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Short Communication

Critical adjustments and trauma surgery trends in adaptation to COVID-19 pandemic in Malaysia

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ABSTRACT

Malaysia has one of the highest total numbers of COVID-19 infections amongst the Southeast Asian nations, which led to the enforcements of the Malaysian "Movement Control Order" to prohibit disease transmission. The overwhelming increasing amount of infections has led to a major strain on major healthcare services. This leads to shortages in hospital beds, ventilators and critical personnel protective equipment. This article focuses on the critical adaptations from a general surgery department in Malaysia which is part of a Malaysian tertiary hospital that treats COVID-19 cases. The core highlights of these strategies enforced during this pandemic are: (1) surgery ward and clinic decongestions; (2) deferment of elective surgeries; (3) restructuring of medical personnel work force; (4) utilization of online applications for tele-communication; (5) operating room (OR) adjustments and patient screening; and (6) continuing medical education and updating practices in context to COVID-19. These adaptations were important for the continuation of emergency surgery services, preventing transmission of COVID-19 amongst healthcare workers and optimization of medical personnel work force in times of a global pandemic. In addition, an early analysis on the impact of COVID-19 pandemic and lockdown measures in Malaysia towards the reduction in total number of elective/emergent/trauma surgeries performed is described in this article.

Introduction

From the first ever recorded case on 25th January 2020, the number of COVID-19 cases in Malaysia has risen exponentially. This led to more than 7185 perpetuating infections, ranking Malaysia as one of the highest numbers of positive cases within the Southeast Asian nations.[1] These high number of infected patients has led to a significant strain on major healthcare systems in Malaysia. With the "Movement Control Order" (MCO) being implemented in Malaysia beginning 18th March 2020, major changes and adaptations were required for all major medical disciplines to overcome hospital bed occupancy shortages, continuing emergency medical or surgical services and strict control measures to prevent disease transmission amongst healthcare workers.

The general surgery department of Hospital Sultanah Aminah, Malaysia is an umbrella for multiple sub-speciality surgical units (trauma surgery unit,[2] colorectal surgery unit,[3] upper gastrointestinal surgery unit,[4] hepatobiliary surgery unit and paediatric surgery unit[5]). The substantial amount and variety of cases managed by the general surgery department is reflected by the trauma surgery unit which provides treatment for no less than 1000 patients per year.[6,7] With the expectation of increasing bed occupancy for COVID-19 patients and to protect medical personnel from transmission of disease, major adjustments were required. These adjustments is categorized into the sub headings: (1) surgery ward and clinic decongestions; (2) deferment of elective surgeries; (3) restructuring of medical personnel work force; (4) utilization of online applications for tele-communication; (5) operating room (OR) adjustments and patient screening; and (6) continuing medical education and updating practices in context to COVID-19.

With these measures implemented, there is an anticipated decrease of surgeries performed during this period. This is due to

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the lockdown measures which only allow citizens to continue duties in essential departments and stay home preventive strategies which led to a reduction in road traffic accidents and industrial related trauma. A descriptive analysis of the general surgery operative records to estimate the impact of COVID-19 pandemic and lockdown measures towards the number of elective/emergent/trauma surgeries were performed 4 weeks before and 4 weeks after the implementation the MCO.

Ward and clinic patient decongestion, elective surgery deferment

An integral strategy to reduce transmission of COVID-19 which is via air-borne droplets, decongestion of the closely bedded surgery ward and clinics were required.[8] Steps taken to decongest the wards is by withholding all elective surgeries.[9] This reduces the daily ward admissions for elective surgeries and its post-operative care significantly. Priority is given to patients who require emergent surgery for life-threatening conditions and cancer cases. An additional strategy to minimize transmission is by dividing the daily clinical rounds according to ward cubicles. Doctors and nurses assigned to the designated cubicles is advised against attending to patient in other cubicles unless under life threatening conditions. The daily surgery clinic (which averages from 120 to 160 patients per day) is reduced to a minimum and screening of cases is performed daily to ensure quality and timely delivery of treatment prior deferral of clinic appointment.

