Commentary

Preparing for a COVID-19 pandemic: Redefining roles of multidisciplinary team in a large tertiary hospital in Rajasthan

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ABSTRACT

Through this manuscript, we would like to share our experience with building a COVID hospital, allocating duties, planning and managing supplies during COVID-19 pandemic. This manuscript is prepared by the Doctors of various specialties with vast experience involved in actual planning of the infrastructure and resources. This comprehensive manuscript will help teams to prepare and train, stockpile necessary equipment and prepare their staff to deal with current crisis if there is a surge in infected cases.

Keywords: COVID-19, hospital, preparedness, pandemic, Rajasthan

Introduction

"On 31st December 2019, the World Health Organization (WHO) China Country Office was informed of cases of pneumonia of unknown etiology detected in Wuhan City, Hubei Province of China. On 7 January, 2020, Chinese authorities identified a new strain of Coronavirus as the causative agent for the disease. The virus has been renamed by WHO as SARS-CoV-2 and the disease caused by it as COVID-19".[1] COVID-19 pandemic is a difficult time for both health care workers (HCWs) and society; and presents a unique challenge for both developed as well as developing countries. Developing countries face a greater task, as the pandemic has the propensity to overwhelm their healthcare system, which is strained even under normal circumstances. Inadequate preparedness and lack of knowledge about the disease may lead to exhaustion of health care facilities. Effective response and preparedness of the health care system during the period of crisis and pandemic are vital for health system

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resilience.[2] Lack of proper strategies and poor implementation may lead to early collapse of the health system. This may make the health system prone to become epicentre for the spread of infection and increase the morbidity and mortality.[3] Infection among health care workers will increase the apprehension in the general public regarding hospital-acquired infections. A resilient health care system is the key to the containment of infections and improves the outcome in hospitalized patients. This is a critical time for judicious utilization of health care resources especially in resource-limited countries like India. For effective management, consideration must be given to demography, geography, education level, and political preparedness. Various bottlenecks like illiteracy, poverty, religious fundamentalism, poorly trained staff, etc., need redressal to mount an effective response. Institutional permission was taken by the head of the Institute while drafting the manuscript. Patient data was not used in the manuscript so ethical clearance was not required.

Setting, Command, Control, and Task Force Co-ordination

AIIMS Jodhpur is an apex health care system, taking care of 1.2 crore population of western Rajasthan approximately equal to Wuhan. A pandemic poses a war-like situation on the society and nation, which requires a coordinated and calculated effort and strategy to win. The Covid-19 pandemic has created a panic like situation in all affected nations, especially with the way the pandemic has overwhelmed the healthcare infrastructure of even resource-rich countries. It has been a difficult time for health care workers and presents a challenge to the resource structure of developing countries, which more often than not are already strained and inadequate. This requires concerted and rapid efforts to overcome this unusual situation. With the first case appearing in India on 30 Jan, 2020 and in Rajasthan on 3 March, 2020, the All India Institute of Medical Sciences (AIIMS) Jodhpur started preparing to deal with this on-coming pandemic. This required creation of a war room which can deal with human resource, procurement and supplies, infrastructure re-allocation, training, infection control, patient movement control, etc., A Central Core Committee was created, which consisted of director, Administrative staff, head of departments of clinical specialties, Microbiology, Community Medicine, School of Public Health, Forensic Medicine, Biochemistry, and in-charges of medical and other stores, nursing, paramedical staff, and engineering services. A big hall was converted into a temporary command control center, which could accommodate all with adequate social distancing and ventilation. The WHO document of preparedness for pandemics also supports comprehensive management by a core committee.[4] This Central Core Committee started functioning from the first week of March.

