



Emergency department 'outbreak rostering' to meet challenges of COVID-19

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ABSTRACT

The COVID-19 outbreak has posed unique challenges to the emergency department rostering. Additional infection control, the possibility of quarantine of staff and minimising contact among staff have significant impact on the work of doctors in the emergency department. Infection of a single healthcare worker may require quarantine of close contacts at work. This may thus affect a potentially large number of staff. As such, we developed an Outbreak Response Roster. This Outbreak Response Roster had fixed teams of doctors working in rotation, each team that staff the emergency department in turn. Members within teams remained constant and were near equally balanced in terms of manpower and seniority of doctors. Each team worked fixed 12 hours shifts with as no overlapping of staff or staggering of shifts. Handovers between shifts were kept as brief as possible. All these were measures to limit interactions among healthcare workers. With the implementation of the roster, measures were also taken to bolster the psychological wellness of healthcare workers. With face-to-face contact limited, we also had to maintain clear, open channels for communication through technology and continue educating residents through innovative means.

BACKGROUND

Singapore was among the first countries outside mainland China to report cases of COVID-19. This novel outbreak posed challenges in disease detection and containment. We discuss the adaptations in roster planning made for doctors, to address the challenges of the COVID-19 outbreak. No patient or human subject information was used.

INTRODUCTION

Singapore General Hospital (SGH) is the largest tertiary teaching hospital in the country with 1785 beds. The Department

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of Emergency Medicine (DEM) sees approximately 130 000 visits annually, with about 350 visits per day in 2019.¹

The first case of COVID-19 in Singapore was detected at SGH on 23 January 2020.² At that time, precautions were enhanced at DEM. All staff on shift were required to wear personal protective equipment (PPE) according to guidelines by the Ministry of Health (MOH).

Elective operations were postponed and the adjacent Ambulatory Surgery Center was converted into a second isolation area for DEM. The isolation areas were staffed by dedicated doctors during shifts, minimising potential disease transmission. To ensure adequate manpower, leave was embargoed and doctors from other departments were seconded to DEM.

On 7 February 2020, MOH raised the outbreak alert to 'Disease Outbreak Response System Condition' (DORSCON) Orange.³ The DORSCON framework is used by the Singapore government to indicate the severity of a disease outbreak situation and subsequently guides prevention and response plans. A DORSCON level of orange is usually applied to a disease that is severe that has human-to-human transmissibility but is being contained. As a result of our previous experience managing the severe acute respiratory syndrome (SARS) outbreak in 2003, we transitioned to an Outbreak Response Roster, which was in contrast to the pre-outbreak overlapping shift system, where infection of one may lead to the quarantine of a disproportionate number of staff.

SETTING

The DEM is staffed by 25 specialist emergency physicians (EPs), who work an average of 180 clinical shift hours per 28 days, along with approximately 40 non-specialists who clock an average of 216 clinical shift in the same period. Daily interaction between ED staff can be significant in the form of team-based resuscitation and supervision of junior doctors by the senior doctors. While doctors do

PPE when attending to patients, they may not always do so when discussing patient management.

There are four main areas in DEM, which receive patients triaged according to the Patient Acuity Category Scale (PACS).⁴ Life-threatening emergencies are seen in the resuscitation room. Acutely ill and non-ambulatory cases are seen in the critical care area. Stable ambulatory patients are seen in a consultation room setting. Patients who require isolation are usually identified at triage and placed immediately in the isolation area. [Table 1](#) is a sample roster on a usual day.

INTERVENTION

Following the implementation of DORSCON orange, the placement of patients in the ED was altered to minimise contamination and spread. Patients who were assessed at triage to be at high risk of COVID-19 were placed according to their PACS in different areas within the ED isolation facility, which was expanded. The remainder of the patients were triaged according to their PACS to the usual corresponding areas in the ED.

The Outbreak Response Roster was initiated on 8 February 2020 with the following objectives.

