COVID-19 pandemic: Hospital preparedness in a tertiary care hospital in North East India

Kawal Krishan Pandita¹, Topno Noor², Sambit Kumar Sahoo³

¹Associate Professor, Department of Hospital Administration AIIMS Bhopal, Madhya Pradesh, ²Medical Superintendent and Head of Department General Surgery, NEIGRIHMS, Shillong, ³Biomedical Engineer, NEIGRIHMS, Shillong, Meghalaya, India

Abstract

Background: The first case of Coronavirus was reported by World Health Organisation (WHO) on 31 December 2019. Due to its high infectivity and increasing mortality, WHO on 30 January 2020 declared the infection as public health emergency of international concern. Various measures were initiated and carried out by health care facilities to tackle the pandemic. Our experiences of hospital preparedness may help future health policies to tackle the pandemics. Method: Various guidelines given by Ministry of Health and Family Welfare, Centre for Disease Control, Indian Council of Medical Research were studied and analysed. The hospital layout plan was studied, modifications in the physical structure of the hospital as planned by the hospital authorities were observed and recorded. The impact of the new planning on patient management was recorded by the investigators. Results: It was observed that proper planning on the basis of laid down guidelines and the modifiable initial layout is very effective in the prevention and management of the pandemic. A total of 130 beds of the hospital under study could be separated from the main building with little modifications. Another important observation was dedicated leadership and coordination among different specialities ensuring successful planning. The investigators concluded that the new hospitals should be planned and constructed in such a way so that a major part of the hospital building can be converted to an isolation area with little modifications in the physical structure of the hospital at the time of pandemics.

Keywords: Communication, coronavirus, COVID-19, pandemic, telemedicine

Introduction

A new viral infection emerged in Wuhan, the capital city of China’s Hubei province in December 2019. The first case of Coronavirus was reported to World Health Organisation (WHO) on 31 December 2019.¹ This was later found to be a new strain of Corona virus named severe acute respiratory syndrome Coronavirus-2 (SARS-CoV-2) by the international committee on taxonomy of viruses as it shows similar genomic features to that of SARS-CoV which caused the pandemic in 2002.² Due to its high infectivity and increasing mortality, WHO on 30 January 2020 declared the infection as public health emergency of international concern.³ On 11 February 2020, WHO Director-General named the disease caused by SARS-CoV-2 as “COVID-19.”⁴ As a result of its rapid spread in various countries around the world, WHO on 11 March 2020 announced that the status of Coronavirus disease 2019 will be changed from epidemic to pandemic disease.⁵ India was not among worst hit countries till May 2020, but by the end of 2020, the country ranked top in the number of cases in Asian countries⁶ The number of confirmed cases is constantly increasing worldwide and each country is facing a crisis due to lack of a standard response to the pandemic. On 13 June 2020 at 10:59:29, the total number of confirmed COVID-19 cases across the world was 7,629,227. In India, 308,993 cases were reported as COVID-19 positive, out of whom 154,330 recovered while 8,884 succumbed to the illness. Around 18 months later, as of 14 December 2021 at
5:02 PM, the total number of confirmed COVID-19 cases across the world stood at 270031622. In India, 34703044 cases have been reported as COVID-19 positive, out of which 34138763 recovered, 475888 succumbed to the illness and 88993 are active cases. Meghalaya has 84698 confirmed COVID-19 cases, of which 83019 have recovered, 1476 succumbed to the infection since the time the pandemic started and 203 patients are active as of 14 December 2021. India currently has the second-largest number of confirmed COVID-19 cases in the world.