The principal objective of the central core committee was to create infrastructure and allocate resources for effective patient care, preparing and training of human resource, procurement, and stocking of adequate stores including reserves, infection prevention and control, pharmacy services, laboratory services, security, engineering and maintenance, laundry services, food services,

cleaning and waste management and communication with the state and national registry. To achieve this various sub-committees were created, which would accomplish the given task and report daily to the central core committee for any administrative decision or removal of bottlenecks. A key responsibility of the core committee was also to evaluate and update guidelines and operational protocols as and when updated by the Ministry of Health and Family Welfare (MOHFW), Government of India.[4,5]

Staffing and Critical Area Operations

Pandemic preparedness committee decided to allocate one third healthcare resources at a time in a rational, ethical, and organized way so as to be able to do the greatest good for the maximum number of people without exhausting manpower. It was aimed to minimize the risk of exposure to healthcare workers. In Wuhan, around 50,000 patients suffered from COVID-19 over a time period of 4 months and $5 - 6\%$ of them required respiratory support.[6] As of 12 September 2020 in western Rajasthan, 99,775 patients have tested positive. Out of these 81,978 have recovered and 1214 have died.[7]

The hospital has been divided into 5 broad zones:
1. COVID screening desk (Triage zone)
2. Ward for COVID suspected cases
3. COVID area looking after stable patients with mild to moderate illness and
4. Critical Care ward with ventilator support

A realistic duty plan of healthcare workers was planned based on:
1. Allocation of healthcare resources in a rational and organized way so as to manage the maximum number of patients in the context of an escalating outbreak without exhaustion of manpower.
2. Deployment of resident doctors and nursing officers in groups according to core specialty and capability at various zones of the hospital as described below.[8]

Duty Roster: The duty roster comprising of Doctors from various specialties are shown in Table 1. General Considerations:

1. Each day duty is divided in three-shift of 8 hours each
2. Three teams of doctors have been designated for each ward.
3. A 15-day duty roster has been created in the non-aerosol generating wards which require only monitoring of patients cycle, with each doctor performing 5 days of morning, afternoon, and night shifts.
4. A 9-day duty roster has been created in aerosol-generating wards requiring intense monitoring, with each doctor performing 3 days of morning, afternoon, and night duties.
5. Those HCW exposed to COVID positive patients will undergo quarantine for 14 days after completion of the roster with aim to give them rest and allow them to recuperate.

Teams of junior and senior residents were constituted according to the working zones. Each team, included three junior residents

Table 1: Groups of resident doctors and their working zones		
Groups	Core specialty	Working zone
Group A	Non-Academic Junior Resident (MBBS) Doctors	COVID-19 Screening desk
Group B	Resident Doctors (MBBS) of Clinical and Para clinical Specialties not dealing with ICU care	COVID-19 suspected ward and COVID-19 positive stable patients ward
Group C	Senior (MD/MS) and Academic Junior resident Doctor (MBBS) of Medical and surgical specialties already running ICU/HDU	HDU for COVID 19 positive critical care ward with ventilator setup and MICU for COVID suspected serious patients
Group D	Senior (MD/MS) and Academic Junior resident Doctor (MBBS) of Medical and surgical specialties, Interns	Non-COVID Zone and Reserve team

of Group A and Group B for the COVID screening desk, COVID suspected wards and COVID positive stable patients ward, respectively. Total 25 teams were made and deployed as the wards were filled up by patients. For High dependency Unit (HDU) for COVID 19 positive critical patients, a team with three senior residents and three junior residents was constituted. The deployment of healthcare manpower is shown in Table 2.

A checklist was developed according to Indian Council for Medical Research (ICMR) guidelines to screen and test all suspected patients of COVID 19.[9] Separate areas were created to provide care to surgical/obstetric suspected COVID 19 cases as well as to handle brought dead or unresponsive patients to minimize the cross-infection. Prepared wards were able to maintain negative pressure within its premises. To minimize unnecessary exposure of health care workers to patients, video conferencing facility was created. These measures were helpful in handling the crisis in Italy.[10] Preplanning for these situations minimizes the chances of direct or cross infection to the HCW.

Wards were designated as suspect positive stable and corona critical care unit. As most of the patients were expected to have mild to moderate disease, junior residents of pre and para clinical departments were posted to take care of them in Covid suspect stable and Covid positive stable wards. This strategy was later supported by the guidelines issued by MOHFW.[5] This offered the following advantages:
1. Shorter work duration with optimum rest and quarantine: 15 or 9-day duty cycle in non-aerosol generating or aerosol-generating wards followed by 14 days quarantine. The duty cycle would be repeated after 3 months.
2. Management of the maximum number of patients in the context of an escalating outbreak without over fatigue of the manpower.
3. Non-exhaustion of clinical residents to allow for better handling of sick patients.

