ABSTRACT

Objectives The majority of the cancelled elective surgeries caused by the COVID-19 pandemic globally were estimated to occur in low- and middle-income countries (LMICs), where surgical services had long been in short supply even before the pandemic. Therefore, minimising disruption to existing surgical care in LMICs is of crucial importance during a pandemic. This study aimed to explore contributory factors to the continuity of surgical care in LMICs in the face of a pandemic.

Design Semistructured interviews were conducted over zoom with surgical leaders of 25 tertiary hospitals from 11 LMICs in South and Southeast Asia in September to October 2020. Key themes were subsequently identified from the interview transcripts using the Braun and Clarke’s method of thematic analysis.

Results The COVID-19 pandemic affected all surgical services of participating institutions to varying degrees. Overall, elective surgeries suffered the graveness disruption, followed by outpatient surgical care, and finally emergency surgeries. Keeping healthcare workers safe and striving for continuity of essential surgical care emerged as notable response strategies observed across all participating institutions.

Conclusion This study suggested that four factors are important for the resilience of surgical care against COVID-19: adequate COVID-19 testing capacity and effective institutional infection control measures, designated COVID-19 treatment facilities, whole-system approach to balancing pandemic response and meeting essential surgical needs, and active community engagement. These findings can inform healthcare institutions in other countries, especially LMICs, in their effort to tread a fine line between preserving healthcare capacity for pandemic response and protecting surgical services against pandemic disruption.

INTRODUCTION

The Coronavirus Disease of 2019 (COVID-19), officially declared a pandemic by the World Health Organisation (WHO) on 11 March 2020, has brought about unprecedented disruptions to surgical services globally. With a sudden increase, actual or anticipated, in demand for trained healthcare workers, personal protective equipment (PPE) and hospital facilities to treat patients infected with COVID-19, many hospitals were ordered by their governments to cancel elective surgeries to allow for redeployment of surgical teams and repurposing surgical care resources, or voluntarily did so to develop safety measures needed to continue providing surgical care during the pandemic. A study by the COVIDSurg Collaborative published in May 2020 estimated that 28,404,603 surgeries in 190 countries would be cancelled or postponed during the peak 12 weeks of disruption, the minimum duration of disruption as assessed by experts, caused by the COVID-19 pandemic and more than half of cancellations were expected to take place in low- and middle-income countries (LMICs).

Given that unmet surgical needs had been a chronic problem in LMICs even before the COVID-19 pandemic, with the magnitude of the issue ranging from 48% to 87% in the top five regions with the greatest shortages, the large number of cancellations of elective surgeries caused by the COVID-19 pandemic will only exacerbate accessibility issues of surgical care in these countries. As delay in surgeries can lead to morbidity and mortality, striving to maintain continuity of surgical care during the pandemic is especially important for the LMICs.
Unfortunately, the scale and impact of the COVID-19 pandemic are unprecedented in modern history and there are no established guidelines for the surgical leaders in LMICs to follow to minimise disruptions to surgical care. Systematic analyses of the experiences by healthcare institutions in LMICs are lacking and each institution has to learn from their immediate past experiences. This study sought to bridge this gap by eliciting and analysing the experiences of a set of tertiary hospitals and specialist centres in South and Southeast Asia, which are among the top five regions in the world with the largest unmet surgical needs. Our goal was to bring to light key potential factors contributing to the resilience of surgical care delivery in resource-constrained LMICs during a pandemic. The findings from this study will serve as the basis to formulate hypotheses of effective response strategies to maintain surgical care continuity in a pandemic in LMICs, which will be subsequently tested quantitatively in a follow-up study. The ultimate findings are not only useful for the participating institutions to learn from their collective experiences, but also for informing the response strategies of other LMICs, in and beyond these regions, sharing similar challenges, in the preparation for future pandemics.

MATERIALS AND METHODS
A purposive sampling method was adopted to select urban tertiary medical centres from 11 South and Southeast asian countries: Bangladesh, Cambodia, India, Indonesia, Malaysia, Myanmar, Pakistan, Philippines, Sri Lanka, Thailand, and Vietnam. As we sought to capture the unique experiences of surgical care institutions in resource-constrained settings, only countries within the low- and middle-income brackets, as defined by The World Bank, were recruited for the study. The recruitment of the participants was coordinated by the SingHealth International Collaboration Office (ICO), which has existing contacts with the healthcare institutions in these countries. In order to examine how the healthcare system as a whole responded to the crisis of the COVID-19 pandemic, we decided to include healthcare institutions spanning the full spectrum of the disruptive impacts caused by the COVID-19 pandemic—from those whose surgical services were wholly disrupted to those that were only lightly affected. For the same purpose of maximum variation, we also included both public and a small set of private healthcare institutions. In total, the surgical leaders of 30 eligible institutions were invited by email to participate in the study. All the participating surgical leaders held both clinical and administrative appointments at the time of interview.

In-depth, semi-structured interviews of the surgical leader(s) of each participating institution were conducted over Zoom in September to October 2020. All interviews were conducted in English except for one, in which an official translator (from the participant’s hospital) was engaged. Each interview was carried out by one of the two study team members trained in the method of conducting qualitative interviews according to an interview guide (online supplemental material 1) in the presence of one or two country representatives from the ICO to introduce the participants and to serve as a translator when needed. The average duration of the interviews was 59 min. A brief survey on pre-COVID-19 surgical capacities and their changes since the onset of COVID-19 (online supplemental material 2) was emailed to each participant before the interview to collect background information on the participating institutions.

All interviews were audiorecorded and transcribed verbatim. The transcription scripts were then analysed manually to identify key themes following the six steps outlined by Braun and Clarke to characterise the impacts of the COVID-19 pandemic on surgical care and key institutional strategies employed to respond to them. The two interviewers began by reviewing the full set of transcripts and familiarising themselves with the data. In the initial analysis, an inductive approach to the coding process was adopted, and the coding was carried out independently by the two interviewers, yielding a preliminary set of codes. The codes were then critically discussed, refined and subsequently crystallised into the final smaller set of themes. This collaborative open coding approach helped in ensuring that the emerging themes were comprehensively explored, assuring rigour of the study findings. The details of the findings will be presented in the next section followed.

Patient and public involvement
There was neither patient nor public involvement in this study. The surgical leaders in this study were recruited in the capacity of informants for their experiences in maintaining surgical care continuity during the pandemic.

RESULTS
Twenty-five healthcare institutions, coded as H1–H25, from 11 countries (median number of institutions/country=2) participated in this study, of which 18 were public institutions and 7 were private institutions. All except five institutions from five different countries were involved in treating the COVID-19 cases (henceforth referred to as COVID-19-treating institutions). Four of these five institutions were in the public sector and one was a private entity. Seventeen preinterview surveys were returned with six of them fully completed. A summary of the survey results are presented in online supplemental table 1.

