

Is There a Delay in Emergency Surgical Procedures in a Designated COVID-19 Hospital? -The Hospital Sungai Buloh (Malaysia) Experience

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ABSTRACT


Introduction: The global pandemic Corona Virus Disease 2019 (COVID-19) caused by Severe acute respiratory syndrome coronavirus 2 (SARS, CoV-2) is highly contagious and has driven many hospitals including Hospital Sungai Buloh (HSB) in Malaysia to become a designated hospital exclusively for COVID-19 patients only. These patients may develop complications requiring surgical consultation and intervention which have led to concerns regarding delay in the surgical management of these patients. Currently, there is a paucity of published data worldwide with regards to whether there is a delay in the time taken to perform the intended emergency procedure that has been planned by the attending surgical team.

Method: This single-centered, retrospective study aims to investigate whether there is any delay in performing emergency surgical procedures during the COVID-19 pandemic in HSB from 1/3/2020 to 30/3/2021. All the cases were categorized based on recommended priority into acute emergency, emergency, and urgent.

Results: There were a total of 105 patients; 5(4.8%) acute emergency cases, 22(21.0%) emergency cases, and 78 (74% cases) required an urgent intervention of which the majority had an endoscopic procedure performed i.e., 85.9% (67 cases) compared to surgery, 14.1% (11 cases). Patients in the emergency procedure category took the longest time to intervene whereby the median time taken was 548 minutes. 50% of patients in this category were delayed. Patients in the acute emergency category had delays seen in all 5 patients, with a median of 239 minutes. On the other hand, patients in the urgent category had only 10.3% of the patients who were delayed.

Conclusion: From the total of 105 patients requiring emergency surgical intervention over 12 months period during the COVID-19 pandemic, the delay was seen in 24 patients (23% of cases). Multiple factors contributing to the delay have been postulated, pertaining to the implementation of the new standard operating procedure (SOP) in managing COVID-19 patients in general, which needs to be verified with further study and addressed accordingly.

KEYWORDS: Corona Virus Disease 2019, COVID-19 Pandemic, Emergency surgical intervention, Managing COVID-19 patients.

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INTRODUCTION

The Corona Virus Disease 2019 (COVID-19) was first reported in Wuhan, China in December 2019 and has currently become a pandemic. Severe acute respiratory syndrome coronavirus 2 (SARS, CoV-2), a novel member of *Coronaviridae*, has been identified as the cause of this contagious disease [1].

Hospital Sungai Buloh (HSB), Malaysia admitted its first COVID-19 patient in January 2020 and gradually received increased admissions of more patients with this disease until eventually, HSB became a designated hospital exclusively for COVID-19 patients in March 2020 [2].

COVID-19 patients may develop complications requiring the involvement of other specialties. For those requiring surgical consult and intervention, they are referred to the in-house surgeons. The General Surgical team received its first referral in February 2020. The numbers of referrals subsequently increased with proportion to the number of admissions of COVID-19 infected patients into HSB [3]. During this period, the surgical team only provides services catering for acute surgical emergencies, with interventions consisting of emergency general surgical operations and endoscopy procedures. Elective cases have been diverted to the neighboring hospitals within the state.

Concerns regarding the delay in surgical management have been raised in other countries enduring the same pandemic. An international study conducted by the World Society of Emergency Services reported an 87.8% decrease in the total number of patients undergoing emergency surgery and an average of 25% estimated a delay of more than 2 hours in the time-to-diagnosis and another 2 hours in the time-to-intervention [4].

On the other hand, an observational study in Portugal, Rome from March to May 2020 show no statistically significant difference in delay of urgent or emergency cases when compared to the same period the year prior [5]. Currently, there is a paucity of published data worldwide with regards to whether there is a delay in

the time taken to perform the intended emergency procedure that has been planned by the attending surgical team.

The Malaysian Ministry of Health had published 'Guideline for Management of Surgery During COVID-19 Pandemic' within which recommendations were given for the prioritization of cases for emergency and elective surgical procedures according to categories which are acute emergency, emergency, and urgent (Figure 1). These categories are useful for surgeons and anesthetists in planning and prioritizing cases based on the degree of emergency and urgency as delay may lead to an increase in perioperative morbidity and mortality. The preoperative preparation of the surgical COVID-19 patient is more complicated in many aspects, with additional measures and new standard operating procedures (SOP) to adhere to, aiming to mainly prevent the spread of infection to healthcare workers amongst others. These precautionary steps affect all aspects of patient care from the emergency department or ward, transfer to OT, OT facilities, and the procedure itself. This can potentially cause delay to the procedure and may affect the outcome of surgery and patients' recovery. Furthermore, the delay will have an even more significant impact on the recovery of the critically ill, stage 4 and 5 COVID19 patients (Figure 2) who already has at least one organ failure, to begin with.