Space

AIIMS Jodhpur has a six-floor infrastructure with an inpatient capacity of 1000 beds. Currently, the top three floors are dedicated to COVID and the ground three floors are for Non-COVID patients. A "Screening" desk for COVID-19 is created on the ground floor next to "Emergency". Those patients suspected of COVID-19 at the screening desk (as per

the ICMR guidelines) are either referred to COVID suspect wards or SARI-ICU (severe acute respiratory illness) depending upon the clinical status. COVID positive wards (eight in number with total 220 beds; separate wards for male and female) for stable non-ventilatory patients are created on the fourth, fifth, and sixth floor. SARI-ICU is created on the fifth floor. COVID suspect wards are created on the fourth floor. Separate passage and lift are designated to reach the SARI-ICU and all COVID wards from the ground floor. Patients in COVID suspect ward or SARI-ICU who turned out to be COVID positive after testing (time required for COVID report around 12 − 18 h) are shifted to COVID positive wards or the COVID critical care unit depending upon the clinical status of the patient. COVID critical care unit is established on the fifth floor (two wards with 25 ventilatory beds each). The workflow at our hospital for COVID-19 patients is depicted in Figure 1. Three step-down COVID high dependency units are created in the sixth floor (30 beds in each ward) for shifting patients from COVID critical care unit who were weaned from the Ventilatory support. All the COVID wards including the SARI-ICU have separate donning and doffing area. Two operation theatres are earmarked in the ground floor of emergency for operating COVID patients.

Supplies

Preventing the spread of infection to and from HCWs and patients relies on effective supply and use of personal protective equipment (PPE)—gloves, face masks, air-purifying respirators, goggles, face shields, respirators, and gowns. Due to inadequate and lack of supply of good quality gowns in the initial phases, our COVID team designed its own customized PPE consisting of inner coverall, outer gown, shoe cover, and a face shield made of polypropylene sheet.[11] Disinfectant solutions (sodium hypochlorite, sanitizers, etc.) were purchased in bulk as advised by our hospital infection control committee. Ventilators, video laryngoscope, blood gas machines, portable X-ray machines, portable ultrasound machines were also purchased.

Capacity Building and Simulation Training

The central core committee after several brainstorming sessions reached the conclusion that the following four areas for capacity building were required to be developed:
1. Hospital infection control (HIC), personal protective equipment (PPE), and biomedical waste management for COVID-19

2. Management of respiratory failure including ventilatory management in the COVID-19 patients
3. Hospital preparedness and development of SOPs for COVID-19
4. Standard nursing care practices for COVID-19

Batch wise schedule was made with a maximum number of 30 attendees per batch, keeping in mind the principle of "Social Distancing". A well-ventilated E-Class room of capacity of 100 was purposively chosen to accommodate 30 persons only. Simultaneous sessions were arranged with different sets of trainers to complete training in a stipulated time of 10 days.

Liasioning with National and Regional Health Care Network

COVID-19 is an evolving situation. The protocols, guidelines, and advisories keep on changing and revising as per the available evidences. These guidelines are issued at the level of Union Ministry of Health and adopted with modifications at the State and District level based on the current situation. So, a dedicated team of doctors, hospital administrators, and public health personnel from the Institute are entrusted with the responsibility of liasioning with the local, regional, and national health departments for implementation of these guidelines.

Setting Up a Quarantine Facility

HCWs are not only are at a higher risk of infection but can also amplify outbreaks within healthcare facilities if they become infected. Identification and protection of HCWs who are exposed or at risk for exposure is absolutely essential as this is a scarce and non-renewable resource.