In addition to information on surgical capacities collected through the survey, we also retrieved statistics on the severity of COVID-19 for each participating country at the time of the interview from the WHO official COVID-19 dashboard (online supplemental table 2) to provide context for our understanding of the response strategies adopted. The patterns of the impact of, and responses to the COVID-19 pandemic are described in the sections below, with detailed thematic findings in online supplemental table 3–5.
Impact of the COVID-19 on surgical services

First, elective surgeries suffered the greatest disruptions. Only two hospitals were able to maintain normal service provision owing partly to a relatively low national COVID-19 case count, and partly to their national strategies of having a dedicated COVID-treating institution, such that other hospitals could continue to provide normal healthcare services. Ten institutions closed their elective surgeries completely for durations ranging between two months and seven months. Five of these closures were ordered by their respective governments, in a bid to free up hospital resources for treatment of COVID-19 patients; the other five were self-initiated by the healthcare institutions due to a combination of different reasons, namely: shortage of essential manpower, in particular anaesthesiologists, limitation of general ward and intensive care unit (ICU) bed capacities, shortage of operating theatres, inadequate safety measures and protocols, and limited availability of PPE and screening test kits. The reasons were aptly summarised by the study participant from H6 where elective surgeries were cancelled for 3 months ‘mostly due to the decrease in ICU and wards capacity, (and) not enough PPE at the time’ and more importantly, due to ‘the unavailability of screening methods’. The other 13 institutions experienced 20%–80% reductions in the volume of elective surgeries, with 6 of them seeing a reduction of more than 50% for the same set of reasons described above, compounded by nationwide lockdowns and widespread public fear of visiting hospitals.

Second, surgical outpatient services saw a decrease in volume at a scale comparable to that of elective surgeries in all but two hospitals, where an opposite trend was observed. The reduction was partly imposed by healthcare institutions to minimise risk of infection by way of crowd management, and partly contributed by public fear of visiting hospitals during a pandemic. On the other hand, the paradoxical increase in patient volume reported by the two hospitals in this study was attributed to a reversal of medical tourism by affluent patients, due to international travel bans. Another important finding in outpatient surgical care was the increase in complications and severity of presenting conditions seen during consultations, postulated to be caused by delays in seeking treatment.

Finally, most participating institutions saw a brief period of decline in the volume of emergency surgeries mainly during the national lockdowns, but overall the workload of emergency surgeries maintained or increased. All the emergency departments accepted admission of all patients regardless of their COVID-19 status. For the five non-COVID-19-treating institutions at the time of the interview, time-critical emergency surgeries with unknown COVID-19 status were performed in a dedicated operating room/theatre, and non-time-critical emergency surgeries were referred to the designated COVID-19 treatment institutions if the patient was tested to be COVID-19-positive. In general, the participating institutions saw an overall increase in cancer cases, cardiac cases and obstetrics for emergency surgeries, likely due to closures of the respective elective surgical services.

It is worth noting that although surgical healthcare workers were reported to have been infected with COVID-19 in 13 participating institutions, the infections did not emerge as a main reason for the disruption of surgical services, and the sources of infections were often unknown.

Response strategies

Keeping healthcare workers safe and striving to provide essential surgical care emerged clearly as the twin guiding principles for the management of surgical care during the COVID-19 pandemic by all the participating institutions. The commitment that “your (healthcare workers) safety is my first priority” made by the participant from H8 was echoed repeatedly and resoundingly by other participants we interviewed. The keen sense of duty to “fulfill our obligations and responsibilities to help those who are sick, need urgent care” articulated by the participant from H16 was also evident in all the participating institutions’ effort to reach out to patients when they could not or were unwilling to seek hospital care.

Keeping healthcare workers safe

Overall, three themes emerged as key strategies to keep healthcare workers safe: redesigning facilities, implementing new infection control protocols, and attending to staff well-being.

Redesign of facilities

A zoning strategy was commonly used to segregate COVID-19-positive from COVID-19-negative patients. This was achieved by converting a campus, a building, a wing, a floor or multiple floors of a building into a zone or setting up a makeshift facility near the hospital for the management of COVID-19 cases. These zones or makeshift facilities have separate entrances and exits, segregating COVID-19-positive patients from the traffic flow of normal patients. The operating theatres, ICUs and general wards in the COVID-19 zones were re-engineered to be equipped with high efficiency particulate air (HEPA) filters, negative pressure airflow systems, and distinct gowning and de-gowning areas. Most institutions also designated a separate area for COVID-19-probable cases to prevent cross-infection. Doctors and nurses in H10, led by the surgical leader we interviewed, brought the redesign of facilities further by collaborating with technology companies to co-develop mobile isolation wards, screening stations and negative pressure intubation chambers, for additional protection of their healthcare workers working in high exposure risk situations.

Implementation of new infection control protocols

As operating on a patient with COVID-19 without adequate protection can result in catastrophic consequences, all the participating institutions in this study have, at variable speeds, developed and implemented safety guidelines. These guidelines serve to provide a standard on...
the appropriate levels of PPE to use in different settings, infection control protocols for performing emergency surgeries and elective surgeries respectively, for inpatient and outpatient visits respectively, and protocols on manpower deployment and staff safety surveillance.

The highest level of PPE was mandated by all participating institutions for staff involved in surgical operations, unless the patient receiving surgery was confirmed to be COVID-19 negative. An initial shortage of PPE was experienced by all institutions at the start of the pandemic, but the supply shortages were resolved within one to three months. Some institutions (H6) reacted to quantity shortfalls by implementing rationing limits of one N95 mask per doctor per day, while other institutions (H23) reported having N95 masks of substandard quality. Thus, it was common for healthcare workers to procure masks of acceptable quality by their own means, to replace or supplement officially issued ones.

Measures to keep operating theatres safe included limiting the number of personnel allowed in theatre during procedures, sequential admission of the surgical team into operating theatre after completion of intubation by the anaesthesiologist, and segregating PPE donning and doffing areas.

It was a standard practice by all the participating institutions at the time of the interview to conduct preadmission COVID-19 screening test(s) for elective surgeries and to perform surgeries only on COVID-19-negative patients. The most commonly used screening test was RT-PCR, administered either to all patients, or to only those at high risk determined by a checklist of symptoms, travel and contact history. However, not all patients in all countries in this study sample could afford the test. As a result, two participating institutions had to admit a small number of patients without undergoing COVID-19 tests and observe for warning symptoms in the wards with extra precautions in place before proceeding with the surgeries. For time-critical emergency surgeries, the operations were generally performed with precautions taken as if the patients were COVID-19-positive. COVID-19 screening tests were performed after surgery to determine the patient's COVID-19 status and the appropriate treatment was administered accordingly. For non-time-critical emergency surgeries, RT-PCR was also commonly used to ascertain the patient's COVID-19 status, especially in the high-risk group of patients. There was great variability in the time taken for RT-PCR tests to become available in the participating institutions, ranging from three months to seven months after the start of the pandemic. The availability of adequate RT-PCR tests was found to be one of the key contributing factors to the resumption of elective surgical services during the pandemic.

The protocol of perimeter screening for outpatient visits was very similar across all the 25 institutions, consisting of temperature screening, self-reported symptoms, and declaration of travel and contact history. Two institutions also included oxygen saturation tests to increase their sensitivity in detecting COVID-19-positive cases. The guidelines on staff deployment generally followed both compassion and equity rules, with all healthcare workers taking turns to work in COVID-19 zones with the exception of those of advanced age, having major comorbidities or being pregnant. Split-team work arrangement was also a common practice adopted to prevent cross-infection. In general, regular RT-PCR tests of staff were used only when the risk of infection was deemed high, in an attempt to preserve testing resources.