During the clinic visit, a supplementary measure implemented is to record the contact details of patients, attending nurses and medical officers. This is to facilitate accurate contact tracing in case of a positive COVID-19 exposure. To further minimize the risk of disease transmission, all patients were required to declare any history of traveling to high risk nations of COVID-19, contact with COVID-19 patients or with symptoms within the last 14 days. Failure to declare these pertinent histories will lead to legal action being taken as it poses a risk not only to the medical personnel but to the public which is being exposed concomitantly.

Restructuring of medical personnel work force

Medical personnel which includes consultant surgeons, general surgeons, surgical registrars, medical officers and house officers is segregated into 2 teams to prevent a total collapse of workforce in the event of co-infection or exposure to a positive COVID-19 patient. In Malaysia, healthcare workers with history of positive contact or is suspected to have COVID-19 is required to take a 14 days home quarantine or to be admitted if the nasal swab tests positive. By separating the work force into 2 teams with alternate working days for each team, minimizes contact between the entire department.

Added strategies implemented is to minimize movement between work stations. Medical personnel being stationed in the surgery ward, operating theatres, endoscopy suite and clinics will remain at their work post and is advised against moving to other work stations. This approach minimizes the number of quarantined personnels and makes contact tracing procedures easier in an event of positive COVID-19 exposure.

Operating room adaptation and patient screening

OR adaptation is important and tedious to implement. One of the major features of COVID-19 OR is a separate, standalone location which does not mixed with other operating facilities. Basic negative pressure environment (which allows inflow of air into the OR and outflow of air via specialized outlet with protective filter) is a mandatory requirement to reduce dissemination of the virus. The OR must be equipped with its individual ventilation system and an integrated high-efficiency particulate air (HEPA) filter with at least 25 air changes per hour. Restriction of movement and minimizing personnel during surgery is required at all times.

Situation which requires emergency surgery for patients with COVID-19, maximum personnel protective equipment (PPE) is mandatory which consist of the options powered air-purifying respirator, N95 respirators and a sterile gown.[10] All trauma patients with suspicious history of COVID-19 requiring surgery is handled as patient under investigation and surgery is performed with precautionary measures as per positive COVID-19 until a confirmatory nuclei acid nasal swab test is taken post-operatively.

The surrounding OR equipment (anaesthetic monitors, laptop computers and ultrasound machine) will be covered with plastic wrap to decrease the risk of contamination. Intraoperatively, laparoscopic surgery is avoided due to the risk of aerosolizing particles during insufflation of gas.[11] Single use drapes and equipment is advocated. Postoperatively, the patient should be extubated and reviewed in the OR. Following extubation, prompt transfer directly to a designated COVID-19 surgery ward using a special designated route and lift is paramount. All the involved staffs were required to shower and change into a clean set of scrubs for the subsequent case.

During the preliminary 2 weeks of the lockdown in Malaysia, the criteria for screening with nucleic acid nasal swab test was performed only in patients with symptoms and with the risk of COVID-19 contact. For patients that required emergent surgery but nasal swab test was not performed due to the nature of exsanguinating traumatic injuries, the active operating team wore full PPE as aforementioned and surgery was performed in a standalone OR with its individual ventilating system. However, as the COVID-19 test kits became more readily available and enhanced guidelines were implemented in the subsequent 2 weeks of MCO, all patients (elective and emergent) receiving surgery had mandatory nucleic acid nasal swab test preoperatively. In addition to the mandatory nucleic acid test, all patients which had suspicious chest radiograph continued on with contrast enhanced computed tomography of the thorax prior surgery (elective or emergent surgeries).[12]

Utilization of online communication and continuing medical education

The antecedent implementations have led to a disruption in continuous medical education via the traditional case base discussions and tutorials.[13] This limitation is overcome by using online applications installed on mobile devices. WhatsApp messenger, Zoom and Microsoft Teams webinar became more apparent in daily telecommunications and patient case discussions within the general surgery department.[8] From dissemination of departmental information to continuous medical learning, the application of WhatsApp, Zoom and Microsoft Teams has demonstrated individual reliability and importance during this period. This sustains a continuous two-way communication and allows the department to run steadily despite the restrictive implementations.