WHO, Ministry of Health and Family Welfare (MoHFW), Government of India (GOI), National Centre for Disease Control (nCDC), Indian Council of Medical Research (ICMR) and central pollution control board issued various guidelines and revised them from time to time to deal with the deadly viral infection. Our hospital adopted the expert guidelines and geared up for the challenge. Various measures were initiated and carried out in a well-coordinated and time bound manner. In view of the impending threat of the multiple waves of COVID-19 and other pandemics in the future, preparedness to face the challenge by the health care centres, be it a primary, secondary or tertiary level is the need of the hour. The number of PHCs, CHCs, sub-centres and district hospitals have increased in the past 6 years although not all of them are up to the standards set by Indian Public Health Standards.[7] The preparedness should be best possible within the existing infrastructural standards at every level of care. We need to select the best practices to prepare ourselves for future unforeseen pandemics. These best practices or what we call ‘standards’ can be adopted only when experiences are documented and shared by the health care facilities. Our study describes our experiences while dealing with the COVID-19. The motive of the present study is to share the experiences as a guide to the doctors, hospital administrators working in primary care set up in a village or a tertiary care hospital for preparing the health care set ups for future similar unforeseen situations.

Methodology

Relevant data from the Websites of WHO, MoHFWGOI, nCDC, ICMR, central pollution control board were studied and analyzed for applicability in our set up. On the basis of these guidelines, short terms and long-term plans were framed by the hospital administration. The impact of these new planning measures on patient management was studied. The initial layout plan of the hospital was retrieved from the engineering section of the hospital. The layout plan of the hospital was studied. The written plan developed by the hospital administration and the physical modifications by the civil engineering unit of the hospital were observed and recorded. The feasibility of the modification in the initial layout for segregation of suspected COVID-19 and routine patients was studied and the suitability of physical modifications in the initial hospital layout and structure were analyzed and recorded. All the notifications, recommendations, patient records from the COVID-19 areas were retrieved, studied and analyzed. Administrative approval for the study was obtained from the hospital administration.

Observations and Results

The hospital under study is a 590 bedded multidisciplinary hospital located in the North-East India. The main entrance to the hospital splits into two, which leads the patients and visitors to the Emergency and the out patient department (OPD) areas of the hospital. Under normal circumstances, these two paths are in use for Emergency patients and OPD patients, respectively. The emergency area has a patient examination area, resuscitation area, observation area and a high dependency area. OPD entrance leads to the OPD and Inpatient Department (IPD) block. IPD block has wards of all broad and super specialties.

Behind the main IPD block, at the extreme end of the hospital is a private ward block which has five floors numbered Minus 4 to 0 level. The lay out plan of the hospital depicts a separate entrance from behind the hospital connecting to minus 3 and minus 4 level, which were found closed and not maintained. This block has a capacity to accommodate 130 patients.

Hospital has five adult ICUs, one pediatric ICU and one neonatal ICU. Surgical ICU is located at the ground floor near the Emergency block.

Facility and its accessibility

The study of the layout plan of the hospital revealed that four of the five floors in the private ward block can be isolated from one another, so as to facilitate segregation of different kinds of patients like a suspected category on one floor and confirmed patients on the other floors with separate accessibility. That made it possible to divide the hospital facilities in to exclusive COVID-19 facilities and non-COVID-19. Initially, on 25 January 2020, 26 beds were identified in the private ward block at the minus 3 levels to be used for the confirmed COVID-19 patients. After the first COVID-19 positive case was reported in India on 30 January 2020, the hospital administration started working on re-organizing the existing facilities, so as to accommodate maximum possible COVID-19 patients.

The study of the lay out plan of the hospital led to the development of a modification plan. The engineering wing of the hospital was explained by the hospital administration for some physical modification in the hospital building in view of the new needs arising due to the COVID-19 pandemic. Exhaust fans were fitted in the isolation rooms to create negative air pressure in the rooms.

The reorganization plan was made in such a way so as to prioritize the new needs which arose due to the COVID-19 pandemic over the existing facilities. The new prioritization plan included the vacation of the canteen in front of the Emergency block to set up a screening area near the Emergency entrance. All the windows towards the Emergency and ambulance driver’s room were sealed. One separate patient waiting area was created by covering a part of the existing attendant waiting area in front of the screening area.
On 13 April 2020, the first positive case of COVID-19 was detected in the city. Twelve (12) contacts of the patient later turned out positive for COVID-19. These developments prompted to gear up for the next stage of preparedness. The complete minus 3 level in the private ward block was declared as the COVID-19 positive ward and the area at minus 4 level was vacated and declared as part of the COVID-19 management area. An existing ramp from behind the hospital was repaired and widened, so that the approach to the level B, COVID-19 area is separate from the main front entrance. The entrance to the private ward from the hospital side at level zero was closed. Beds were re-arranged so as to make level B a 130-bed capacity COVID-19 facility.