Attending to staff well-being

Ensuring the safety of healthcare workers extended beyond prevention of infection, with many participating institutions taking additional measures in supporting the well-being of their staff. For example, H11 offered free accommodations for its staff to serve quarantine orders after work exposure to COVID-19, thus alleviating their concerns about the safety of their family members. H8 ensured that its staff was paid in a timely manner, in spite of delays in receiving government payment, after the institution was turned into a COVID-19-treating institution overnight. H20 organised donation drives to secure lunch and dinner delivery services for their healthcare workers over a period of two months spanning the lockdown period. Taken together, these actions demonstrated compassionate leadership, which has been shown to be key in forging resilience and solidarity of healthcare workers in the face of the COVID-19 pandemic.9

Reaching out to provide essential surgical care for patients

With closure and reduction of elective surgeries and outpatient services, compounded by patients' fear of seeking hospital care, most of the participating institutions had to take a proactive approach to ensure continuity of outpatient surgical care. Many institutions reached out to their patients through mass media and social media, by way of purposefully built telemedicine platforms, and by tapping on existing networks of community health workers. Interinstitutional outreach was also observed, whereby collaborations between public and private healthcare institutions were established.

Mass media and social media

Many institutions resorted to mass media and social media to remain connected with their patients when normal surgical care was disrupted abruptly during the height of the pandemic. For example, H7 published the phone numbers of the doctors in the local newspaper for patients to call when it was ordered to close its elective surgeries and outpatient services on short notice. Doctors in many institutions also gave out their personal phone numbers directly to their patients and offered consultations over the phone or social media platforms. At the time of the interview, six participating institutions were also preparing marketing materials to launch a ‘Safe Hospital Initiative’ campaign on mass media and social media, which was aimed at alleviating patients’ fear of hospitals during the pandemic.
Eleven participating institutions looked to telemedicine for provision of outpatient care when they had to reduce their outpatient capacity drastically. However, we found that both the sophistication of the telemedicine platforms and the uptake rate varied significantly across institutions. Only H16 and H20 were on-route to offering full-fledged telemedicine services, and were in the process of setting up dedicated facilities and specialised equipment in their hospitals. H8 offered telemedicine services in the form of a mobile application for communication between their community health workers and medical specialists in the hospital. In spite of the steps taken to set up telemedicine services, the uptake rate of telemedicine by both patients and doctors was generally low in all institutions, with the reasons cited being medico-legal issues and practical constraints such as limited coverage of broadband network or lack of affordable integrated medication delivery services and payment systems. While telemedicine has been reported in the literature to play a non-trivial role in helping healthcare institutions cope with the increased strains and workload during the pandemic, its full benefits are yet to be seen in our study sample of LMICs.

Community health workers

By “bringing them (patients) safely to the hospital, and then taking them back to the community and telling the community that it can be done safely and they do not have to die for want of treatment”, the participant from H8 explained the important role of community health works. Echoed by several institutions, community health workers were found to be an effective method of addressing patients’ fear of visiting the hospital during a pandemic. With the help of telemedicine platforms connecting these community health workers with medical specialists in hospitals, they serve as a proxy to bring specialist care to patients in the comfort of their homes. This was an important contribution to the continuity of outpatient care for patients who were unable to commute to hospitals during the lockdowns of the pandemic.

Outreach between public and private healthcare institutions

When public hospital H21 received a government order to vacate its wards for COVID-19 patients, it entered into a successful financial arrangement with a neighbouring private hospital, which allowed for the transfer of care of non-COVID-19 patients from its wards to the private hospital. Conversely, private specialist centre H17 attempted to reach an agreement with an adjacent public hospital to handle its elective surgeries, when the public hospital was overwhelmed by the demands of COVID-19 treatment. However, the attempt was hampered by the payment system, which had been designed for a healthcare system with rigid separation of public and private providers.

DISCUSSION AND CONCLUSION

This study showed that COVID-19 has caused significant disruptions to surgical care in all participating institutions with the exception of two, which were in countries with dedicated COVID-19 hospitals. These disruptions were multifaceted with multiple driving forces—the sudden increase in the demand of healthcare resources to treat COVID-19 patients, the need for healthcare institutions to adapt their work environment and processes to ensure safety of both staff and patients, and the widespread public fear of hospitals resulting in delayed health-seeking behaviour. While the response strategies employed by the various healthcare institutions were varied in the details, we found that there was clear convergence in the two guiding principles of keeping healthcare workers safe, while continuing to provide surgical care for the sick. We also found that while the pandemic by and large overwhelmed many public healthcare institutions in the study, some private healthcare institutions retained untapped capacity that could be potentially deployed to maintain surgical care continuity on a national level. Taken together, these findings suggest that four potential factors are important for mitigating the disruptive impact of the COVID-19 on continuity of surgical care in LMICs.

First, availability of affordable COVID-19 screening tests and comprehensive infection control measures are fundamental for delivering routine surgical care in a pandemic. Screening of patients and healthcare workers constitute the first line of defence in maintaining COVID-19-free hospital clean zones, while infection control measures (such as post exposure quarantines imposed by H24, strict time and space segregation seen in H5, H21 and H22, and the PPE policies adopted universally by all institutions) act as additional safeguards that minimise undetected virus spread. In practice, we found that although the adaptation of work processes and facilities for infection control were largely within the control of individual healthcare institutions, access to COVID-19 screening kits was managed at the national level, and LMICs are disadvantaged to compete for test kits with high-income countries due to resource constraints. Most of the participating institutions did not have the capacity to conduct RT-PCR preadmission screening tests until May or June 2020. Two institutions (H23, H24) did not have access to screening tests for a protracted period of time till October 2020. The WHO’s programme to supply 120 million rapid tests for COVID-19 to LMICs from October 2020 to March 2021 offers some hope to ease the shortage of screening tests in LMICs. Additional measures by global health agencies are needed to ensure sustainable supply and uninterrupted access in these LMICs.

Second, a whole-system approach in the allocation of healthcare resources facilitates continuity of surgical care by optimising healthcare resource utilisation. Our study showed that while many public healthcare institutions struggled with manpower and resource capacity shortages and were forced to reduce surgical care services to prioritise the care of patients with COVID-19, there remained unused capacity among private hospitals (H16–H19), which could be redirected to ease public sector workload. While ground-up efforts were made to forge partnerships...
between public and private healthcare institutions (H14 and H16), the public-private collaboration was not without administrative setbacks and faced mixed reception. While H19, a private institution, took the initiative to allocate 30% of their bed capacity for treatment of public COVID-19 patients, it found ‘much difficulty in getting our private surgeons to accept the cases’ (H19). Despite the barriers, our study seemed to suggest that there was potential value of public-private partnerships among healthcare institutions and highlighted the importance of system preparedness to forge such partnerships for optimal pandemic response and minimising disruption to normal surgical care.

