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Original article

Preparedness for establishing COVID-19 services during acute emergency of COVID-19 pandemic: Experience of a tertiary care TB and respiratory diseases hospital

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Background: The ongoing coronavirus disease 2019 (COVID-19) calls for setting up of well-equipped and dedicated health facilities to manage sick patients while protecting health-care workers and the environment. An ideal high-level isolation unit requires a high level of administrative commitment, availability of space, human resource and logistics.

Method: The experience of setting up COVID-19 care facilities on a noticeably short period in a tertiary TB and respiratory diseases institute in wake of the COVID-19 pandemic is being shared here.

Result: All the essential COVID-19 services were set up in record time of 8 days. A total of 115 COVID-19 patients were admitted. Out of these 89 patients were discharged in a satisfactory condition. There were 19 deaths, and 4 patients became critical and had to be referred to level 3 facility for ICU care.

Conclusion: This experience will help other hospitals in planning out the strategies and solve the difficulties they may face while opening a COVID-19 care facility under limited resources on an urgent basis.

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1. Introduction

India, especially the National Capital ‘New Delhi’ became the epicenter of the global pandemic during the second wave of COVID-19 in April 2021. The picture changed drastically when India began recording a dramatic increase in new cases from April 15 onwards, with more than 200,000 cases daily. On 30 April 2021, India became the first country to report over 400,000 new cases in a 24-hour period. This second wave in India was widely attributed to the B.1.1.7 (alpha) variant which had led to sudden rise in cases in the state of Punjab. Another possible reason was a native variant, called B.1.617 (delta), with two worrying mutations, that originated in Maharashtra, the worst affected state.

India’s capital, Delhi, announced a week-long lockdown on 19th April, after a record spike in cases overwhelming the city’s healthcare system. The positivity rate reached highest to 36.24% on 22 April 2021. The highest number of cases in a day in Delhi was 28,000 during the second wave in contrast to 8500 cases in first wave. According to one study, during the second wave, the mortality was about 40% higher as compared to the first wave.

The demand for oxygen increased drastically because the number of cases had risen exponentially. Also, probably due to more severe lung damage by the new variant, there was increased need for more ICU facilities and medicines for treating the tsunami of COVID-19 patients. More patients required oxygen support in second wave as compared to first wave (74.1% vs. 63.4%). There was an urgent need to further increase the in-bed capacity to tackle the increasing number of cases. Setting up COVID-19 services in such urgent situation in terms of isolation wards, provision of oxygen beds etc. at a short notice becomes a big challenge. An ideal high-level isolation unit requires a very high level of administrative commitment, availability of space, human resource and logistics. Herein, an attempt has been made to share the experience of setting up COVID-19 care facilities on a very short notice in a tertiary TB and respiratory diseases Institute in wake of the COVID-19 pandemic.

2. Administrative setup

The National Institute of Tuberculosis and Respiratory Diseases (NITRD) is a 470 bedded public sector tertiary TB care hospital under the Ministry of Health and Family Welfare, Govt. of India. It is a major teaching institution and a center of excellence in the field of tuberculosis and other respiratory diseases located in south of Delhi. The Director is the administrative head of the Institute. Considering the worsening situation in Delhi during the second wave of COVID-19, the institution took a decision to start a level 2 COVID-19 care facility for patients who are co-infected with tuberculosis and moderate category COVID-19 disease. Although the institute planned to start the COVID-19 services during first wave of COVID-19 in March 2020 however there were several considerations. Most admitted TB patients were malnourished, were already suffering from compromised lung functions and there were higher chances of mortality if co-infected with COVID-19. However, during this wave keeping in view the deteriorating health infrastructure in the city, the director of the institute took the decision to start COVID-19 care facility on 19th April 2021. As a first step, administrative committees were constituted with members from the hospital administration, respiratory medicine, critical care, microbiology, pathology, biochemistry, internal medicine and anesthesia. The committees were assigned various tasks and responsibilities and were instructed to work in a time bound manner. The committees had to coordinate with different departments, identify possible issues, provide solutions and establish services within a week.

3. Steps for organizing a response

3.1. Identification of a dedicated space for the COVID-19 care facility

The first step was to identify an area for screening and triage of suspect COVID-19 patients. A separate area in the emergency wing of the hospital was identified. The emergency ward already had the facility for rapid antigen test and for sample collection for RT-PCR. The patients were transported from the triage area to the respective ward from a separate access. This entire zone was labeled as red zone, and barriers with security guards were installed round the clock to ensure no movement of staff or materials from this zone to the rest of the hospital.

Next step was to identify and demarcate the site within the hospital to receive the diagnosed COVID-19 patients and to admit them in the identified wards. These wards needed to be separate from non-COVID-19 patients to avoid any transmission to the patients or to the staff. A separate block which consisted of two wards one 42 bedded ward for male patients and another 35 bedded female ward which had a separate access were identified.

Proper donning and doffing areas were marked, and protocols were created for donning, doffing as well as movement of items and personnel. The block was labeled as COVID-19 and to bring clarity, direction boards were put for patients and accompanying relatives. The guards as well as the civil defense volunteers helped the patients and relatives with directions.