MOHFW has set up guidelines as per the current understanding of the pandemic and accordingly isolation refers to separation by way of admission and observation in a hospital setting. The Institution's core committee set up multiple facilities to effect separation and segregation of high and low-risk exposure HCWs and even optional facilities to enable residential accommodation of HCWs who reside in containment clusters and associated buffer zones.
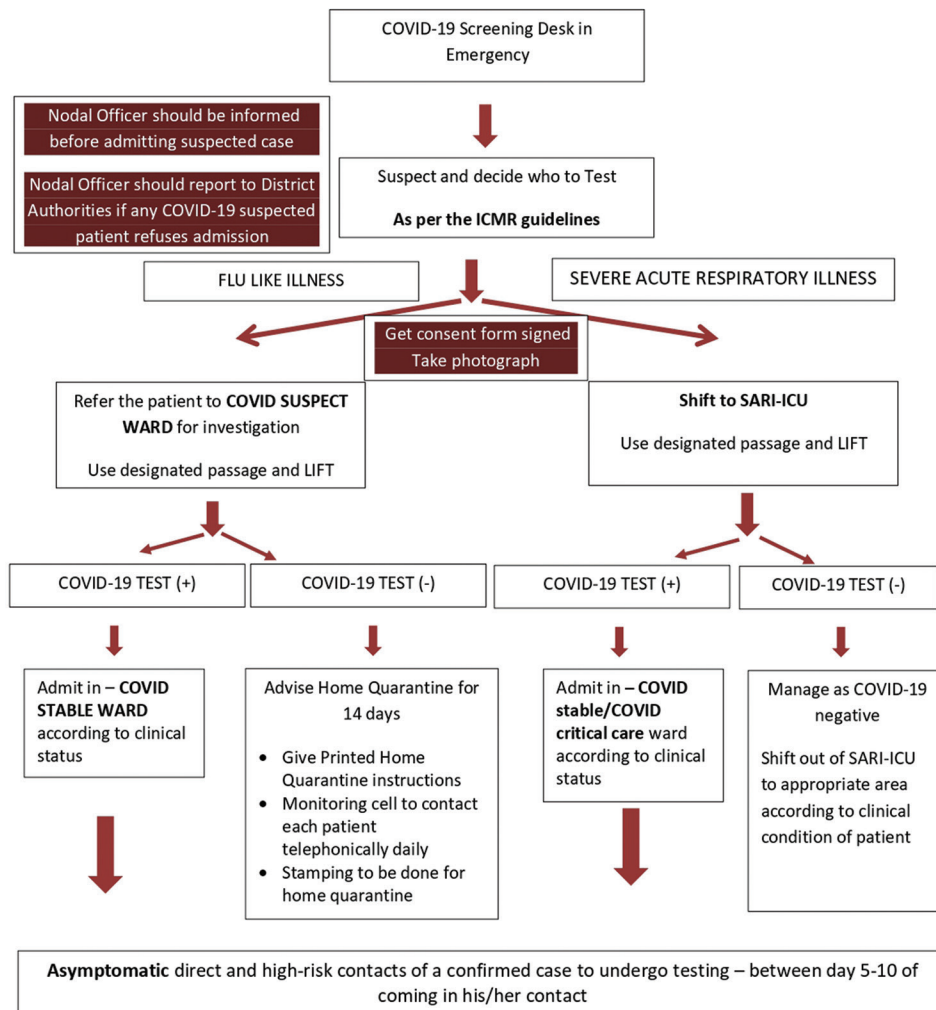

Figure 1: AIIMS Jodhpur Workflow for COVID-19

Table 2: Deployment of Healthcare manpower

Designated Zones	Working manpower in one shift of 8 h
COVID Screening desk	MBBS Doctor (Group A) - 1
	Nursing Officer - 1
	Hospital Attendant - 1
	House Keeping Staff - 1
	Data entry operator - 1
COVID suspect wards	Duty Doctor (Group B) - 1
	Nursing Officer- 1 each ward
	Hospital Attendant -1 each ward
	House Keeping Staff-1 each ward
COVID suspect serious patients	Duty Doctor (Group C) - 2 (One SR + One JR)
	Nursing Officer- 5 (1 for every two patients)
	Hospital Attendant -2
	House Keeping Staff-2
COVID positive stable patients ward	Duty Doctor (Group B) - 1
	Nursing Officer- 1 each ward
	Hospital Attendant -1 each ward
	House Keeping Staff-1 each ward
COVID positive Critical patients	For each ward-
	Duty Doctor (Group C) - 2 (One SR + One JR)
	Senior Nursing Officer- 1 per two ward area.
	Nursing staff - 1 per 2 beds
	Hospital Attendant - 2 per shift
	House Keeping Staff - 2 per shift