In addition, designating COVID-19 treatment centres and leaving other healthcare institutions to provide routine healthcare services can enable optimal resource allocation between pandemic-related and routine surgical care services, provided that the healthcare system as a whole has the capacity to do so. H2 and H25 were able to offer normal surgical care as a result of the realignment of healthcare services by their governments to centralise the treatment of COVID-19 cases in designated hospitals. This model was recommended by the participants from H6 and H7, upon reflecting on the lessons learnt from this pandemic, citing protection of healthcare workers’ physical and psychological well-being as potential benefits. This view is also echoed by the lessons learnt from the decision-makers and physicians from four designated COVID-19 hospitals in the USA. However, implementing this model has potential challenges due to the moral implication of deliberately placing one group of healthcare workers at higher risk than others. To ease the strain on healthcare institutions during a public health crisis, rapid construction of an isolation facility physically separate from the hospital as practised by H19 and the successful experience of Singapore in leveraging on telemedicine to care for the COVID-19 patients without the need for intensive care in purposely built community care facilities could be another model to consider without disproportionately increasing the risk of any particular group of healthcare workers.

Finally, community engagement is crucial to maintaining surgical care continuity during a pandemic. Fear-driven delay of hospital visits was a common phenomenon observed by all participating institutions which, left unmanaged, can compound the consequences of COVID-19 on surgical care. Participants from H13, H16 and H24 alike, felt that telecommunication tools and telemedicine have an important role to play in maintaining doctor-patient contact, arranging medical appointments, and also in providing reassurance and medical advice to patients. In particular, participant from H19 reflected that on hindsight “the move to teleconsultation should have been given more push to address the low census for outpatient visits”. Community health workers also proved to be an important bridge between patients and hospitals, and have the added benefit of bringing a personal touch to the engagement process which is much needed in a crisis situation. Participants from H8 and H22 found that by equipping their community health workers with telecommunication tools, they were able to bring specialist care into patients’ homes during the pandemic. Therefore, strengthening community healthcare network alongside enhancing telemedicine infrastructure is important for a resilient healthcare system in LMICs.

We acknowledge the following limitations in this study. First, we only studied the perspectives of surgical leaders and did not include any surgical healthcare workers or patients with surgical needs. As a result, we were unable to appreciate how these two groups made sense of the disruptions of surgical services and the organisational efforts to maintain service continuity amid a pandemic. Unfortunately, we were unable to overcome this limitation due to practical difficulties of recruitment and language barriers of interviews. Second, there is only one low-income country in South and Southeast Asia and we were unable to reach it, which will restrict the generalisability of our study findings to mainly middle-income countries. However, it is plausible to assume that the challenges confronting the middle-income countries are likely to be similarly faced by low-income countries due to their shared economic conditions and shortage of surgical services, and therefore, the response strategies adopted by the participating institutions will be relevant for low-income countries to. Third, the participating institutions were facing different degrees of severity of the COVID-19 outbreak at the time of the interview, which has invariably impacted the availability of resources and hence institutional responses to the crisis. While the exact degree of consensus in response strategies was not examined, and hence remain unquantified in our study, we have found variation in response strategies to be only in the details, with a rather clear convergence in guiding principles among all the institutions. With that in mind, the findings of this study should be applied with considerations of situational variability in future pandemic settings. Finally, we wish to highlight that our intention of adopting the qualitative approach to this study is to generate contextualised knowledge of the impact of and responses to the pandemic, with the aim of capturing a full spectrum of heterogeneous experiences from a set of healthcare institutions facing the same constraints of resource availability. At the point of data collection, the world remained in the thick of the pandemic, rendering it premature to quantify the effects of the institutional response strategies. However, the findings from this study will inform the formulation of specific hypotheses for quantitative testing of these effects in our subsequent quantitative study which will explore the value of various pandemic response strategies in the overall maintenance of surgical care continuity.

To conclude, while it is intuitive that non-essential or non-time-critical surgical procedures should be deferred in the acute phase of a pandemic for the conservation of healthcare capacity, a complete neglect of all surgical services for the purpose of redirecting healthcare...
resources to cope with the pandemic could cause downstream collateral damage, leading to increase in mortality or reduction in lifespan as a result of delayed medical care. This qualitative study of the experiences of 25 healthcare institutions demonstrates that availability of appropriate screening tests, adequate infection control measures, realignment of healthcare resources taking a whole of healthcare-system approach and effective patient engagement were potentially critical to ensure continuity of essential surgical services while battling the great disruption of a pandemic like the COVID-19. A follow-up quantitative study in collaboration with the participating institutions in this study is currently underway to test these hypotheses.

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SUPPLEMENTARY MATERIAL

Supplementary Material 1: Interview Guide

Part I. Context

Before we get to the details of surgical services, I would like to ask you some questions about how COVID-19 has impacted your country and your hospital.

1. First, could you share with me briefly what is the COVID-19 situation like in your country now? What about the situation in the city where your hospital is located?

2. How is the effort to fight COVID-19 organised in your country? [Probe] Is it coordinated at the national level such as by your Ministry of Health or by a specially formed taskforce?

3. Some countries allow COVID-19 cases to be treated in any hospital, and others designate certain hospitals to take care of such cases. What is the arrangement in your country? [If there are designated COVID-19 hospitals] Is your hospital a designated COVID-19 hospital? How many COVID-19 cases have been treated in your hospital?

4. Has any of your hospital facilities been converted to COVID-19 wards? [If yes] Has any surgical facilities been converted? How many?

5. How many or what percentage of the surgeons in your hospital have been deployed to fight the COVID-19?

6. Has any healthcare worker in your hospital contracted the COVID-19 in the course of work? [If yes] Has anyone of them got infected with the virus while providing surgical care?

7. What measures has your hospital taken to prevent cross-infections within the hospital? Are there any specific measures for preventing cross-infections in surgical care? [Probe] Are there any changes to the policies and processes to perform surgeries during the COVID-19 pandemic? Is there split-team arrangement among surgeons to prevent cross-infection?

Part II: Disruption to surgical services and its management
Thank you for sharing information on the big picture. Now we will move on to talk about how COVID-19 has affected surgical services in your hospital. Let’s start with emergency surgeries.

8. Has there been a significant change in the volume and types of emergency surgeries during the COVID-19 pandemic in your hospital compared to normal times? [If yes] In what way and to what extent? What do you think were the reasons for the change?

9. Were there any changes in the processes of preparing for and performing emergency surgeries during the COVID-19 pandemic? [Probe] How do you screen patients for COVID-19 to ensure that they are safe to undergo surgeries? Are there operating theatres designated specifically for the operation of patients with the COVID-19? Has any emergency operation been performed on patients with suspected or confirmed COVID-19 so far?

Thank you for sharing the information and your thoughts on emergency surgeries. Now let’s move on to elective surgeries.

10. Have all or some of elective surgeries in your hospital been cancelled during the COVID-19 pandemic?

11. When did you start cancelling elective surgeries? [Probe] Was it when you had the first confirmed COVID-19 case in the country or in the hospital or was it some other time?

12. Who made the call to cancelling elective surgeries? [Probe] Was it your Ministry of Health or the senior management (i.e. your CEO or CMB) of your hospital?

13. What were the main considerations for postponing such surgeries? 
   Probes:
   • Was it to prevent cross-infection in the hospital?
   • Was it because manpower shortage?
   • Was it to conserve critical care resources such as PPEs?
   • Were there other considerations?