Early outcome analysis of critical adjustments

Early analysis 4 weeks before and 4 weeks after the implementation of MCO in Malaysia on 18 March 2020 showed a 55% reduction in total surgeries (4 weeks prior MCO: 348 surgeries and 4 weeks after MCO: 156 surgeries) as illustrated in Table 1. Elective operations were reduced by over 80% with only 37 surgeries performed in comparison to 187 elective surgeries which was performed 4 weeks prior to the implementation of MCO. During the

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Table 1
Effect of breakdown on surgeries performed before and after COVID-19 pandemic in Malaysia, *n* (%).

Variables	4 weeks before MCO	4 weeks after MCO
Surgeries	348 (100)	156 (100)
Elective	187 (55.7)	32 (20.5)
Emergent	161 (46.3)	124 (79.5)
Trauma	17 (10.6)	6 (4.8)
Non-trauma	144 (89.4)	118 (95.2)

MCO: Movement Control Order; Before MCO: Feb 19, 2020–Mar 17, 2020; After MCO: 18 Mar, 2020–Apr 14, 2020.

Table 2
Minor and major surgical procedures on trauma patients before and after MCO, *n* (%).

Surgical treatment	4 weeks before MCO ($n = 17$)	4 weeks after MCO ($n = 6$)
Minor procedure		
Tracheostomy	0 (0)	1 (16.7)
Laceration wound and debridement	6 (35.3)	2 (33.3)
Major procedure		
Crash laparotomy	4 (23.5)	2 (33.3)
Bowel/Mesenteric repair	0 (0)	1 (16.7)
Liver laceration haemostatic procedure - packing	2 (11.8)	1 (16.7)
Liver resection	1 (5.9)	0 (0)
Splenectomy	2 (11.8)	0 (0)
Nephrectomy	1 (5.9)	0 (0)
Relaparotomy -liver pack removal/washout/closure	4 (23.5)	1 (16.7)
Brachial artery repair	1 (5.9)	0 (0)
Diagnostic angiogram	1 (5.9)	0 (0)

MCO: Movement Control Order; Before MCO: Feb 19, 2020–Mar 17, 2020; After MCO: 18 Mar, 2020–Apr 14, 2020.

Table 3
Injured organs of all trauma surgeries performed before and after COVID-19 pandemic in Malaysia, *n* (%).

Variables	4 weeks before MCO ($n = 17$)	4 weeks after MCO ($n = 6$)
Number of involved organs		
Single	12 (70.6)	6 (100)
Multiple	5 (29.4)	0 (0)
Detailed involved organs		
Tracheobronchial	0 (0)	1 (16.7)
Vascular	2 (11.8)	0 (0)
GIT and mesentery	2 (11.8)	1 (16.7)
Liver	5 (29.4)	1 (16.7)
Spleen	3 (17.7)	0 (0)
Genitourinary tract	2 (11.8)	1 (16.7)
Rectal	1 (5.9)	1 (16.7)
Pelvis	1 (5.9)	0 (0)
Soft tissue	7 (41.2)	2 (33.3)

MCO: Movement Control Order; Before MCO: Feb 19, 2020–Mar 17, 2020; After MCO: 18 Mar, 2020–Apr 14, 2020.

initial 2 weeks, there were no elective surgeries performed with gradual recommencement and priority given to cancer patients. Emergent surgeries remained as the majority (124 surgeries) of operations performed after the enforcement of MCO. Throughout the MCO, there were no patients with COVID-19 that required surgery in our institution. These critical adjustments were effective as till date, there were no reports of COVID-19 transmission within medical personnel or patients treated within the general surgery department. There were no recorded COVID-19 infection to any post-elective or emergent surgery patients which was treated and warded within the general surgery department.

Early sub-analysis and impact of COVID-19 pandemic on trauma surgeries

From the early analysis of surgery electronic database, there were a 23% reduction of emergent operations performed after the start of MCO (161 *vs.* 124). Prior MCO, 10.6% emergent surgeries comprised of trauma-related injuries. This figure was reduced to only 4.8% four weeks after implementation of MCO. Due to the decrease in trauma cases, the amount of minor/major trauma surgeries and number of injured organ/multiple organs were also reduced after the implementation of MCO. Detailed information is summarized in Tables 1–3.