Limiting contact amongst staff

Having teams with fixed members limited contact among staff. Should one become infected, only the person's team would be quarantined, limiting the impact to manpower. Separate teams were created with doctors divided according to seniority and experience. Each team was led by a senior consultant who had worked through the SARS period. Nurses in the department were also split into teams that worked the same 12 hours shifts as doctors. Coverage for DEM would be provided by a single team on 12 hours, alternating shifts ([table 2](#)).

Distribution of team members to the different areas of DEM during shift was left to the discretion of the senior doctors within that team. Manpower is usually distributed according to the load in each area during the shift. Typically, a dedicated team of approximately one senior doctor and two junior doctors cover the ED isolation facility. The number of doctors posted to each area in the ED is usually rather fluid and doctors help to cover busier areas when necessary. [Table 3](#) shows a sample outbreak roster coverage for a particular shift, however, exact coverage may differ based on individual teams and patient load on a given shift.

Table 1 Usual non-outbreak emergency department roster

	Morning shift (8:00–16:00 hours)	Evening shift (16:00–23:00 hours)	Night shift (23:00–8:00 hours)
Resuscitation (P1)	Senior doctor x1	Senior doctor x1	Senior doctor x1
Critical care area (P2)	Senior doctor x2	Senior doctor x2	Senior doctor x1
Ambulatory area (P3)	Senior doctor x1	Senior doctor x1	
Fever area (isolation)			
	Morning shift	Evening shift	Night shift (21:00–8:00 hours)
Resuscitation (P1)	Junior doctor x1 (10:00–20:00 hours)		NIL
Critical care area (P2)	Junior doctor x2 (8:00–17:00 hours)	Junior doctor x2 (13:00–22:00 hours)	Junior doctor x2
	Junior doctor x2 (10:00–19:00 hours)	Junior doctor x2 (16:00–1:00 hours)	
Ambulatory area (P3)	Junior doctor x3 (8:00–17:00 hours)	Junior doctor x3 (13:00–22:00 hours)	Junior doctor x2
	Junior doctor x3 (10:00–19:00 hours)	Junior doctor x3 (16:00–1:00 hours)	
Fever area (isolation)	Junior doctor x1 (from ambulatory area as needed)	Junior doctor x1 (from ambulatory area as needed)	Junior doctor x1 (from ambulatory area as needed)

Handover duration was reduced and doctors were encouraged to leave shortly after shift completion. All ED staff, regardless of which area they worked in, were encouraged to shower in the hospital and change out of their scrubs prior to leaving the hospital. Everyone was required to electronically submit their temperature twice daily. Any unwell staff member was to report to the hospital to be assessed, swabbed and quarantined as necessary, with contact tracing initiated on positive COVID-19 findings.

Maintaining buffer capacity

A single team under quarantine would result in increased shift frequency and less inter-shift rest for the remaining teams. During the SARS outbreak, a similar fixed-team outbreak roster was adopted by SGH DEM. Three initial teams were

created then, and when one healthcare worker fell ill despite wearing PPE, a 14-day quarantine was imposed on the team. The remaining two teams then had to work 12 hours alternating shifts. The situation would have been dire if another staff member from the remaining teams fell ill during that quarantine period.

Drawing from the SARS experience, sufficient buffer capacity was built into our current outbreak roster by having an increased number of teams. Staff were subsequently distributed into five teams, after balancing the need for buffer capacity against the number of staff per team required to meet anticipated workload. Each team had approximately six senior doctors and nine junior doctors. Manpower was supplemented by junior doctors seconded from other departments in the hospital, such as internal medicine,

anaesthesia, radiology and various other surgical specialties. These junior doctors were evenly split into the five teams, with approximately two in each team.

It is difficult to make a direct comparison as shift timings differ between the non-outbreak and outbreak roster and junior doctors work staggered shifts in the non-outbreak roster as compared with the fixed-shift outbreak roster. However, on the non-outbreak roster there may be up to 4 senior doctors and 16 junior doctors in the department at the peak during the middle of the day, which is more than that of the outbreak roster. During the night, the number of doctors on the outbreak roster exceed that of the non-outbreak roster. The creation of any more than five teams would severely affect team size and hence manpower in the daytime.