Surgical ICU with eight ventilators was designated as the COVID-ICU (level C). The central air conditioning outlets were sealed by the civil engineering unit and this area was fitted with exhaust fans to ensure air circulation of 16-20 cycles/minute.

The Emergency area with 16 observation beds was designated as COVID-19 ‘level A’ area. All suspected cases of COVID-19 were planned to be kept in this area till the reverse transcription-polymerase chain reaction (RT-PCR) status report is received. Consequent to that, the existing Emergency was shifted to the Orthopedics ward and Orthopedics ward to Female surgical ward, so that the non-COVID-19 patient care services are not hampered.

A fiber glass chamber for the collection of swab samples was installed in the screening area. On 16 April 2020, one more screening area was created before the entrance to the OPD area so as to ensure that patients attending the routine OPDs are first screened for any influenza-like illness (ILI).

**Communication**

On 1 February 2020, an official communication was circulated to the HODs and I/C sections about the guidelines of hospital preparedness and the hospital planning to tackle the emerging challenge. On 12 February 2020, a meeting was held, which included all the head of department (HODs) and I/C section heads to discuss the planning and the hospital preparedness. Standard operating procedure (SOP) for infection prevention and control were finalized and circulated to all sections and departments.

A number of review meetings were held subsequently to monitor the planning. A series of meetings of core team members were held every day in the office of the Medical Superintendent at 10 am which were attended by the Director of the institute as well. The decisions of the core committee meetings were conveyed to all the stakeholders.

**Education and trainings**

On 6 February 2020, the first training session on infection control measures was organized by the department of microbiology to demonstrate to the health care workers (HCWs), the correct technique of donning and doffing of personal protective equipment (PPE), swab sample collection and its transportation. These trainings were imparted in various batches by faculty of microbiology, faculty of General Medicine and Infection Control team. These trainings continued till all the doctors and other HCWs were trained.

**Infection control**

The hospital under study has a standing hospital infection control committee (HICC), which is a sub-committee of the patient safety committee. The committee meets at regular intervals and recommends on the basis of evidence, various measures for infection control in the hospital. The existing infection control measures were modified in view of the latest WHO guidelines. Sufficient IEC material in the form of banners, pamphlets of the WHO guidelines was printed and displayed in the hospital premises for public awareness.

As a hospital policy, different colours of linen are used on different days of the week in the patient care areas. To avoid mixing of linen from COVID-19 and non-COVID-19 areas, it was decided to use only one colour (white) in COVID-19 areas. Blue colour was decided to be used (twice in a week, Wednesday and Sunday) in place of white colour in COVID-19 areas and white coloured linen was stopped for use in non-COVID-19 areas.

**Tests (RT-PCR)**

From 11 March 2020, the microbiology laboratory of the hospital started RT-PCR for COVID-19. The nasopharyngeal swab of all the patients, suspected to be COVID-19 was taken in the screening area. Besides in-house samples, the hospital laboratory was catering to the samples received from other hospitals of the state. Eleven thousand four hundred and ninety-five (11495) nasopharyngeal samples for COVID-19 were processed in the microbiology laboratory of the hospital till 9 June 2020.

**Clinical management**

Department of General medicine was designated as the parent department to manage the Covid-19 areas A and B. HOD Anesthesiology through communication from Director was assigned the responsibility for the management of COVID-19 ICU, in addition to the main non-COVID-19 ICU.

On 4 February, one faculty of Respiratory Medicine was nominated as the nodal person for COVID-19. This nomination was communicated to all the HODs and I/C section heads with the advice to contact the nodal officer in case of issues related to the policy of COVID-19.