TERMINOLOGY

EMERGENCY SURGERY	
Acute Emergency	Patient condition, which requires immediate operation, i.e. life-threatening situation, failing which life/limb will be lost. Surgery may proceed without baseline investigation/patient being fasted.
Emergency	Patient condition which haemodynamically stable that requires operative procedure to be carried out, otherwise life is threatened or morbidity is increased.
Urgent	Patient condition, which requires operative procedure within 24-hours otherwise there is increased in morbidity.
Semi-urgent	Patient condition, which requires operative procedure within one week otherwise there is increased in morbidity.

* For prioritisation of cases according to discipline please refer **Guidelines Perioperative Mortality Review (POMR): Prioritisation of Cases for Emergency and Elective Surgery (2nd Revision) 2018**

Fig. 1: Prioritisation of Cases for Emergency and Elective Surgery (2nd Revision) 2018. Ministry of Health Malaysia Guideline for Management of Surgery During COVID-19 Pandemic (Version 2/2020).

Clinical stage	
1	Asymptomatic
2	Symptomatic, No Pneumonia
3	Symptomatic, Pneumonia
4	Symptomatic, Pneumonia, Requiring supplemental oxygen
5	Critically ill with multi-organ involvement

Fig. 2: Clinical Staging of Syndrome Associated with COVID-19. Clinical Management Of Confirmed COVID-19 Case In Adult And Paediatric Guidelines For Ministry Of Health Malaysia 2021 (Annex 2e) d

Objectives: This study aims to investigate whether there is any delay in performing emergency surgical procedures during the COVID-19 pandemic in a designated COVID-19 hospital by comparing the time taken from diagnosis to intervention with the standard recommendations by the Ministry Of Health according to the relevant category for each case. The secondary objective is to ascertain whether there is any association between any delay with the severity of COVID -19 infection.

METHODOLOGY

This is a single-center, retrospective study carried out in Hospital Sungai Buloh, which is a dedicated fully COVID-19 hospital in Malaysia. This study was registered to the National Malaysia Research Registry reviewed and approved by the Medical Research and Ethics Committee (NMRR-21-1268-60421). It included all confirmed COVID-19 patients and Patient Under Investigation (PUI) patients referred to the general surgical team and had undergone an emergency operation and/or endoscopy procedure i.e., oesophago-duodenoscopy (OGDS) and/or colonoscopy from 1/3/2020 to 30/3/2021 i.e., over a 13 months period. COVID-19 patients were those who had Antigen Rapid Test Kit (RTK-Ag) and/or polymerase chain reaction (PCR) COVID-19 test positive. PUI patients have also been included in this study in view of the same precautionary and preparatory measures that have to be taken in managing these patients. Data were collected from the patients' case notes available on the virtual eHIS Live patient data system. Exclusion criteria are patients who had a delay in giving consent for the intended procedure and patients where the delay was clearly due to other factors such as requiring preoperative optimization of general condition.

All the cases were categorized into acute emergency, emergency, and urgent as per Table 1. For acute emergencies, even though the exact time frame was not mentioned in the guideline, for the purpose of this study a cut-off time of 1 hr was thought to be reasonable for patients requiring immediate intervention. Also for this study, endoscopy procedures were categorized under urgent procedures (within 24 hours), following Malaysian Ministry of Health, Clinical Practice Guidelines for management of non-variceal upper gastrointestinal bleeding (UGIB), as the majority were indicated for UGIB. Time taken from diagnosis to time operation/procedure started for each case was calculated and compared to the time frame recommended for each category, and any delay identified. The variables were presented as mean with the standard deviation and also the frequencies in numbers and percentages. Fisher's exact test was used to calculate if there was any significant association between the delay and the severity of COVID19 infection. All Statistical analyses were performed using the SPSS (version 26.0) software.