14. Did you have any concerns about cancelling the elective surgeries? Could you elaborate on them?
15. [If only some elective surgeries were postponed] How did you decide which elective surgeries to cancel and which ones to carry on? [Probe] Was there a formal guideline to follow? [If yes] Was it a hospital, national, or international guideline (e.g. Elective Case Triage Guidelines for Surgical Care by the American College of Surgeons)? Or was it left entirely to individual surgeons to decide? Were there patients who were disagreeable to the hospital’s decision to cancel their surgeries? How did the hospital manage the disagreement?

We have talked about emergency and elective surgeries, now let’s talk about outpatient care.

16. How has COVID-19 affected outpatient care for surgical patients in your hospital? [Probe:] How does the outpatient workload during the COVID-19 pandemic compare to normal times? [If there has been a significant drop in the number of outpatient clinic visits] Was it because patients chose to postpone their visits or was it because the hospital advised patients to postpone their non-urgent visits or both? How did you decide which patients’ appointments to postpone? Were there any guidelines/criteria to follow? Where there patients who insisted coming to the hospital despite the hospital’s advice for him/her to postpone the visit? How did you manage these patients?

17. Was tele-communication used as an alternative to normal clinical consultation for surgical care? [If yes] What was the take-up rate by surgeons and patients? How do you feel about this result? Why? For those patients who chose to or had to come to the hospital for outpatient follow-up, what measures have been put in place to keep both patients and staff safe? [Probe] Is here any screening procedure? How are patients screened?

Part III. Reflecting on the past and looking into the future

We have covered in detail how COVID-19 has affected the surgical services in your hospital. Now I would like to hear your reflections on the experience of managing the impact of COVID-19 on surgical services.

18. Overall, what were the biggest challenges you faced as a surgical leader during the COVID-19 pandemic?

19. Sometimes disruption of status quo can offer leaders a unique opportunity to gain insights into the way they do things normally. What insights has the experience of the COVID-19 pandemic offered you about the delivery of surgical care during normal times? And what do
you envision to be the new normal for delivering surgical care in your hospital after the COVID-19 pandemic?

20. If there were another pandemic like the COVID-19 in the future, what are the things you have done in the last few months you will do again? What are the things you will do differently based on your experience during the COVID-19 pandemic?

21. What plan do you have to tackle the backlog of cancelled surgeries after the COVID-19?
   [Probe] In view that is still uncertain when the COVID-19 will be over, how do you estimate workload and plan for resources? Do you resort to mathematical modelling?

22. Finally, what is your biggest concern now as a surgical leader?
Supplementary Material 2: Pre-interview Questionnaire

<table>
<thead>
<tr>
<th>Based on last year 01 Jan 2019 – 31 Dec 2019</th>
<th>Please provide the accurate numbers as best as you can</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of surgeons in your hospital</td>
<td></td>
</tr>
<tr>
<td>Total number of elective surgeries performed in your hospital</td>
<td></td>
</tr>
<tr>
<td>Total number of emergency surgeries performed in your hospital</td>
<td></td>
</tr>
<tr>
<td>Total number of surgical outpatient clinic consultations in your hospital</td>
<td></td>
</tr>
</tbody>
</table>
### TABLES

#### Table 1: Pre-Interview Survey Results

<table>
<thead>
<tr>
<th>Surgical Capacities Before the COVID-19</th>
<th>Range</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of surgeons (N=17)</td>
<td>17 – 229</td>
<td>57</td>
</tr>
<tr>
<td>Number of elective surgeries performed in 2019 (N=17)</td>
<td>325 – 23 126</td>
<td>2 396</td>
</tr>
<tr>
<td>Number of emergency surgeries performed in 2019 (N=16)</td>
<td>15 – 22 965</td>
<td>369</td>
</tr>
<tr>
<td>Number of outpatient visits (N=16)</td>
<td>2 031 – 560 000</td>
<td>25 085</td>
</tr>
</tbody>
</table>

**Average Change in the Volume of Surgical Services in the**

**First Nine Months of 2019 and the First Nine Months of 2020 (N=6)**

<table>
<thead>
<tr>
<th>Service</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of elective surgeries</td>
<td>-38%</td>
</tr>
<tr>
<td>Number of emergency surgeries</td>
<td>38%</td>
</tr>
<tr>
<td>Number of outpatient visits</td>
<td>-55%</td>
</tr>
</tbody>
</table>
## Table 2 – Summary of COVID statistics corresponded with interview date

<table>
<thead>
<tr>
<th>Number of positive COVID-19 cases per 10,000 population at time of interview</th>
<th>Hospital Code</th>
<th>Number of COVID-19 deaths at time of interview</th>
<th>Number of new COVID-19 cases per day at time of interview</th>
<th>Trend of COVID-19 infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 5</td>
<td>H25</td>
<td>35</td>
<td>1 (0.09%)</td>
<td>Low throughout, small peaks in Aug 20 and Jan 21</td>
</tr>
<tr>
<td></td>
<td>H1</td>
<td>0</td>
<td>0</td>
<td>sporadic increase</td>
</tr>
<tr>
<td></td>
<td>H2</td>
<td>0</td>
<td>0</td>
<td>sporadic increase</td>
</tr>
<tr>
<td></td>
<td>H10</td>
<td>59</td>
<td>22 (0.62%)</td>
<td>first wave Mar-Apr 20, second wave Dec-Feb 21</td>
</tr>
<tr>
<td></td>
<td>H22</td>
<td>13</td>
<td>76 (1.47%)</td>
<td>Low till Oct 20, then increasing</td>
</tr>
<tr>
<td></td>
<td>H11</td>
<td>444</td>
<td>987 (5.55%)</td>
<td>Initially low, start of rise in Sept, Peak Nov, decreasing thereafter</td>
</tr>
<tr>
<td></td>
<td>H20</td>
<td>159</td>
<td>563 (3.6%)</td>
<td>Low till Sept 20, then increasing</td>
</tr>
<tr>
<td>6 - 10</td>
<td>H21</td>
<td>236</td>
<td>1240 (4.67%)</td>
<td>Low till Sept 20, then increasing</td>
</tr>
<tr>
<td></td>
<td>H12</td>
<td>1199</td>
<td>1331 (2.71%)</td>
<td>Initially low, start of rise in Sept, Peak Nov, decreasing thereafter</td>
</tr>
<tr>
<td></td>
<td>H3</td>
<td>10 473</td>
<td>3509 (1.28%)</td>
<td>increasing</td>
</tr>
<tr>
<td></td>
<td>H4</td>
<td>10 740</td>
<td>4284 (1.52%)</td>
<td>increasing</td>
</tr>
<tr>
<td>11 – 20</td>
<td>H5</td>
<td>12 027</td>
<td>3906 (1.16%)</td>
<td>increasing</td>
</tr>
<tr>
<td></td>
<td>H6</td>
<td>12 959</td>
<td>4432 (1.19%)</td>
<td>increasing</td>
</tr>
<tr>
<td></td>
<td>H13</td>
<td>6535</td>
<td>624 (0.2%)</td>
<td>First wave May-Jul 20, Second wave Nov-Jan 21</td>
</tr>
<tr>
<td>21 - 30</td>
<td>H23</td>
<td>5818</td>
<td>1436 (0.36%)</td>
<td>Relatively high throughout, first peak Jun 20, second peak Nov/Dec 20</td>
</tr>
<tr>
<td></td>
<td>H24</td>
<td>5861</td>
<td>1493 (0.47%)</td>
<td>Relatively high throughout, first peak in Jun 20, Second peak in Nov/Dec 20</td>
</tr>
<tr>
<td></td>
<td>H14</td>
<td>5925</td>
<td>2804 (0.86%)</td>
<td>Constant increase</td>
</tr>
<tr>
<td></td>
<td>H15</td>
<td>5295</td>
<td>2804 (0.86%)</td>
<td>Constant increase</td>
</tr>
<tr>
<td>31 - 40</td>
<td>H16</td>
<td>6449</td>
<td>2823 (0.53%)</td>
<td>Constant increase</td>
</tr>
<tr>
<td></td>
<td>H17</td>
<td>6449</td>
<td>2823 (0.53%)</td>
<td>Constant increase</td>
</tr>
<tr>
<td></td>
<td>H18</td>
<td>6690</td>
<td>1606 (0.45%)</td>
<td>Constant increase</td>
</tr>
<tr>
<td></td>
<td>H19</td>
<td>6690</td>
<td>1606 (0.45%)</td>
<td>Constant increase</td>
</tr>
<tr>
<td>41 - 50</td>
<td>H7</td>
<td>96 318</td>
<td>70 589 (1.16%)</td>
<td>increasing till mid-Sept then decreasing</td>
</tr>
<tr>
<td></td>
<td>H8</td>
<td>99 773</td>
<td>81 484 (1.29%)</td>
<td>increasing till mid-Sept then decreasing</td>
</tr>
<tr>
<td></td>
<td>H9</td>
<td>103 569</td>
<td>61 267 (0.92%)</td>
<td>increasing till mid-Sept then decreasing</td>
</tr>
</tbody>
</table>
### Table 3 – Summary of thematic findings on “Impact on Surgical services”