COVID-19 areas were divided into three (i) COVID-19 area A - Screening area (ii) COVID-19 area B -Isolation wards (iii) COVID-19 area C - COVID-19 ICU. A triage area before the entrance to the area A (screening area) was introduced to segregate patients having ILL. A self-declaration form was also introduced to be filled up so as to screen the patients of possible
contact with any COVID-19 patient for further precautions from the hospital side. Thermal scanners were introduced from 24 March 2020 at the entrances of the hospital to identify potential cases of infection.

One portable X-ray machine (300 mA) and one ultrasonography (USG) machine was shifted to level B to ensure patients in the COVID-19 area get these investigations done at the point of care.

One ambulance was dedicated to carrying exclusively the COVID-19 positive patients from area A to area B from outside the hospital so that there is no trespassing through the patient care areas of the main hospital. This hospital under study has a 20 feet wide metalized road surrounding the hospital.

A common pool duty roster of Senior Resident Doctors working in all clinical, para-clinical and non-clinical departments was framed. Similarly, a common pool of Junior Resident Doctors was also framed. The nursing staff roster was re-organized to draw nursing staff from all the patient care areas on a rotation basis to perform duties in COVID-19 care areas. Five groups were formed in each category. Each group was given an orientation training for Dos and Don'ts by the faculty of General Medicine before the start of their duty.

High risks HCWs, who had co-morbidities or pregnancy were spared from COVID-19 patient management duties on the recommendations of the Nodal officer. Four groups of JR/SR and sisters were posted to work in the COVID-19 areas for seven days. Another group of doctors and sisters were kept ready to work for the next seven days or replace the existing group in any emergent situation.

Six ventilators were procured by the Administration as emergency procurement and were installed in COVID-19 ICU to augment the existing numbers.

Routine OPD, IPD, ICUs, NICU and PICU services continued in the hospital uninterrupted.

**Tele-medicine service**

In the hospital under study, tele-consultation services to both COVID-19 and non-COVID-19 patients were started from 11 May 2020. A roster of doctors was framed for different days of the week and this roster was conveyed to the public through the local media, print as well as electronic in a press meet by the Director. Nine hundred and fifty-three patients availed of the service till 13 June 2020.

**Barrier precautions**

The hospital had some stock of PPE and N95 masks before COVID-19 was declared a pandemic. Due to lockdown declared on 24 March 2020 and also due to high demand of PPE and N95 all over the country, the stores of the hospital were able to receive very little supplies.

Re-processing of N95 and PPE on the basis of CDC guidelines was started on 24 April 2020 in one area on the back side of the hospital. One plasma sterilizer was shifted from central sterile supplies department (CSSD) for this purpose. Departments were issued code numbers to be written on their individual N95 respirators so that the N95 respirators are issued to the original user after re-processing. It was ensured that the health care workers enter the COVID-19 areas only after donning the PPEs. N95 masks, PPEs and hand sanitizers were provided to non-COVID-19 areas as per the MoHFW guidelines dated 1 May 2020.

**Biomedical waste management and de-contamination of the areas**

Sanitation officer under the supervision of the infection control team has delegated the authority to utilize whatever resources to ensure scientific disposal of the waste generated from the COVID-19 areas with strict adherence to guidelines issued on 25 March 2020 and revised on 18 April 2020 by the Central Pollution Control Board.

**Dead body management**

Sufficient number of dead packaging bags as per the recommended specifications were purchased by the stores and procurement department on the instructions of the core committee. The management of the mortuary was delegated to the senior medical social worker under the supervision of HOD forensic medicine.

**Discussion**

The investigators of the study retrieved the lay out plan of the hospital to study possible modification as per the requirements in view of emerging needs due to the COVID-19 pandemic and discussed in the core committee. A written plan was developed for desired modifications to ensure that the recommendations of WHO are met for adequate environmental ventilation. These small modifications in the existing design help to make the existing patient care area not only suitable to manage the patients effectively but also help to prevent the spread of the infection to healthy people like health care workers and patient attendants. These design modifications in line with the expert recommendations in the existing structure are usually possible at any level of patient care, be it a PHC, CHC, DH or a tertiary care hospital being simple and the financial implications being less. Shrestha et al also reported to have undertaken similar measures in their hospital to maintain adequate aeration.

