

Review Article

Challenges in managing an emergency and trauma ICU during COVID-19 pandemic: Perspective from a tertiary care centre in western Uttar Pradesh (India).

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Abstract

In December 2019, a novel coronavirus (now named COVID-19) was identified as a causative agent for a cluster of pneumonia cases in Wuhan, China.¹ Till March 2020, India was one among 50 countries which identified patients tested positive for COVID-19.² One day curfew was imposed in the country on March 22, 2020 to forewarn the people about the danger the country was going to face. The government of India announced a nationwide lockdown for 21 days from March 25, 2020 with subsequent second, third and fourth lockdowns. This was done to reduce the transmission of disease and flatten the curve. The preparations to manage COVID-19 pandemic crisis began in Jawaharlal Nehru Medical College Hospital Aligarh, a tertiary care centre in western Uttar Pradesh by 15th of March 2020. In April 2020, it was declared as Level 2 COVID care hospital to deal with complicated and critical cases. The establishment of flu clinic, exclusive COVID-19 isolation ward, teleconsultation and widespread screening of patients by Reverse transcriptase polymerase chain reaction (RT PCR) were some measures undertaken to deal with the crisis. The increased burden of patients presenting with bronchopneumonia necessitated augmentation of the existent infrastructure and better utilization of resources. Emergency and trauma centre, JNMCH, AMU Aligarh was also no exception and reorganising emergency trauma ICU as COVID-19 suspect ICU made the functioning of the entire hospital a lot smoother during this unsustainable crisis situation. However, there were several challenges to overcome while designating an emergency and trauma ICU as COVID-19 suspect ICU. There is ample amount of literature available discussing the strategies for preparing a dedicated COVID ICU, however there is relative scarcity of literature on the challenges in managing an emergency and trauma ICU (ETC – ICU) during the pandemic. In this review, we discuss the strategies and planning for converting an emergency and trauma ICU into a COVID suspect ICU in a tertiary care centre in western Uttar Pradesh (India) during the pandemic and the challenges faced.

Keywords: COVID-19; pandemic; intensive care; challenges

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Timeline of Emergency Trauma ICU JNMCH, AMU ALIGARH

The emergency and trauma centre, JNMCH started functioning on 10th October 2018 and a nine bedded

High dependency unit (HDU) was also established. The HDU was later converted to nine bedded emergency trauma ICU (ETC-ICU) from 10th December 2019 to cater to the needs of the patient admitted in emergency and trauma centre. The ETC-

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ICU was designated as COVID-19 suspect ICU on 29th April 2020 with a plan to provide optimum care to the patients presenting in emergency and trauma centre, with heterogenous range of symptoms.

Basic strategy and Planning

Jawahar Lal Nehru Medical College and Hospital (JNMCH) is a tertiary care hospital located in Aligarh, a city in western Uttar Pradesh. It is a university affiliated hospital (Aligarh Muslim University) which is a central university. JNMCH was designated as level 2 COVID care centre in April 2020. The first COVID positive patient was admitted to isolation ward on April 22, 2020. All the nonessential OPD services and elective surgeries were postponed, however JNMCH being a tertiary care centre, the patients experiencing cardiovascular, neurological, gastrointestinal and other non-COVID surgical emergencies were being admitted in the hospital.³ The patients presenting in the emergency department were screened for COVID-19 depending upon the symptoms. With the rapid influx of critical patients and COVID-19 patients presenting with varied range of symptoms, there was a need of having a COVID suspect area and a COVID suspect ICU different from an isolation ICU where all the patients presenting to the emergency and requiring ICU care were managed till the RT PCR result was awaited. It was difficult to establish a COVID suspect ICU in the emergency & trauma center in a short span of time. Therefore, we had to convert ETC ICU into COVID suspect ICU, assuming all the patients to be COVID suspect unless proven otherwise by RT-PCR. During the early phase of the pandemic there was relative scarcity of literature on the range of symptoms, disease severity, progression, complications and definite routes of transmission of virus. While there are well established international guidelines for the management of COVID-19,⁴ there are unique challenges to the delivery of critical care in Indian set up. The challenges in converting the existing emergency and trauma ICU into a COVID suspect ICU were huge in terms of resource limitations, infection control, protection of healthcare workers (HCWs) and training of health care workers. The aim therefore was to maximise the containment to reduce spread without affecting the emergency services of the hospital. Maintaining critical care services to all the suspect patients, separated from other areas of the emergency and trauma centre, thereby allowing for segregation of staff, equipments and adequate rationalisation of resources in the emergency and trauma centre was considered paramount.

Infrastructure

The emergency and trauma centre JNMCH is the first point of contact for the patients presenting with any acute emergency. In addition to a fully equipped triage area there are dedicated medicine, surgery and paediatrics ward. The patients requiring emergency surgeries are managed in specialised operation theatres. The centre also has a dedicated radiology department which offers round the clock radiology services to the patients admitted in emergency and trauma centre.