**Emergency surgical services**
- Emergency surgical services were kept running
  “The emergency admissions were there, emergency operations were always going on” (H23)
- Oncology surgeries were given the same level of prioritization as emergency surgeries/reclassified as emergency surgeries
  “We were asked to reduce our elective surgical procedures prioritising the cancer cases and surgical emergencies” (H22)
  “Cancer patients, we usually admit the patients through outpatient department. But if we delay the operation, that cancer will be more aggressive. So we had to admit those patients during that period through emergency department.” (H23)

**Changes in pattern of surgeries include** -
- Fewer traumas from road traffic accidents during national lock-down
  “During that period, yes, the emergencies that were resulting from traffic accidents went down. Because people were not on the road so there weren’t many accidents” (H21)
- Increase in obstetrics and gynaecology surgeries
  “So the number of caesarean section is now increasing in our emergency department, because they referred from other provincial hospitals to our hospital in this pandemic. That’s why the number of emergency cases not decreasing, but increasing.” (H5)
- Increase in semi-emergent gastrointestinal surgeries
  “There were certain changes we have noticed during this lockdown period. There were slight increase in emergency and semi emergency non trauma surgery. Patients with something like obstructional hernia” (H8)

**Elective surgical services**

**Varying degrees of closure due to** -
- Government directive
  “When the lockdown was imposed, in the third week of March, we had to shut down all elective operations” (H16)
  “The government announced for total OPD closure from March almost up to the middle of May, and all elective surgery were cancelled or postponed or stopped” (H8)
- Manpower shortage – especially nurses and anaesthetists
  “Nurses with expertise are moved by management to COVID areas. Surgery cannot be done smoothly as the dedicated nurse for the specific type of surgery is not there” (H6)
  “We did not have enough nurses, even our OR nurses were deployed to the intensive care units for COVID and COVID wards. So all the elective services were stopped.” (H16)
“A lot of staff deserted the hospital. They left their job. Nurses especially. They got panicky, they said they will not do job, they were worried, they resigned, and then they left the hospital.” (H8)

- Resource shortages – personal protective equipment, COVID testing

“The time between the test and the result is still three to five days and that is unsatisfactory for us. The third one is PPE. Sometimes to feel more safe, we have to procure our own PPE and N95.” (H6)

“We were concerned about the adequacy of the PPEs at the time” (H16)

“During the peak season of the COVID, we didn't have enough facilities for the RTPCR, and our government did not allow for the antigen test. So, we actually based on the symptom checks. Then, actually, we tried to avoid admitting the patients.” (H23)

- Hospital capacity shortage

“We actually were given three wards that will only accommodate 50 for all the surgical departments and we were reserving this for the emergencies.” (H16)

- Resource conservation – Personal protective equipment, blood products

“We certainly did give instructions, not to perform any surgeries that that anticipating significant blood loss.” (H21)

## Outpatient surgical services

Decrease in outpatient surgical consultations due to -

- Daily quota on outpatient consultations for crowd control
- Restriction on accompanying companions
- Patients’ fear, doctor’s fear

“It's due to patients not showing up, they don't want to seek consultation face to face and also the doctors, they didn't want to come to clinics for fear of, you know, COVID” (H15)

“They were really scared to come to the hospital. They think that they might contract COVID when coming to hospital.” (H8)

- National movement restriction orders

“Yeah. biggest worry is that many of our patients were untreated during this time... we operated a patient, that patient was then went to her home, very distant place in Bangladesh. We told her to come for follow up, but she could not come. She did not have any of the follow up in last 10 months” (H23)

- Government directive

“The government announced for total OPD closure from March almost up to the middle of May, there was no OPD patient, as well, and all elective surgery were cancelled or postponed or stopped” (H8)

Changes in pattern of outpatient surgical consultations include -

- Increase in affluent patients

“Patients have increased in every hospital, even in provincial hospitals. Before this, businessmen used to leave the country to Thailand or Singapore for treatment. But now that borders are closed, they stay in the country and we see our surgical numbers increasing” (H2)
- Increase in complications due to delays in seeking medical attention

“Main issue for me as a digestive surgeon, is that there are many cancer patients that were postponed and that creates a backlog. Because of that, many cancer patients have become more advanced than their initial presentations” (H6)

“An elderly lady who was having gallbladder stones, diagnosed in the month of February 2020, but since the lockdown was launched they were just hesitant to come to the hospital. When the lady came in the month of July, she was in sepsis.” (H8)
### Table 4.1 – Summary of thematic findings on “Keeping Healthcare Workers Safe – Redesign of Facilities”