During the study, it was observed that an escalation plan was developed after the detection of COVID-19 positive patients in the city. The escalation plan was implemented on an emergency basis and the whole of the private ward block was designated as a Level B COVID-19 care facility. Some modifications in the original structure like the closure of entrance from the hospital side, widening of the ramp leading to the newly designated COVID-19 care facility, shifting of some services to other areas of the hospital, mobilization of beds, renovation of washrooms
was done to ensure the creation of a separate 130 beds capacity COVID-19 facility. Carenzo et al.[18] have also described similar temporary long and short-term arrangements in their hospital in view of COVID-19 preparedness. The pro-active role of the hospital management, quick decision making and prompt implementation of the decisions was observed in every activity and it proved very useful to undertake such measures within the shortest possible time. It was observed in the study that the everyday review meetings in presence of the Medical Superintendent and Director were instrumental to complete the tasks in a time bound manner.

The resources of the hospitals are usually limited to the daily needs, be it materials, machinery equipment or human resource. The hospital management, therefore, needs to utilize the available resources thoughtfully, more so, the health care workers need to be facilitated so as prevent them from getting infected while dealing with highly infectious diseases like COVID-19. Keeping in view the safety of the doctors, technicians and other health care workers, decisions were made to ensure barrier precautions while dealing with patients. A fiberglass chamber for collecting swab samples was installed in the screening area of the hospital to prevent exposure of health care workers to COVID-19 infection at the time of nasal and throat swab collection. A screening area was also created to screen the patients so as to ensure that patients having ILI do not mix up with other patients attending the routine OPDs. Similar measures for screening of patients are also reported from other hospitals.[11,12]

Information exchange that is accurate and timely is a key to the effective management of the pandemic.[13] Precise, accurate and timely communication of guidelines or hospital decisions needs to be communicated through every possible quick medium to update the work force, so that their movement from the workplace in search of information is restricted. The timely dissemination of information to the concerned is the responsibility of the hospital administration at every level of the health care setting. In our study, we observed that official communications, expert guidelines of hospital preparedness, decisions are taken in the core committee meetings, official orders and circulars were ensured to be communicated to all stakeholders so as to have proper coordination of various activities to manage the COVID-19 pandemic. WHO guidelines for prevention from the COVID-19[14] were disseminated for the awareness of the public and the HCWs by the hospital management.

Education and training on infection control, donning, doffing and precautions around aerosolizing procedures remain a top priority for the protection of staff.[15,16] The investigators of the study observed that one of the earliest strategies adopted by the hospital administration of the hospital under study was to train the health care workers for the correct technique of donning and doffing of PPE, swab sample collection and its transportation. A series of training sessions were arranged by the department of microbiology to ensure training of all HCWs for the proper method of donning doffing of PPEs, sample collection and other hygiene practices.

In view of the interim guidance of WHO[8] the hospital infection control committee modified the existing policy of hospital control measures for effective and efficient management of the Pandemic. The investigators of the study observed that the HICC met regularly to analyse, modify and ensure implementation of guidelines by participating in infection control activities.

For optimum utilization of manpower and proper management of patients, it is imperative for hospital administration to re-arrange resources in such a way so as to prevent exhaustion of resources mid-way. This simple but important activity for the improvement of service utilization needs cooperation and coordination of HODs of various specialties and super specialties. In our study, we observed that the existing patient care areas were reorganized, so as to divide the COVID-19 patient care areas as (i) Area A, where after screening and triaging of patients, those with ILI with suspicion of COVID-19 were planned to be admitted till the confirmation report of RT-PCR is received. (ii) Area B- Isolation ward where RT-PCR confirmed COVID-19 patients, who do not require ICU care were admitted (iii) Area C- ICU designated to treat the COVID-19 patients who require ICU care. This pattern of division of patient care areas at various levels for effective management of COVID-19 pandemic was also reported by other hospitals across the world.[10,16]