The total number of beds in the emergency trauma centre, JNMCH is 134 out of which greater than 120 beds are connected to central oxygen supply. The emergency and trauma centre ETC- ICU has a total of nine beds and all other beds with central oxygen source were kept as reserve to be used as critical care beds in case the need arose. The oxygen supply is through a 10 kilolitres liquid medical oxygen tank.

Equipment

Since most of the equipments were diverted to the dedicated Covid Isolation ICU, we utilised available resources/ equipments of the hospital from other non-functional areas of the hospital. The dependency on immediate purchase and procurement was reduced as procurement was difficult because of lockdown and shortage. Adequate number of equipments required in ICU were ensured and these included:

1. ICU ventilators
2. BiPAP/ CPAP machines
3. High flow nasal cannula (HFNC) devices
4. Multipara monitors
5. Syringe pumps
6. Airway management equipments including video laryngoscopes
7. Portable X-ray machine
8. DVT Pumps
9. Miscellaneous

Drugs

Since all the patients admitted to COVID suspect ICU were considered positive until proven otherwise the inventory of various disposables and drugs was prepared in line with COVID Isolation ICU. The nursing incharge of each team was instructed to coordinate with the central drug store and non drug store. This was done to reduce any shortage of items and to maintain uninterrupted supply of items that would have occurred because of an increased patient scenario.

Human resources

Considering the mental and physical stress resulting in fatigue of healthcare providers accompanying this pandemic, duty hours were scheduled in six hourly shifts. Three anaesthesiology and three general surgery residents were posted in each posting supervised by a medical officer and an ICU consultant. In each six hourly shift three nursing officers, two attendants and two sweepers were also posted. Four shifts were 8 am - 2 pm, 2 pm - 8 pm, 8 pm - 2 am, 2 am - 8 pm. Each team was supposed to work for a period of two weeks which was then replaced by another team. A strict seven day quarantine after 14 days duty was mandatory for each team. The testing of staff was symptom based and any staff complaining of COVID related symptoms was tested and adequately quarantined and replacement arranged. Mobile phones dedicated exclusively for ICU were also arranged ensuring complete independent units. An effective communication between the residents, staff and consultants was established. The team coordinated with the COVID control room and any change in the protocol or strategy was timely updated. This ensured effective utilisation of the resources and prevented mismanagement.

Establish infection control measures

The vulnerability of Health Care Workers (HCWs) to infection was considered to be very high because of exposure to various aerosol generating procedures and longer time of contact with the patient.^{5,6} The importance of an effective infection control strategy to protect both the patients and the health care workers was understood and implemented in accordance with Hospital infection control committee (HICC) guidelines of the institute. Emphasis was laid on hand hygiene, safe donning and doffing techniques of personal protective equipment (PPE), eye protection and proper disposal as per the biomedical waste management guidelines⁶. The staff was regularly sensitised to infection control strategies⁷. The members of HICC took daily rounds of the ICU and ensured strict compliance of the infection control strategies. An effective communication was established with the nursing staff and residents about the safe practices to be adopted during pandemic.

Education and Training

Since the trained nursing staff was posted in COVID-19 isolation ward by rotation, the untrained staff from the wards was deployed in COVID suspect

ICU. It was therefore decided to thoroughly train the staff in the following aspects of COVID-19 management, before joining their duties in the COVID suspect ICU.

1. Sample collection
2. Proper donning and doffing techniques
3. Basic ventilator management
4. General care of ICU patients
5. Critical Care training
6. Basic ventilator management including set up and trouble shooting
7. Transport of critically ill patients
8. Infection control
9. Biomedical waste management

Audiovisual aids, video clippings, powerpoint presentations, hands on training on the mannequins and ventilators were different teaching modalities employed to train the staff.

Dedicated trainees were identified from Departments of Anaesthesiology, Pulmonary Medicine, General Medicine and Microbiology to train the staff on different aspects of critical care management and Infection control. An online refresher course was also organised for residents and the staff on various aspects of COVID-19 management. The training programmes were coordinated by a nursing instructor.

Safety of healthcare workers

Ensuring and emphasising the safety of healthcare providers was considered paramount. A full set of PPE, inclusive of goggles, face shield, mask, gloves, coverall/gowns, head cover, and shoe cover as defined by the government of India were provided to the doctors and staff working in the ETC-ICU.⁸ The number of PPE and masks required was calculated as per the duty hours and persons posted in ETC-ICU and accordingly a monthly quota for the ICU was fixed to maintain an uninterrupted supply of PPE and masks. Sanitizer vending machines were installed in dedicated areas to make them readily available when needed. Strict adherence to droplet and contact precautions was practiced including hand hygiene, eye protection, and safe donning and doffing of PPE. Dedicated areas for donning and doffing were identified next to the ETC-ICU.