From previous publications, the majority of patients treated by the trauma surgery team comprises of 90% from blunt traumatic injuries.[2] In addition, motorcyclist makes up 60% of the traumatic patients involved in road traffic accidents.[7] With the commencement of MCO which restricts the citizens to stay in bound with only workers in the essential services (healthcare, finance, essential food supplies and government services) to continue duties led to a drastic reduction in road traffic accidents and industrial occupation related trauma. The overall impact is a positive reduction in trauma cases which is attributed to a decrease in activity and movement from the restriction order in a bid to prevent disease transmission.

Conclusion

The challenges faced to execute these necessary changes within a short period of time is a challenging task. However, the key to success to striking a balance in maintaining continuous quality surgery service to the community and safeguarding the safety of the medical health care workers is by a strong team foundation coupled with self-sacrifice of all personnel. The COVID-19 pandemic has led to a restriction in movement which led to an overall decrease in traumatic injuries. We hope this article may shed a light on the optimal management of general surgery services in this difficult time of Covid-19 pandemic to all affected general surgery departments.

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Ethical Statement

This study is registered under the National Medical Research Register of Malaysia (ID: NMRR-20-815-54725).

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Declaration of Competing Interest

All the authors have declared no competing conflict of interest.

References

1. Official Portal Ministry of Health Malaysia. Latest COVID-19 statistics in Malaysia. http://covid-19.moh.gov.my/. Accessed May 23, 2020.
2. Huei TJ, Mohamad Y, Lip HTC, et al. Prognostic predictors of early mortality from exsanguination in adult trauma: a Malaysian trauma center experience. *Trauma Surg Acute Care Open*. 2017;31:2. https://doi.org/10.1136/tsaco-2016-000070. e000070.

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3. Tan HCL, Tan JH, Nur Dzainuddin NA, et al. First feasibility study and short-term outcomes of laparoscopic-assisted anterior resection in colorectal cancer in Malaysia. *Ann Coloproctol*. 2020;36:89–96. https://doi.org/10.3393/ac.2019.05.10.
4. Tan JH, Sivadurai G, Tan HCL, et al. A novel method of nasojejunal feeding and gastric decompression using a double lumen silicon tube for upper gastrointestinal obstruction. *Surg Laparosc Endosc Percutaneous Tech*. 2020;30:106–110. https://doi.org/10.1097/SLE.0000000000000754.
5. Tan HCL, Tan JH, Muthu VV. Morbidity in an infant by superabsorbent polymer ingestion. *APSP J Case Rep*. 2017;8:33. https://doi.org/10.21699/ajcr.v8i5.627.
6. Henry TCL, Huei TJ, Yuzaidi M, et al. Unexpected complication of arteriovenous fistula of the left common carotid to internal jugular vein following central venous catheterization. *Chin J Traumatol*. 2020;23:29–31. https://doi.org/10.1016/j.cjtee.2019.10.001.
7. Tan Chor Lip H, Tan JH, Mohamad Y, et al. Clinical characteristics of 1653 injured motorcyclist and factors that predict mortality from motorcycle crashes in Malaysia. *Chin J Traumatol*. 2019;22:69–74. https://doi.org/10.1016/j.cjtee.2018.11.001.
8. Wu YC, Chen CS, Chan YJ. The outbreak of COVID-19: an Overview. *J Chin Med Assoc*. 2020;83:217–220. https://doi.org/10.1097/JCMA.0000000000000270.
9. Lacobucci G. Covid-19: all non-urgent elective surgery is suspended for at least three months in England. *BMJ*. 2020;368:m1106. https://doi.org/10.1136/bmj.m1106.
10. Wong J, Goh QY, Tan Z, et al. Preparing for a COVID-19 pandemic: a review of operating room outbreak response measures in a large tertiary centre in Singapore. *Can J Anaesth*. 2020;67:732–745. https://doi.org/10.1007/s12630-020-01620-9.
11. Academy of Medicine of Malaysia. Notice 27th March 2020 from the College of Surgeons Malaysia Office. http://csamm.org.my/news_covid19_triage.html. Accessed May 23, 2020.
12. Annex 22: Guidelines on management of coronavirus disease 2019 (COVID-19) in surgery. Malaysia Ministry of Health. https://www.moh.gov.my/index.php/pages/view/2269?mid=760. Accessed May 23, 2020.
13. UNESCO. COVID-19 Educational disruption and response. https://en.unesco.org/covid19/educationresponse. Accessed May 23, 2020.

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