Patients face a tough dilemma of risk of infection during hospital visits vis-a-vis denial of adequate care because of various measures to prevent the spread of the pandemic.[17] Another big challenge during the COVID-19 was the care of those patients who were suffering from other chronic or acute ailments. The utilization of telemedicine services to their fullest potential emerged as the appropriate answer. The GOI launched the e-Sanjeevani OPD, a National teleconsultation service, which has been adopted by many state governments as mandatory for healthcare providers.[18] In the hospital under study, due care was taken to ensure services to the patients who could not reach the hospital during the pandemic, by starting the tele-consultation services to both COVID-19 and non-COVID-19 patients in the second week of May 2020.

In the absence of a licensed vaccine or effective therapeutics for COVID-19, in addition to the non-pharmaceutical measures of hand hygiene and cough etiquettes, quarantine becomes a critical strategic containment and mitigation intervention towards the early detection and isolation of cases to break the chain of transmission and slow down the spread of the outbreak.[19] Although vaccination against the disease is now available, evidence of the development of herd immunity is still awaited. Training of HCWs in hand hygiene practices, IEC materials for cough etiquettes were included in the action plan of the COVID-19 management in the hospital.

COVI-19 pandemic led to disruption of supply chain mechanism and caused wide spread shortage of personal protective equipment and N95 masks. The possibility that N95 could be sterilized and re-used was explored. The National Institute
The administration of the hospital surge capacity in a tertiary level should have a part of the hospital planned in such a way during pandemics but also during normal circumstances. The structural design of the hospital under study is such that one part of the hospital could be isolated from the rest of the hospital, so that routine services and pandemic management service can be carried out under one administrative control, with the common resources by affecting minor physical changes. The structural design of the hospital ensured an almost perfect set up ready for the simultaneous management of the COVID-19 pandemic. New hospital building design planned at primary, secondary or tertiary level should have a part of the hospital planned in such a way that during normal circumstances the whole hospital can function as one unit to manage the routine patient services, and can be converted to an isolation area with little alteration if the need arises.

Lessons learnt

1. COVID-19 appeared in India on 30 January 2020 that is, within around one month from its birth in Hubei China and the next few months cases were reported from almost every part of the world. Our country was caught in an unprepared state when the lock down was imposed w.e.f 25 March 2020. The administration of Hospitals was feeling helpless for inadequate resources and infrastructure. From COVID-19 we learned that countries need to be prepared before another such pandemic stuck the world. The preparation should be a continuous process that begins from the time of inception of an idea to commission a hospital irrespective of whether a primary, secondary or tertiary level.

2. Trainings on hygiene practices and other infection control measures should be a routine practice.

3. A decisive and accessible leadership of the health care organizations manages unforeseen situations well.

4. Coordination and cooperation of all the sections and departments result in the efficient management of resources.

5. The infrastructure of information and communication technologies for patient care services need to be made more robust and accessible in primary care areas.

6. Every challenge poses a threat, but if we learn from our experiences, the future will be smoother.

Novelty

The design of a hospital should be such so that a part of it can be converted to tackle a disaster or a pandemic without affecting or least affecting the normal services.

Acknowledgements

The authors acknowledge the help and information shared by the core committee members, nodal officer COVID-19, engineering unit and the sanitation section of the hospital.

References

1. WHO Novel Coronavirus situation report 1 (2020) 1 5. Available from: https://www.who.int/docs/default-source/coronavirus/situation-reports/20200121-sitrep-1-2019-ncov.pdf?sfvrsn=20a99c10_4. [Last accessed on 2020 Jun 14].

2. Paudel S, Dangal G, Chalise A, Bhandari TR, Dangal O. The coronavirus situation: What does the evidence show? J Nepal Health Res Counc 2020;18:1-9.