Testing protocol for identification and isolation of suspect cases

An effective triaging protocol was defined and patients presenting to the emergency and trauma centre were segregated depending upon the symptoms^{9,10}. The

patients presenting with any one of the criteria of severe disease (respiratory rate $> 30/\text{min}$ or $\text{spo}_2 < 90\%$ on room air) were shifted immediately to the COVID suspect ICU. Diagnostic testing for SARS COV 2 was performed in all patients with RT PCR. Samples were collected in the triage area by a dedicated nursing staff trained in specimen collection in presence of a clinician as per the Indian Council of Medical Research (ICMR) guidelines for sample collection for novel coronavirus¹¹. PPE (apron, hand gloves, face shield, N95 Masks etc.) was donned by the dedicated staff and all biosafety precautions were ensured while carrying out sample collection and packaging. Nasopharyngeal samples were collected with Dacron swabs and put inside the primary viral transport media tubes provided. Collected samples with proper labelling were safely kept in a triple container packing and transported to the laboratory under cold chain at the end of eight hour shift along with the proforma which identify the patient and the specimen.

After a negative RT PCR test, the patients were shifted to other areas of the hospital while patients with positive report were shifted to COVID isolation ICU. To further limit the spread of the infection to other areas of the hospital in case of a false negative test, we ensured a double negative RT PCR report before the patient was transferred to other areas of the hospital. Concurrent timely shifting to other areas helped us in managing the resources more effectively and debulking of the emergency and trauma centre.

Transport of patients

A dedicated ACLS ambulance with a transport ventilator was used for all COVID positive patients to shift the patients to Covid Isolation ward. The transport was managed by anaesthesiology residents with full PPE and all necessary precautions.

Spacing

Since the COVID suspect ICU catered to all critical patients till their RT PCR COVID-19 report results, there was an issue of cross-infection. Negative pressure airborne infectious isolation rooms would have been ideal¹², however this was not possible in our set up. To minimise the risk of cross infection and maximise containment, all the beds were placed 2meters apart separated with physical barriers¹³. Emphasis was also laid on strict infection control measures.

Statistics

The first wave of COVID-19 pandemic lasted from April 2020 to September 2020. The total number of patients admitted in the ETC-ICU during the first wave were 200.60 of these patients presented with features of bronchopneumonia of which 18 turned out to be COVID-19 positive. Only 2 patients were positive out of 54 post-operative surgical patients admitted. All the 52 and 34 patients admitted from OBG and General Medicine respectively were COVID-19 negative. Due to dedicated and sincere team efforts there was no mortality in the COVID suspect ICU. During the course of the first wave only one health care worker posted in ETC-ICU was infected, with mild symptoms and joined his duties after adequate treatment and completion of the isolation.

Challenges

COVID-19 pandemic presented as a health care emergency of an unprecedented nature. The experience to deal with such a situation was lacking in our set up. The practice policies and protocols were not defined in the initial stages and the authorities kept modifying them depending upon the situation which was dynamic and rapidly evolving. The patients presented with heterogenous range of symptoms from being asymptomatic to acute respiratory distress.

Due to sudden increase in number of patients presenting to the emergency and trauma centre there was always a relative shortage of ICU beds and segregation of patients was also difficult in the emergency. Since ours is a combined trauma and COVID-19 suspect ICU there was always a risk of cross infection which had to be dealt accordingly. Infrastructure was not enough to cater such a huge population so that there was always a need of increasing the number of ICU beds which was not feasible in a resource limited setting. Encouraging and motivating the mentally exhausted staff was another challenge presented throughout this period. Since RT PCR is the only diagnostic test done in our institution and lack of availability of other tests such as rapid antigen test, CB tru NAAT, point of care testing resulted in delayed transfer of patients from the ICU. All these challenges demanded thoughtful planning and integrated approach which was fulfilled by commitment of all the personnel involved.

Conclusion

COVID- 19 pandemic is a rapidly spreading disease caused by a novel virus. Because of the rapidity

and scarcity of standard operating protocols the emphasis was to define local practice and policies and continuous review of the methods for prevention and treatment. Since JNMCH was a Level 2 COVID care hospital, there was an influx of patients suffering not only from COVID but other emergencies also which needed admission. The efforts taken by the hospital administration and our decision to convert ETC ICU as COVID suspect ICU in the emergency and trauma centre helped us immensely in managing the crisis. Segregation and smooth functioning before the transfer of patients from COVID suspect ICU to main ICU or COVID isolation ICU was possible because of this approach. This helped us in rationalising the resources in an effective manner. However, the situation was dynamic and demanded frequent change in practice and policies. Each health care system needs to evolve their protocols to balance safety and optimise resource utilisation.

“We don't grow when things are easy, we grow when we face challenges”

The challenges and the learning experience during

the first wave of the COVID-19 pandemic prepared us for the dreadful second wave. The established COVID suspect ICU in the emergency and trauma centre, trained manpower and established protocols during the first wave of the pandemic helped us to tide over the second wave in a more effective manner.

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Authors contribution

Data gathering and idea owner of this study: Dr Obaid Ahmad Siddiqui, Dr Farah Nasreen

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