<table>
<thead>
<tr>
<th>Zoning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Physical separation of COVID designated and non-COVID areas</td>
<td></td>
</tr>
<tr>
<td>“You zone infectious disease patients, and you don't allow mixture,</td>
<td></td>
</tr>
<tr>
<td>not just of the patients, but also the manpower as well as the things</td>
<td></td>
</tr>
<tr>
<td>materials that you use in the wards” (H16)</td>
<td></td>
</tr>
<tr>
<td>“So we decided that in GNRC out of the four campuses, one campus will</td>
<td></td>
</tr>
<tr>
<td>make it a dedicated COVID campus so that we don't have to mix up</td>
<td></td>
</tr>
<tr>
<td>with other patients.” (H8)</td>
<td></td>
</tr>
<tr>
<td>“All surgeons are taking the precautions of international protocols</td>
<td></td>
</tr>
<tr>
<td>and some of the floors we are dedicated for the COVID patients and</td>
<td></td>
</tr>
<tr>
<td>some of the lifts are also dedicated for the COVID patients.” (H24)</td>
<td></td>
</tr>
<tr>
<td>• Reallocation of operating theatres, intensive care units and wards</td>
<td></td>
</tr>
<tr>
<td>for COVID designated use</td>
<td></td>
</tr>
<tr>
<td>“We have two wings, separate OR complex for COVID, and we have a</td>
<td></td>
</tr>
<tr>
<td>separate complex for non-COVID.” (H16)</td>
<td></td>
</tr>
<tr>
<td>“The role of general ICU was converted to COVID ICU” (H24)</td>
<td></td>
</tr>
<tr>
<td>• “Float zones” for temporary holding of patients awaiting COVID</td>
<td></td>
</tr>
<tr>
<td>status</td>
<td></td>
</tr>
<tr>
<td>“While waiting for the test result the patient would be moved to</td>
<td></td>
</tr>
<tr>
<td>the infectious disease department where they will be in isolation in</td>
<td></td>
</tr>
<tr>
<td>quarantine until they received two successive negative test results,</td>
<td></td>
</tr>
<tr>
<td>at which point they will be moved to another department for</td>
<td></td>
</tr>
<tr>
<td>treatment.” (H25)</td>
<td></td>
</tr>
</tbody>
</table>

### Management of traffic flow

• Segregated entrances and exits for COVID zones and non-COVID zones

“Even to bring the patients from the emergency department to the       |                                                                                      |
operating theatre, we actually mapped out a separate pathway. We have |                                                                                      |
our own internal police and they helped to clear the pathways for us  |                                                                                      |
when we needed to transport patients.” (H21)                           |                                                                                      |
“You can also make use of some buildings that are standalone with     |                                                                                      |
separate entrance, to serve as your COVID area. You can just add it   |                                                                                      |
on in a modular manner. You don't want to use the elevator for the    |                                                                                      |
non COVID, to be used by patients with COVID.” (H16)                  |                                                                                      |
• Segregated donning and doffing areas in operating theatres

“Even had separate pathways for staff to enter and leave the          |                                                                                      |
operating theatres” (H21)                                             |                                                                                      |

### Environmental design

• Installation of negative pressure systems in COVID-designated        |                                                                                      |
operating rooms                                                       |                                                                                      |
“We have to institute facilities re-engineering, like example setting |                                                                                      |
up negative pressure rooms, HEPA filter in the operating theater etc” |                                                                                      |
(H14)                                                                 |                                                                                      |
• Installation of air filters/purifiers                               |                                                                                      |
“We opened our clinic after some engineering, air exchange,           |                                                                                      |
computation and institution of ventilation mechanisms” (H16)          |                                                                                      |
New facilities

- Central telemedicine facilities
  “We came out with this COVID operation centre. So this is like a call centre which had 20 computers there.” (H16)
  “We are in the process of developing a virtual clinic. We just received a grant to develop a virtual clinic. The intention of this virtual clinic, we were hoping that we will be able to take care of the rest of the 30% of the patient that we are still not able to see” (H20)

- Temporary COVID screening facilities outside of hospital’s premises
  “We have built a new centre there that we call the fever clinic. In the fever clinic there is a COVID test centre. So they go there and they can have a test.” (H24)
  “We built like semi permanently building in the emergency in the parking area to make or to select what is the probable COVID cases” (H5)

- Temporary buildings to meet increased need for facilities
  “We organise a hospital, for a field hospital for infectious disease at a separate location in the hospital. At the field hospital we also situated one surgery theatre designed to operate to provide surgery, to SARS-COVID infected patients suspected of infection by SARS-COVID2, if the need for emergency surgery arise” (H25)

- On-site housing for staff
  “We made a new initiative. So for those who are a bit worried, especially for those staying with family or staying with a friends, we provide the temporary facilities for them for 14 days in a nursing hostel.” (H20)

- On-site RT-PCR testing
  “During the start of the pandemic, our hospital was not yet equipped with an RT PCR but right now, our hospital now has an RT PCR machine that makes it easier for us to screen patients” (H14)

Innovation

- Robotics
  “We also use robotics to deliver food or medicine or medical supply to the COVID patients in the COVID ward” (H10)

- Portable negative pressure chambers
  “Small chamber covering half the body of the patient, connected to negative pressure with HEPA filter to purify the air or generated aerosols during endoscopic procedures. It took three months for development” (H10)

Table 4.2 – Summary of thematic findings on “Keeping Healthcare Workers Safe – Implementation of Infection Control Protocols”

<table>
<thead>
<tr>
<th>Personal Protective Equipment (PPE) policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Quality control of personal protective equipment</td>
</tr>
</tbody>
</table>
“Market was flooded with fake 95 and KN95 even during the pandemic. Testing revealed that it’s no better than the surgical face mask. So we have shifted actually to providing our surgical residents reusable elastomeric masks for interests of sustainability and protection” (H16)

- Differing levels of personal protective equipment depending on exposure risk
  - Highest level of protection: Hazmat suits/PAPR, coveralls, gloves, boots
  - Second level: N95 mask, face shield/goggles, coveralls, gloves, boots
  - Third level: Surgical mask, face shield/goggles, gown

**Operating theatre workflow**

- Mandated time lapse between induction of anaesthesia and admission of surgical team into operating theatre
  
  “We had a protocol for when the anesthetists would be entering the theatre during the intubation. So there was a delay between completion of intubation and surgeons entering.” (H21)

- Restrict personnel allowed in theatre during induction of anaesthesia/surgery
  
  “We set up a local protocol to minimise the number of people involved in a surgery” (H22)

- “During preparation or during the patient intubation by the anaesthetist, the surgeon is not in OT, he or she will wait in the waiting room.”(H5)

- Strict segregation of donning and doffing areas
  
  “We have separate donning and doffing areas for personal protective equipment” (H22)

**Inpatient admissions and screening process**

- Screening questionnaire and temperature check prior to entry into premises
  
  “All patients entering the hospital, must make a medical declaration at the gate. At the gate their body temperature would also be checked.” (H25)

- Oxygen saturation checks
  
  “So aside from the health declaration form, the temperature is taken, their oxygen saturation is also taken.” (H14)

- Chest x-ray or CT for surgical patients
  
  “So a chest x-ray would be taken and if the picture of the chest X ray would suggest that the patient has COVID, then automatically the patient will be admitted in our area 19 or COVID ward.” (H14)

  “Those patients who were planned for an emergency surgery, chest X-ray was mandatory. There was no question that the chest X-ray would not be done. Even in pregnant patients we were doing chest x-rays.” (H13)

- COVID tests prior admission - Wide ranging from rapid antigen test, single RT-PCR to double RT-PCR
  