3.2. Resource management committee

Resource management committee involved the medical superintendent, faculty in charge of the medical store and general store, nodal officer COVID-19, critical care in charge, other senior faculty members. The committee prepared a list of medicines, consumables as well as equipment necessary to run the COVID-19 care facility. Some of the equipment and medicines were needed immediately to run this new facility and hence were purchased immediately, these included personal protective equipment (PPE) kits, N-95 masks, pulse
oximeters, nebulizers, oxygen concentrators, three ply surgical masks, face shields, surgeons caps, foot covers, disposable gowns and drugs like remdesivir, dexamethasone, enoxaparin, doxycycline, azithromycin, ivermectin, HCQs, Vitamin C, zinc, methyl prednisolone and higher antibiotics (as per the COVID-19 management guidelines of Govt of India). Efforts were made to increase the liquid oxygen supply as increase in demand was expected after admission of COVID-19 patients. Hospital was already utilizing 1–1.2 metric tons of oxygen per day. Additional central oxygen points were created in the COVID-19 wards for continuous supply of oxygen. The committee took the decision to shift some of the equipments and consumables for the COVID-19 patients. These included NIVs like Bi-pap machines, defibrillators, crash carts, and other consumables. The existing inventory from different departments was shifted to strengthen the new facility with the necessary supplies and medications.

3.3. **Human resource committee**

The human resource committee consisted of two sub-committees: one for medical faculty members and resident doctors and the second one for other staff like nursing staff and multi-tasking staff. The responsibility of this committee was to post the health care workers (HCWs) required for COVID-19 duty in a rotational manner. It was decided that the HCWs would work for 7 days. A roster of resident doctors which consisted of two teams of two senior residents and two junior residents was made which worked in two shifts of 12 hours of morning and night each. The roster had to be reviewed from time to time based on the workload. Similarly, a roster of nursing staff and multi-tasking staff was made by nursing superintendent. A daily roster of faculty doctors was also made to take daily rounds on rotation. There was need for additional ward boys and cleaning staff in the COVID-19 wards as majority of the patients were bed ridden and oxygen dependent. For every four patients, one ward attendant and cleaning staff each were assigned to assist the patients with meals as well as personal hygiene and ablutions.

One of the constraints was the limited number of HCWs. Five of the junior resident doctors also contracted COVID-19 further reducing the manpower. To overcome this issue decision to curtail the timings of outpatient services and selective admissions was taken as a measure to free the supporting and nursing staff and mobilizing these staffs to other areas for smooth running of essential services.

3.4. **Provision of laboratory and radiology services**

It was decided to extend the laboratory work timings for all seven days of the week to run the laboratory services for various routine biochemistry tests like complete blood counts, liver and renal functions tests. Tests like D-dimer and CRP were outsourced till they could be started in-house. A separate portable machine for radiography was placed in the COVID-19 patient care area. CT scan of admitted COVID-19 patients if needed was done within a specific time in the evening and disinfection was done at the end of the shift. Technicians were trained in the donning and doffing process and were available on call for bedside x-rays.

3.5. **Development of standard operating procedures (SOPs)**

a) **Training of Doctors, Nurses and other support staff**: The staff poses a challenge as the HCWs were inexperienced with the COVID-19 protocols. Hence, all the cadre of HCWs needed to be trained on an urgent basis. The trainings were imparted for infection control practices, donning and doffing of PPE, sanitization and disinfection, movement of staff, patients, and materials inside this new facility. Other than HCWs, other auxiliary staff like radiology technicians, hospital engineers, security guards, multi-tasking staff and personnel handling bio medical waste (BMW) were also trained in appropriate PPE and other relevant infection control protocols.

b) **Biomedical Waste**: A higher amount of BMW was expected to be generated because of the extensive use of PPE by all the staff involved in patient care. Instructions were given to collect all the generated waste in double bags and to be disinfected as per the current guidelines. Personnel donned in PPE from the BMW department would visit these areas in every shift for collection of BMW waste. A separate agreement was made with the company responsible for disposable of COVID-19 waste as per the latest recommendation of state pollution control board and central pollution control board.

c) **Laundry**: Disposable linen, bed sheets, pillow covers, and gowns were used. These disposable one time use items were discarded as per latest BMW guidelines.

d) **Kitchen**: It was decided that food for patients will be prepared in house kitchen for admitted patients and will be delivered to their beds by support staff in disposable plates which will be disposed as per latest guidelines for general waste disposal for COVID-19 waste. Arrangement was also made for providing food to on duty staff from hospital kitchen only. Water was also served in disposable mineral water bottles to the patients and staff on duty.

e) **Referral of critical patients**: Decision was taken to call Centralized Ambulance Trauma Services (CATS) for referring critical patients requiring ICU care to a designated nearby level 3 facility. Also, attempts were made to coordinate with district administration to provide round the clock ambulance services equipped with advanced life support for above purpose. Subsequently a CATS Ambulance was stationed in the institute premises for priority referral of patients.