Preventing staff burn-out

The total working hours for doctors should ideally be similar or less than baseline, to prevent burnout during this high-stress period. The outbreak roster meant manpower was no longer in concert with daily patient arrival trends. Shifts during the day also tend to be busier due to the relatively fewer doctors in the daytime as compared with the non-outbreak roster. Additionally, infection-control precautions and the complex decision-making process for potential patients with COVID-19 led to increased time spent on seemingly regular symptoms.

Although longer than the usual 8 hours, 12 hours shifts allowed for enough rest days for teams in the scenario where none of the teams were quarantined. With all teams functioning, doctors now worked 138 hours per 28 day cycle. While there has fortunately been no need to quarantine any team thus far in the COVID-19 pandemic, in the scenario where three teams are concurrently quarantined, doctors would work 234 hours per 28 days. This is only slightly higher than the average clinical hours worked by non-specialists during the non-outbreak roster.

CHALLENGES

Fatigue and psychological wellness

Psychological health was shown to be of concern among Chinese medical staff battling the COVID-19 outbreak.⁵ Measures taken to combat fatigue and burnout included scheduled breaks on shift, alternating staff in busy areas of the ED, creation of rest areas, and provision a 24-hour peer support hot line. Preshift huddles helped ensure members were looked after and concerns addressed.

Table 2 Outbreak response roster shift rotation

	Team A	Team B	Team C	Team D	Team E
Day 1	Day	Off	Postnight	Night	Off
Day 2	Off	Day	Off	Postnight	Night
Day 3	Night	Off	Day	Off	Postnight
Day 4	Postnight	Night	Off	Day	Off
Day 5	Off	Postnight	Night	Off	Day
Day 6	Day	Off	Postnight	Night	Off
Day 7	Off	Day	Off	Postnight	Night
Day 8	Night	Off	Day	Off	Postnight
Day 9	Postnight	Night	Off	Day	Off
Day 10	Off	Postnight	Night	Off	Day

Day: 8:00-20:00 hours

Night: 20:00–8:00 hours the following day.

Postnight: rest day after ending shift at 8:00 hours.

N.B.: Distribution of team members to the different areas of the emergency department was left to the discretion of the senior doctors within the team.

Table 3 Sample outbreak roster by area

Area	Senior doctor coverage	Junior doctor coverage
Resuscitation (P1)	Senior doctor A (resuscitation in-charge)	Junior doctors x0–1
Critical care area (P2)	Senior doctor B	Junior doctors x2–3
	Senior doctor C (critical care in-charge)	
Ambulatory area (P3)	Senior doctor D	Junior doctors x3–5
	Senior doctor E (ambulatory in-charge)	
Fever area (isolation)	Senior doctor F (isolation in-charge)	Junior doctors x2

N.B.: Actual doctor coverage is fluid and may differ between shifts. It is highly dependent on individual teams and patient load.

activities, these took place on their days off.

Impact on ED throughput

Total ED attendances during the COVID-19 outbreak saw a 23% decrease—with an average of 273 attendances per day in February 2020 compared with an average of 353 attendances per day during the same month last year in 2019. Waiting times, however, generally increased by 8.6 mins (95% CI 6.6 to 10.6 mins) across the different triage categories from an average of 47.0 mins in February 2019 to 55.6 mins in February 2020 (figure 1). This increase may have been due to the need for donning and doffing PPE in between seeing patients, leading to some decrease in efficiency. In addition, fixed teams led to decreased ability meeting surges in ED attendance. However, it is worth noting that the increase was only slight in the 50th percentile. Median waiting times in February 2020 were 32 mins for the non-isolation areas and 33 mins for the isolation areas, which were comparable.

CONCLUSION

The COVID-19 outbreak posed unique challenges to rostering and manpower management. We adopted a fixed team-based strategy, accounting for the various concerns of limiting transmission, maintaining service standards and preventing

To evaluate physician views on the outbreak roster, a poll was conducted for all senior and junior doctors in the seventh week. 78.2% of the physicians in the department participated in the poll, of which, 87% of respondents voted to continue with the 12 hours shifts. Reasons cited for this included fewer handovers leading to better patient safety, less interaction between teams for better staff protection and minimising wastage of PPE. Overall, most physicians polled also felt that they had enough rest time. Older physicians appreciated the increased number of teams, as compared with during the SARS outbreak, allowing for more rest time in between shifts. Many cited adequate sleep and exercise outside of shift hours as a priority in tackling the physical and mental demands of the 12 hours shift rotation. Thus far, none

of the doctors have resigned during this pandemic.

