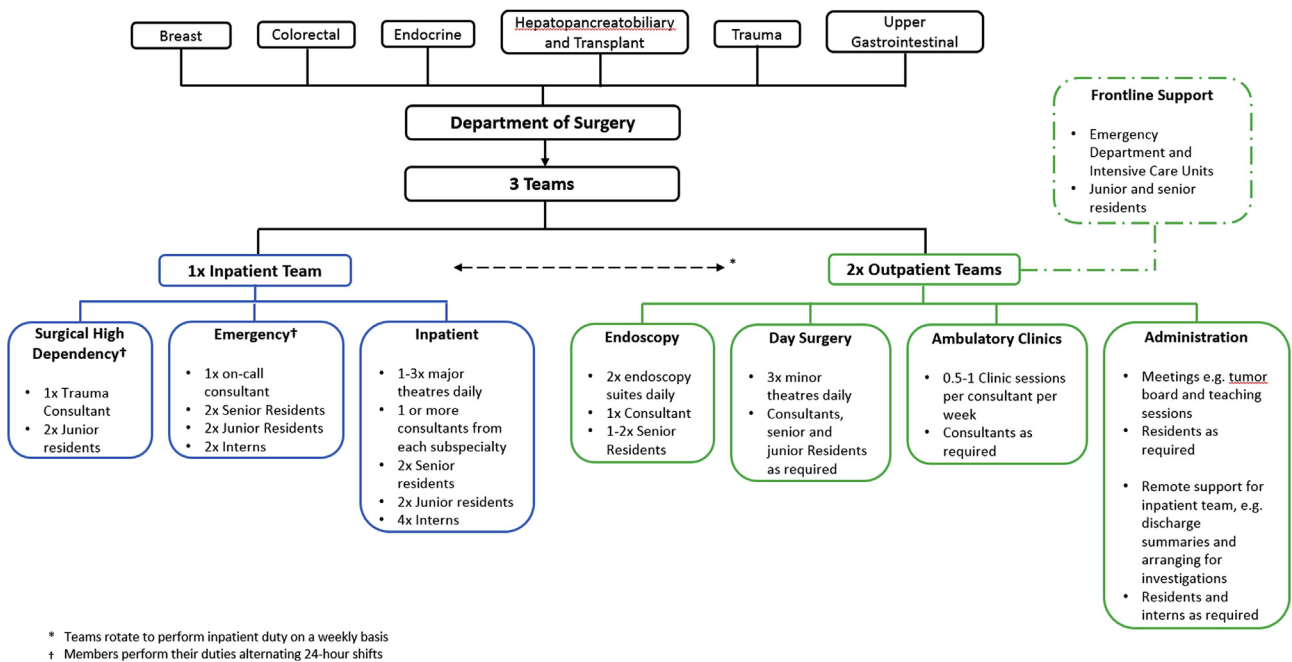


Fig. 1. Pandemic preparedness plan for the department of surgery.