RESULTS

There was a total of 105 patients who met the criteria and were analyzed accordingly. Of these, 81 were male patients and 24 females, aged between 20 to 83 years old. 74% (78 cases) of all patients required an urgent intervention (within 24 hours), of which the majority had an endoscopic procedure performed i.e., 85.9% (67 cases) compared to surgery, 14.1% (11 cases). There were patients from all COVID-19 clinical stages for each category, with the majority of patients at COVID-19 stage 5 type of illness. (Table 1) Patients in the emergency procedure (within 8 hours) category took the longest time

Table 1: Baseline Characteristics of Surgical Patients with COVID 19/ PUI.

	Acute Emergency n (%)	Emergency n (%)	Urgent n (%)
Number of patients	5 (4.8)	22 (21.0)	78 (74.3)
Mean age, years n (SD)	61.0 (16.8)	43.9 (16.9)	58.4 (14.9)
Sex n (%)			
Male	4 (80)	20 (90.9)	57 (73.1)
Female	1 (20)	2 (9.1)	21 (26.9)
COVID 19 category; n (%)			
1	0	1(4.5)	1(1.3)
2	1(20)	0	1(1.3)
3	1(20)	1(4.5)	11(14.1)
4	0	8(36.4)	9(11.5)
5	1(20)	5(22.7)	37(47.4)
PUI	2(40)	7(31.8)	19(24.4)
Procedure n (%)	0	0	67(85.9)
Endoscopy Surgery	5(100)	22(100)	11(14.1)

Table 2: Time Taken for Interventions and Delay.

	Acute Emergency n (%)	Emergency, < 8 hours n (%)	Urgent, < 24 hours n (%)
Number of patients	5(4.8)	22(21.0)	78(74.3)
Time taken (minutes) median(range)	239 (156-813)	548 (101-1676)	300 (38-10161)
Delay n (%)	5(100)	11(50)	8(10.3)

*Duration is presented in minutes for easy calculation

Table 3: Cases with Delay According to COVID-19 Severity.

COVID severity	Stage 1 delay (%)	n	Stage 2 delay (%)	n	Stage 3 delay (%)	n	Stage 4 n delay (%)	Stage 5 n delay (%)	PUI delay (%)	n	p value*
Acute emergency	0	1(100)	1(100)	1(100)	0	1(100)	2(100)	2(100)	2(100)	2	N/A**
Emergency	1(100)	0	0	0	6(75.0)	2(40)	2(28.6)	2(28.6)	2(28.6)	2	0.24
Urgent	0	0	0	1 (9.1)	2 (22.2)	1 (2.7)	4 (21.1)	4 (21.1)	4 (21.1)	4	0.13

* p value calculated using fisher's exact test, value <0.05 is considered as significant

** Not applicable since all patients were delayed

*** Time is reported in minutes for easy calculation

whereby the median time taken was 548 minutes (about 9 hours) which amounts to just an hour more than the recommended time duration. There were 22 patients in this group and 50% of them were delayed based on the recommended time frame. Patients in the acute emergency category had delays seen in all 5 patients, giving a median of 239 minutes (about 4 hours). On the other hand, patients in the urgent category fared relatively well as only 10.3% of the patients were delayed. (Table 2)

All three category patients who had delays were then analyzed based on the severity of COVID-19 illness to ascertain any association between delay and the severity of COVID -19 infection. It was noted that the maximum delay was seen in the Acute emergency group and in the COVID category 4, emergency group patients. However, on the whole, there was no statistically significant delay seen across the analysed groups. (Table 3).

DISCUSSION

To date, there has not been any similar study in literature research to compare this study with which reflects its significance. COVID-19 patients, like any other medical condition, may also have the underlying surgical condition (s) or develop complications that require surgical intervention for example operation or endoscopic procedure. It has already been proven that delay in surgical intervention may affect patients' recovery and increase morbidity and mortality [6], especially in an emergency setting, hence guidelines have been published recommending the appropriate timings for operations based on its urgency. During this unprecedented time of the COVID-19 pandemic, the management of patients has evolved so much with the implementation of the new SOP with the aim to curb the spread of infection.

This study has demonstrated that in HSB, from the total of 105 patients requiring emergency surgical intervention over 13 months period during the COVID-19 pandemic, the delay was seen in 24 patients (23% of cases). Of these 24 patients, most of the delay occurred in patients in the emergency group in which surgery is recommended to be performed within 8 hours of diagnosis. Additionally, all patients (5 cases) who required immediate life/limb saving operations i.e., from the acute surgical emergency group were delayed more than 1 hour. From the experience, multiple factors have been identified from receiving the referral up to the commencement of the procedure, which may have contributed to these delays.