Inter-team communication

The separation of teams decreased face-to-face meetings. This led to the use of secure messaging platforms for information dissemination and discussions. Instructions and news from hospital management were communicated by email.

Continued education

Formal educational meetings were cancelled. Educational activities took the form of online learning and clinical teaching which was limited to members within each team. Within teams, EPs who were academic faculty would hold small group teaching sessions of 15–20 min. As faculty had to continue with academic

ED Waiting Times (mins) in February of 2019 and 2020

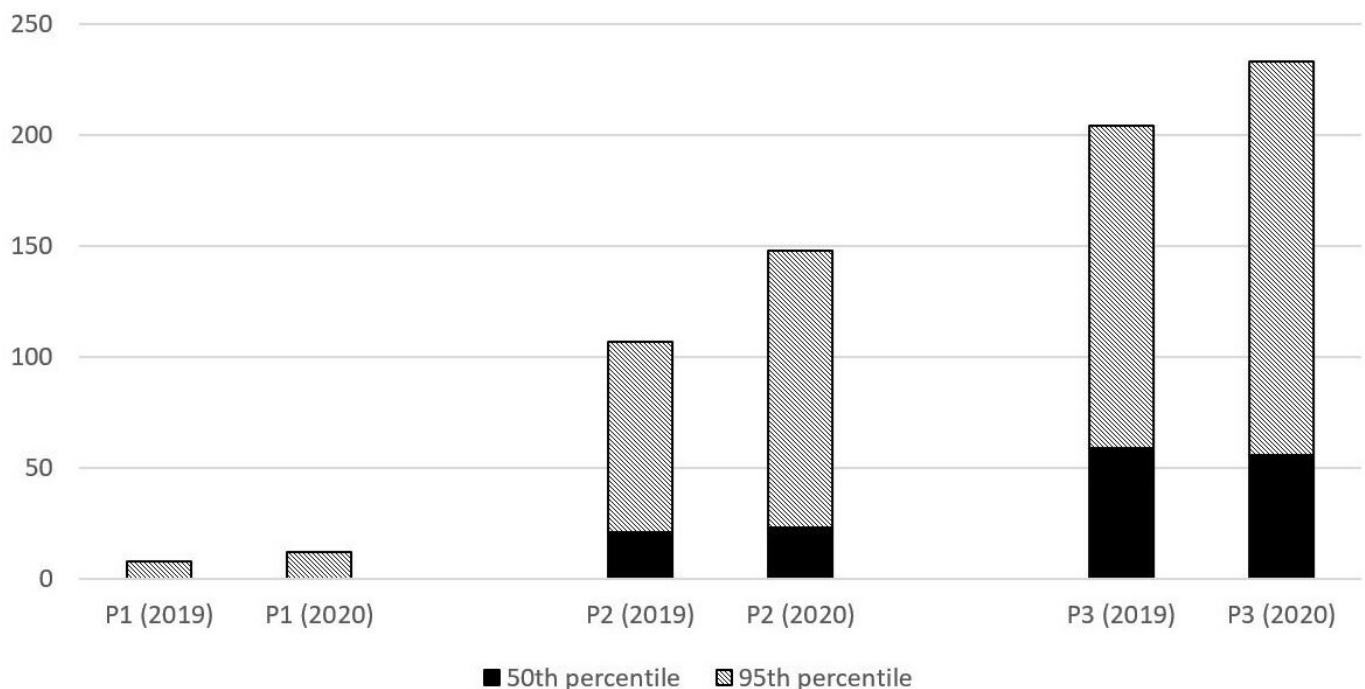


Figure 1 Emergency department waiting times between February 2019 and February 2020. ED, emergency department.

burn-out. It would also be useful to study the effectiveness of our strategy after the COVID-19 outbreak, as it would serve as a reference for future pandemics.

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