Figure 2a. Number of Outpatient Visits

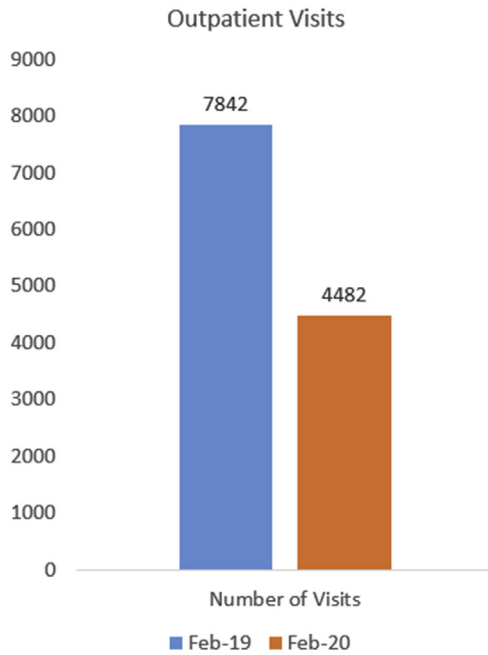


Figure 2b. Median Wait Times for Patients

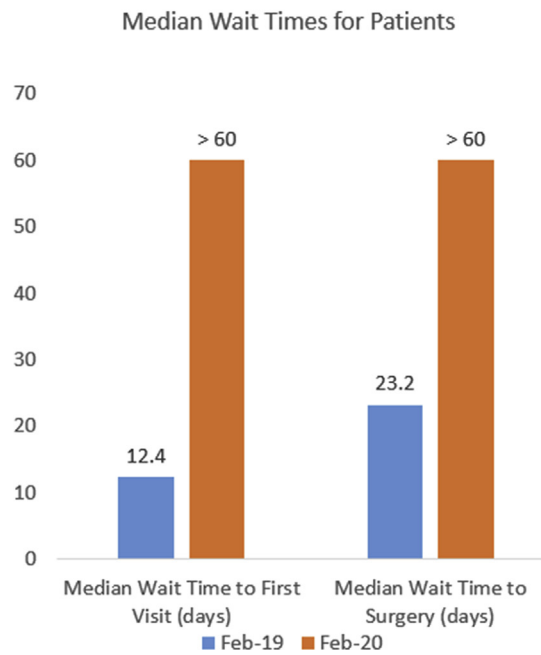


Figure 2c. Operating Room Utilization Rates

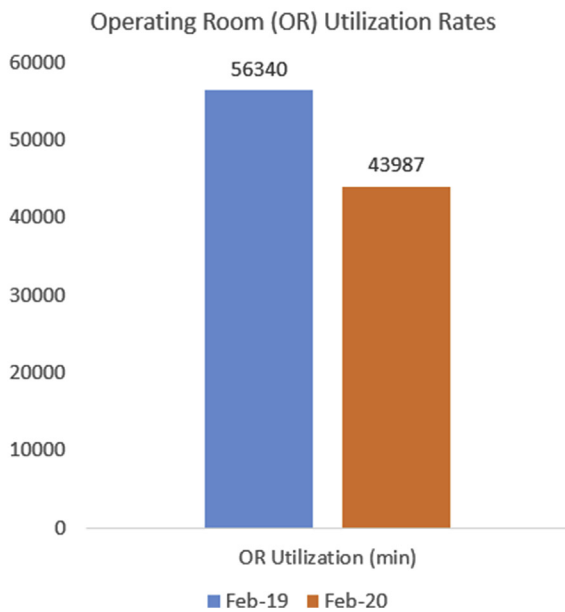


Figure 2d. Number of Incident Reports in our Department

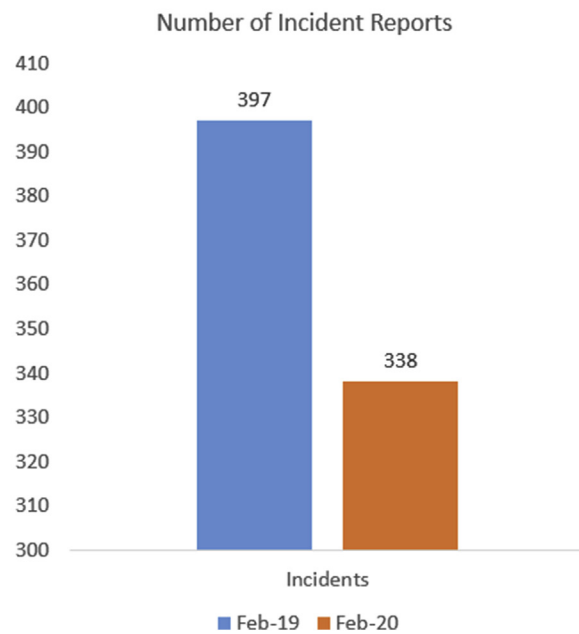


Fig. 2. Operational and safety data.

was implemented to guard against the possibility of an undiagnosed patient. Extra ‘floater’ nurses solely cared for the unconfirmed low-risk cases in these wards.

Central to our plan was the reorganization of medical staff in our department into three independent teams (Fig. 1) to prevent the

standing team from working continuously and avoid the complete shutdown of outpatient services should any team become afflicted with the virus. On a weekly rotational basis, teams took turns to perform inpatient duties while the other two teams performed outpatient tasks. To ensure safety, teams adhered to strict working

hours to ensure adequate rest to reduce error rates and prevent burnout. This was especially so for the emergency teams, who would be on 24-h shifts every other day. To ensure continuity of care, designated times for handover of patients were enforced and patients informed of the changeover of care teams between weeks.

Medical students in surgical rotations were barred from the wards. Instead, tutorials were conducted with simulated patients and models at the university. Didactic lectures were continued on web-based applications. For the final year medical student surgical exams, actual patients were replaced with simulated patients, and the number of examiners reduced. Examiners and candidates were also divided into groups which were geographically segregated.