  “We started admitting the outpatient cases with a result of COVID-19. If the outpatient patient wants to be admitted, he has to do the COVID-19 test.” (H23)
"We have also required all patients for outpatient for elective surgeries to undergo an RT PCR test. So the validity of the RT PCR test is one week." (H14)

- Ward segregation based on COVID status

“Screening of the patient starts in the fever clinic. The patients those are having fever, cough, they will be going there first. Then from there, those who are suspected of infection, they are sent for blood test, if they are positive, then they are referring to the COVID centre.” (H24)

### Outpatient visit control

- Strictly by appointment only and staggering of appointments

“So I think we decided to adopt, we adopt a staggered appointment, you know. Appointments only coming in by scheduling” (H20)

- Daily patient quota

“Doctors were only limited to see 10 patients per day per doctor. It was more because we don’t want the infection to spread that much that we don’t want to congest the outpatient clinics, you don’t want too many people inside the hospital or inside the OPD clinics.” (H14)

“Certain SOPs that we had to adopt, like limited numbers of patient coming to the clinic at one time.” (H20)

- Limit to number of accompanying friends/family members

“We had to limit only one relative next of kin to be there to accompany them. But, you know, sometimes it’s not easy, especially when you want to discuss a very important discussion, like discussing about the cancer management.” (H20)

- Screening questionnaire and temperature checks prior to entry into premises

“All patients entering the hospital, must make a medical declaration at the gate. At the gate their body temperature would also be checked.” (H25)

- Brief history taking done outside of consult room to reduce contact time in an enclosed space

“Residents initially see the patient outside and if they think that this patient need a consultation, a consultant was there to provide dedicated care” (H13)

- Social distancing enforced

“For the clinical consultation, we were asked to maintain at least one metre distance away from the patient.” (H22)

### Table 4.3 – Summary of thematic findings on “Keeping Healthcare Workers Safe – Staff Wellbeing”

**Staff safety surveillance**

- Testing of staff
  - Post-COVID exposure
“If our infection control committee or infection control nurse would label them as high risk contact of a COVID positive patient, then they are mandated to undergo an RT-PCR five days after exposure and then required they are required to complete a 14 day quarantine.” (H14)

“In case of an emergency surgery must be performed on a patient suspected of infection by COVID-19. The patients and the surgery crew, the surgery team will be moved into quarantine after the surgery until a negative test result is available.” (H25)

- After each rotation of COVID duty

“Seven days duty, seven days in a hotel for isolation, then they go for test. (H24)

“All the personnel rotated from the field hospital must be put into a quarantine for two weeks to wait and take the SARS-COVID2 test. And only after two successive negative test would they be allowed to go back to work” (H25)

- At fixed intervals, depending on level of exposure risk

“Basically, we have to do regular swabbing, all of us here, depending on exposure level” (H15)

“There were two major surveillance tests conducted for our healthcare workers. This testing was performed for everyone, not only those who are going on duty in the COVID wards.” (H16)

- Mandatory quarantine post exposure risk/COVID duty rotation

“Seven days duty, seven days in a hotel for isolation, then they go for test. If they are negative they go home. Then stay seven days then come back again (H24)

“We have had some cases where we suspect a staff member may be infected because they came into contact with probably COVID 19 positive cases, but each staff member were immediately moved to quarantine.” (H25)

- Provision of housing for staff on duty

“Our COVID centre doctors, they do their duty for 12 hours, then they go to a hotel, not their home.” (H24)

- Contact tracing

“For zone 1 staff risk, meaning whoever direct contact with the patient, we had to perform the contact tracing for them. (H20)

**Staff deployment**

- Equity rule – rotation of staff for COVID duties

“So we relocated the staffs in different groups and they came with the roster duties… we used a roster system so that everyone is not at risk all the time. ” (H23)

“As I mentioned, we were working on rotational basis. So directly and indirectly, they were involved in the care of COVID patients.” (H20)

- Protection of senior doctors or those with comorbidities

“We avoided pregnant ladies from exposure. And we had a definitive plan of avoiding people with severe comorbidities or immunosuppression, getting exposed to suspected or positive COVID-19 patients” (H22)

“Surgeons above 60 are not allowed to have contact with COVID positive patients. Those with comorbid conditions like heart disease, diabetes, kidney disease are not allowed to come to work” (H6)
Senior doctors operate to reduce operation time and exposure risk

"It was just felt that consultants and specialists could probably accomplish what was needed in a more efficient and minimal risk to the patients and also to other staff." (H21)

"We were involved in management to reduce risk of contamination. Therefore even a simple case, I think it was done by a Senior Specialist rather than a junior most were involved." (H20)
### Table 5 – Summary of thematic findings on “Response Strategies – Outreach to provide essential surgical care”

#### Telemedicine

**Functionality of telemedicine -**
- For general public enquiries
  
  “We had volunteer physicians and even our interns who were not being required to report to the hospital they volunteered, they took in questions from all over the city and even the other parts of the country” (H16)
- Remote triaging
  
  “We have a triage system that is being managed by the Department of outpatient services. They are able to triage the patients that seek consult through the telemedicine website and send them over to that respective departments as necessary.” (H16)
- Follow-up consultations
  
  “They were basically waiting for the consultation and if we have not started their teleclinic that means that people would have started avoiding all those follow-up and basically... So just to avoid those things we started providing services for the teleclinic consult” (H13)
- Consultations between doctors (community doctors to specialists)
  
  “Sometimes some GPs call us from a different place in the country. They used (telemedicine) to take advice for their patients. So our specialists used (telemedicine) to give them advice over telephone.” (H24)

#### Challenges in implementation –
- Lack of infrastructure
  
  “We don’t have a facilities to start or run the telemedicine care in our hospital. Because to run those consultations, we will require a setup. We require some technical expert persons and software, and we don’t have those departments.” (H23)
- Resistance to uptake
  
  “However, most of the patients would like to see, to see their doctors are face to face. I think it’s because of the culture of the Filipino. They want to be seen and examined personally by their doctors.” (H15)
- Legal and safety issues
  
  “You need to understand PDPA and the whole process. Yeah, so there are quite a few legal issues that we need to sort out” (H21)
- Widening of socioeconomic disparity in healthcare access
  
  “Most of our patients are travelling from the remote areas, they are extremely poor and they don’t have enough access to the sort of modern technologies” (H23)
  
  “As I told you because 80% of the patient is from the subsidised. I think it is difficult for them. In a private patient. Yes, we can do we have a special wing in our hospital, in private yes.” (H5)
Social media and technology

- Mobile phone applications
  “We created this software of our own, Android phone. We started giving telemedicine services to the community. The community health worker will carry an android phone in their pocket will walk from one house to another house and ask them for any consultation if they need. They will be connected to the GNRC doctor. That's how we are trying to help them now.” (H8)

- Social media platforms for information dissemination
  “We had separate Facebook pages for all of our different specialties. These were usually, in the local vernacular, in Tagalog. And here, we would have instructions on how patients would be able to seek remote consult with us, through phone or even through Facebook, messenger and Viber.” (H16)

- Media campaigns for public education
  “Administration stepped up their public campaign saying that hospital is a safe place to visit, if somebody thinks that they should visit the hospital. At the same time, we were educating the public that to minimise the visits to the hospital unnecessarily.” (H22)