3. WHO Novel Coronavirus situation report 11 (2020) 1-8. Available from: https://www.who.int/docs/default-source/coronavirus/situation-reports/20200131-sitrep-11-ncov.pdf?sfvrsn=de7c07_4. [Last accessed on 2020 Jun 14].

4. Di Gennaro F, Pizzol D, Marotta C, Antunes M, Racalbuto V, Veronese N, et al. Coronavirus Disease (COVID-19) current status and future perspective: A narrative review. Int J Environ Res Public Health 2020;17:2690.

5. World Health Organization, Director-General’s opening remark at the media briefing on COVID-19 (2020). Available from: https://www.who.int/dg/speechs/detail/who-director-general-s-opening-remark-at-the-media-briefing-on-COVID-19-11-march-2020. [Last accessed on 2020 Jun 06].

6. Chatterji P. Gaps in India’s preparedness for COVID-19 control. Lancet Infect Dis 2020;20:344.

7. sgfw_ch8.pdf. Available from: https://niti.gov.in/planningcommission.gov.in/docs/aboutus/committee/strgrp/stgg_fmhywel/sgfw_ch8.pdf. [Last accessed on 2021 March 03].

8. WHO interim guidance. Infection prevention and control during health care when novel is suspected (2020) 1-5. Available from: https://www.who.int/publications-detail/infection-prevention-and-control-during-health-care-when-novel-coronavirus-(ncov)-infection-is-suspected20200125. [Last accessed on 2020 Jun 06].

9. Shrestha A, Rajbhandari P, Bajracharya S. Hospital preparedness for outbreak at Patan hospital: Lesson learnt from COVID-19. J Nepal Health Res Counc 2020;18:142-3.

10. Carenzo L, Costantini E, Greco M, Barra FL, Rendiniolo V, Mainetti M, et al. Hospital surge capacity in a tertiary emergency referral centre during the COVID-19 outbreak.
in Italy. Anaesthesia 2020;75:928-34.

11. Vanderpuye V, Elhassan MM, Simonds H. Preparedness for COVID-19 in oncology community in Africa. Lancet Oncol 2020;21:621-2.

12. Kim YJ, Jeong YJ, Kim SH, Kim YJ, Lee SY, Kim TY, et al. Preparedness for COVID-19 infection prevention in Korea: Single centre experience. J Hosp Infect 2020;105:370-2.

13. Samina M, Tabish SA, Mufti SA, Ajaz M, Rehana K, Panditha K, et al. Role of hospitals in pandemics: Our experience. JIMSA 2012;25:3.

14. World Health Organization Coronavirus Disease (COVID-19) Advice for the Public. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public.

15. Griffin KM, Karas MG, Ivascu NS, Lief L. Hospital Preparedness for COVID-19: A practical guide from a critical care perspective. Am J Respir Crit Care Med 2020;201:1337-44.

16. Coumare VN, Pawar SJ, Manoharan PS, Pajanivel R, Shanmugam L, Kumar H, et al. COVID-19 pandemic-frontline experiences and lessons learned from a tertiary care teaching hospital at a suburban location of Southeastern India. Front Public Health 2021;9:673536. doi: 10.3389/fpubh.2021.673536.

17. Keesara, S, Jonas A, Schulman K. Covid-19 and health care’s digital revolution. N Engl J Med 2020;382:e82.

18. Mahajan V, Singh T, Azad C. Using telemedicine during the COVID-19 pandemic. Indian Pediatr 2020;57:652-7.

19. Mandal S, Bhatnagar T, Arinaminpathy N, Agarwal A, Chowdhury A, Murbekar M, et al. Prudent public health intervention strategies to control the coronavirus disease 2019 transmission in India: A mathematical model-based approach. Indian J Med Res 2020;151:190-9.

20. CDC. NIOSH Pocket Guide to Chemical Hazards - Hydrogen peroxide 2019, Centers for Disease Control and Prevention; Available from: https://www.cdc.gov/niosh/npgd0335.html. [Last accessed on 2020 Jul 28].