To study the impact on patient care, operational and safety data in the month immediately post-activation of our pandemic preparedness plan were retrieved and compared with data from a similar period in 2019. Overall, we observed a sharp decline in elective surgical and outpatient workload during this period. As a result of efforts to decant and discharge patients, overall bed occupancy rate fell year-on-year from 91.5% to 78.5%. Outpatient visits fell by 43%, from 7842 in 2019 to 4482 visits in our study period (Fig. 2a). The median wait time to first consult for new cases rose from 12.4 days in 2019 to 60 days or more at present. Median wait time from listing to elective surgery rose from 23.2 days in 2019 to 60 days or more at present (Fig. 2b). Correspondingly, Operating Room (OR) utilization rates for this period dropped from 66% in 2019 to 52% (Fig. 2c).

In terms of safety, a decrease in year-on-year numbers of incident reports were observed during this period. There were 338 reported incidents for surgical patients from February to March 2020, compared to 397 for the same period in 2019 (Fig. 2d). Twenty of these incidents were related to COVID-19, of which 14 were due to improper handling of the swab specimen, four were due to issues with communication of revised hospital protocols, and two were related to clinical management of COVID-19 patients. Only one Serious Reportable Event (SRE) involving a medication error in a non-COVID-19 patient was reported, compared to zero SREs for the same period in 2019.

Looking ahead, outpatient services would be further scaled down in phases to redistribute manpower and resources to support essential services such as the Emergency Department (ED) and the Intensive Care Units (ICUs) as the outbreak continues to escalate. Plans for medical and nursing staff to be upskilled for critical care and for transformation of high-dependency units into ICUs to expand infrastructure are also in place.

Beyond that, we would need to keep in mind to gradually transition back to routine care as soon as feasible to ensure sustainability, especially once the curve is flattened and the national strategy segues towards the mitigation rather than containment phase. This is a fine balance as prolonged suspension of elective surgical care is likely result in additional patient morbidity and mortality from delayed diagnosis and treatment.

In conclusion, our initial experience with our model of team segregation suggests that it is feasible and safe. Institutions can consider adopting our model in their war against COVID-19, although modifications have to be made according to their local context.

## Declaration of competing interest

All authors are in agreement with the manuscript and declare no conflicts of interest. No sources of support were received for our study.

## References

1. Wong JEL, Leo YS, Tan CC. COVID-19 in Singapore—current experience: critical global issues that require attention and action. *J Am Med Assoc.* 2020 Feb 20. <https://doi.org/10.1001/jama.2020.2467> [Epub ahead of print].
2. Diaz A, Sarac BA, Schoenbrunner AR, Janis JE, Pawlik TM. Elective surgery in the time of COVID-19. *Am J Surg.* 2020 Apr 16. <https://doi.org/10.1016/j.amjsurg.2020.04.014> [Epub ahead of print].
3. Al-Balas M, Al-Balas HI, Al-Balas H. Surgery during the COVID-19 pandemic: a comprehensive overview and perioperative care. *Am J Surg.* 2020 Apr 18. <https://doi.org/10.1016/j.amjsurg.2020.04.018> [Epub ahead of print].

Tze-Yi Low

*Department of Surgery, National University Hospital, Singapore*

Mikael Hartman\*

*Department of Surgery, National University Hospital, Singapore*

*Yong Loo Lin School of Medicine, National University of Singapore, Singapore*

*Saw Swee Hock School of Public Health, National University of Singapore, Singapore*

Corissa Yi Juan Chee

*Department of Surgery, National University Hospital, Singapore*

*Yong Loo Lin School of Medicine, National University of Singapore, Singapore*

Bhuvaneshwari Mohankumar

*Department of Medical Affairs, National University Hospital, Singapore*

Sophia Bee Leng Ang

*Department of Anaesthesia, National University Hospital, Singapore*

Moe Thu San

*Yong Loo Lin School of Medicine, National University of Singapore, Singapore*

Asim Shabbir

*Department of Surgery, National University Hospital, Singapore*

*Department of Surgery, Alexandra Hospital, Singapore*

Krishnakumar Madhavan, Jimmy Bok Yan So

*Department of Surgery, National University Hospital, Singapore*

*Yong Loo Lin School of Medicine, National University of Singapore, Singapore*

\* Corresponding author. Saw Swee Hock School of Public Health, National University of Singapore, 5 Lower Kent Ridge Rd, 119074, Singapore.

E-mail address: [epfbamh@nus.edu.sg](mailto:epfbamh@nus.edu.sg) (M. Hartman).

8 May 2020