The use of personal protective equipment (PPE) is a mandatory requirement for personnel in attending any suspected or confirmed COVID-19 case. Therefore, all doctors, nurses, and auxiliary staff in the ward, during transfer, and in the OT will have to go through this procedure of donning and doffing every time attending to the patient. A similar protocol is also followed by radiology staff when imaging e.g., CT scan is required for the patient. In addition, the operating team, including surgeons, anesthetists, and nurses will be donning the powered air-puri-

-fying respirator (PAPR) before the patient is pushed into the designated OT. These extra steps may contribute to delay in preparing the patient for OT.

When preparing the patient for any emergency surgical procedure, be it operation or endoscopy, a group and crossmatch will be compulsory before proceeding. Blood as per diagnostic or routine investigations drawn from these patients has to be handled according to COVID-19 protocol. This includes donning PPE by the laboratory personnel, as well as other precautionary steps for example running samples in batches to reduce staff exposure to biohazardous blood.

Obtaining consent and counseling for the intended procedure for those patients who could not give it themselves was time-consuming. The next of kin will have to be contacted and counseled via telephonic or teleconferencing means as they were not allowed to be within the ward/ICU premises during the pandemic. Communication via this means is less effective, thus occasionally will require more explanation and hence, time.

Upon confirmation for surgery, there is of course the unavoidable queue to get a turn in the operating theater (OT). During the pandemic, this has been made worse as there were only one compared to the usual 3 OTs running at a time due to limited staff and negative pressure rooms. Transferring the patients from the ward or ICU to these places will need a team and in addition to wearing PPE, patients only go through specified routes, lifts, etc. to the intended places. During the initial periods, the patients were intubated in designated negative pressure rooms in CCU, then only transferred to the operating theater to prevent exposure of the aerosol generated. These rooms are also used to intubate COVID-19 patients who have deteriorated and require mechanical ventilation, and endoscopy procedures. The latter will take priority over the more stable patients who are waiting for intubation for emergency surgery. This issue was rectified later as some of the OT theater was converted to negative pressure so the patients were intubated in the OT and this helped to minimize the time taken. Similar

issues affected the turnover of the next case to utilize the OT as the OT and equipment including the powered air-purifying respirator (PAPR) used needed terminal cleaning before the next procedure.

As well as these internal factors, the handling of surgical COVID-19 patients is even more complicated interhospital. The surgical department started receiving COVID 19 in- patients needing surgical intervention from all over the state including COVID-19 quarantine centers. Despite delays that were encountered prior to patients' arrival, this time taken from the initiation of referral from the other hospital or center was not taken into account as there was no proper documentation of it so we only used the in-house documented data. A transfer system was put in place for the state, whereby the referring doctor has to refer the case intended to the HSB Surgeon, Infectious Disease specialist and if needed the anesthetist for patients requiring ICU care and also other related departments pertinent to the case. If all parties agree to the transfer, then the patient's particulars will be given to the Bed Management Unit and a transfer will be made according to the bed/ICU care and ambulance availability. The factors affecting the pretransfer timeline experienced were needing to speak to multiple parties to arrange the transfer, availability of a bed in HSB, staff to accompany the patient during the transfer, and ambulance services. The delay in receiving the patients to the HSB side was mainly the bed availability as the admissions surpassed the discharges [7] and some technical issues related to the discharge as well such as waiting for the medications from the pharmacy and waiting for the family members to bring the patients back. We recommend in future that study should be done including from the time taken from the initiation of referral from the index hospital or health facility the where the patient presented himself to in order to address some of these issues and thus improve the service.

CONCLUSION

This study has demonstrated that in HSB, from the total of 105 patients requiring emergency

surgical intervention over 13 months period during the COVID-19 pandemic, the delay was seen in 24 patients (23% of cases). Multiple factors have been identified that may have contributed to the delay and pertain to the new SOP in the workflow of the healthcare facilities in dealing with COVID-19 patients. We hope to address these factors accordingly and improve our services in the future as it is of utmost priority to maintain a good standard of treatment in surgical patients and hence reduce morbidity and mortality.

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