f) **Discharge of patients**: The same route by which the patients enter was also used for discharge of COVID-19 patients. If the patients were still hypoxemic or was in poor general condition even after COVID-19 negative status, he/she was shifted to general ward in a non-COVID-19 area for continuing the management.

g) **Death**: Arrangements were made as per guidelines for the dead patients. Instructions were given for the dead body to be wrapped in leak proof body bags and shifted to the mortuary by trained personnel donned in PPE. Four compartments were earmarked in the hospital mortuary for keeping COVID-19 dead bodies. The local governing body was instructed to undertake the responsibility of
transportation from the hospital mortuary to the area dedicated to performing the last rites. Two hospital staff also accompanied the dead body during transport to the crematorium.

h) Waiting area for the patient attendants: As per protocol, no patient attendants were allowed to stay inside the COVID-19 wards to avoid the risk of spread of infection. A temporary covered structure was created in an open space as waiting area for patient's attendants. The arrangement for sitting, drinking water and table fans were made in view of warm weather in Delhi during this time of the year. Daily briefing at around 11 AM about the status of the patients was done to the attendants by doctor on duty, in the patient waiting area using mike and sound system. The status of their patients was conveyed by the doctor's team so that the fear and uncertainty was allayed.

SOPs made were posted in relevant areas in changing areas, donning and doffing areas, wards, doctors' room, nurses' station, mortuary and BMW areas.

With all above measures in place the first COVID-19 patient was admitted in the institute on 27th April 2021. All the essential COVID-19 services were set up in record time of 8 days. Initially there were many issues like shortage of PPEs, difficulty in maintaining adequate staffing and supporting staff, shortages of critical supplies, materials, and logistic support. However, gradually with team effort and coordination with support from the administration, the COVID-19 facility was up and running.

4. Common challenges/limitations faced and solutions

1) Shortage of PPE: Shortages of PPE put staff and patients at risk. Hospital reported heavier use of PPE than normal, and this was contributing to the shortage. Local administration, state and central government came forward and helped in providing adequate PPEs, N-95 masks, oxygen concentrator, pulse oximeters and drugs like remdesivir which were scarce at that time in the open market.

2) Creating the space: The existing beds for non-COVID-19 patients had to be sacrificed for creating space for COVID-19 patients. The non-COVID-19 patients had to be shifted to surgery wards.

3) Difficulty in maintaining adequate staffing and supporting staff: Due to community transmission and high positivity rate, the staff exposure to the virus and subsequent infection, exacerbated the staffing shortages and overwork. Non-COVID-19 services and care of tuberculosis patients especially drug resistant TB patients need to be looked after for which there was staff shortage. Contractual staffs were hired to overcome the shortage on priority bases. Interviews were conducted to recruit resident doctors.

4) Inadequate training and knowledge in infection control practices of staff involved in patient care was also the concern, however rapid training of these staff by the infection control team helped in a timely fashion.

5. Strengths

1) There was a strong administrative will to start this facility starting from top to bottom and adequate cooperation among various departments

2) Being a tertiary respiratory hospital of the country and the vast experience of the able and knowledgeable faculty in the field of another infectious disease like tuberculosis, helped a lot in streamlining the protocol for management of COVID-19 patients

3) The wards in the institute are designed to treat tuberculosis patients which are well ventilated with natural ventilation. Windows and doors of the wards were kept open for proper ventilation. WHO guidelines advises following minimum hourly averaged ventilation rates for preventing airborne infections for natural ventilation, (a)160 l/s/patient (hourly average ventilation rate) for airborne precaution rooms (with a minimum of 80 l/sec/patient for new health care facilities and major renovations); and (b) 2.5 l/sec/m3 for corridors and other transient spaces. These guidelines were already being followed in the Institute.

4) Being a hospital dealing with critical respiratory patients presenting with respiratory failure, the oxygen supply to the hospital was sufficient. The oxygen distribution company committed to providing more stock in case of rise in demand.

Till date total 115 COVID-19 patients were admitted in our hospital from 27th April 2021 onwards. Out of these 89 patients were discharged in a satisfactory condition. There were 19 deaths, and 4 patients became critical and had to be referred to level 3 facility for ICU care. The mortality rate was comparable to other hospitals in Delhi caring for COVID-19 patients.

6. Conclusion

To conclude, there is a need for disaster preparedness, especially in a pandemic like COVID-19, which demands a sudden change in all pre-existing practices. Every hospital should have ready SOPs if disasters come. These SOPs should immediately be implemented as soon as the need arises. The objective should be to maintain conventional care for as long as possible and to avoid the crisis care. Internal factors must be closely assessed, including the number of patients, treatment capacity for COVID-19 patients and non-COVID-19 patients, and status of staff, space and supplies. External factors must also be closely monitored, such as the epidemiological development of the pandemic, the situation in other facilities within the region, hot spots of transmission, regulations by local health authorities and recommendations and novel scientific evidence. We share this experience for other hospitals which may find these steps helpful to them in planning out the strategies and solve the difficulties they may face while opening a COVID-19 care facility under limited resources on an urgent basis. These are particularly relevant to hospitals dealing with TB patients.
Conflicts of interest

The authors have none to declare.

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