Management of the Dead in COVID-19 Outbreak

Necessary guidelines and SOPs were drafted by the central core committee, keeping in view the guidelines issued by MOHFW on the management of the dead. The SOPs are revised periodically in accordance with the Government of India guidelines. District administration and public health authorities were taken into the loop to ensure successful implementation and achievement of the desired outcome. The core areas of concern were to ensure that:

1. Infection prevention and control practices are followed by all those handling the dead in the hospital as well as outside the hospital, once the dead body is released.
2. Deceased get a humanitarian treatment and their families are offered safe funeral services.
3. Adherence to safe autopsy practices, whenever required.

To ensure infection prevention and control in handling of the dead

1. Regular trainings of the entire faculty and staff of the hospital were conducted in IPC practices and management of the dead in this regard. Training materials in form of videos were developed, and the same was made available for reference.
2. Preliminary disinfection measures of the dead bodies of COVID-19 confirmed/suspects were defined, which included closure of all wounds on the body, washing these with 1% hypochlorite solution, and packing the natural body orifices, etc.
3. Packing and securing the dead bodies with an aim to ensure that those handling the dead bodies do not come in contact

with body fluids or contaminated items. For the purpose, it was decided that all the dead bodies would be packed in at least two layers; one of which would be an impervious body bag, the exterior of which would be disinfected with 1% hypochlorite solution.
4. SARS-CoV-2 has been categorized as a Hazard Group 3 (HG3) organism, and hence, appropriate precautions need to be taken to minimize the risk to those handling of the dead. Appropriate PPE were procured for the healthcare personnel considering the preparation and packing of the dead bodies as a high risk and its transportation to the morgue as a moderate risk of exposure.
5. It was decided to release all COVID-19 confirmed/suspect dead bodies through mortuary, and a path for transfer of bodies from ward/ICU to morgue was defined. This was planned to restrict unwarranted movement of the relatives in the hospital and also to ensure that the dead bodies are safely kept in cold chambers till the arrival of the district authorities and relatives.
6. Deceased are given humanitarian treatment all throughout and their families are offered safe funeral services at the burial grounds and crematoriums

Adherence to safe autopsy practices

As per the guidelines of the MOHFW, autopsies should be avoided in COVID-19 deaths. Institution has drafted guidelines and SOP's for safe autopsy practices in cases where autopsy is to be performed for special reasons. As part of the standard infection prevention and control practices, all aerosol-generating procedures are strictly avoided during autopsy. Autopsy on COVID-19 dead bodies is considered as a high risk of exposure, and hence, full PPEs are provided to the team performing autopsies in such cases. Following autopsy, the dead body is duly packed as described above and handed over to the police/ district administration as per the laws of the land. Embalming of COVID-19 dead bodies is not allowed.

Key Messages

- Experts from various disciplines including administrators should be part of the planning team.
- Hospitals should have separate designated COVID and non-COVID areas
- Optional quarantine facility for healthcare workers should be available
- Resources (drugs, PPE, and masks) should be used judiciously.
- Measures for reuse and extended use for PPE and N95 masks should be incorporated in SOPs.
- Adequate stock of PPE, N95, and drugs should be ensured.
- Liasioning with healthcare physicians and administration at the district level is very important to decide on patient management and transfer protocol.

Conclusion and Relevance to Primary Care Physicians

We have shared our experience with building a COVID hospital, allocating duties, planning, and managing supplies

during COVID-19 pandemic. This manuscript is prepared by the Doctors of various specialties and vast experience involved in actual planning of the infrastructure and resources. This comprehensive manuscript will help all levels of primary and tertiary care physicians to prepare and train, stockpile necessary equipment, and prepare their staff to deal with COVID crisis if there is a surge in infected cases. Primary care physicians working in remote areas should be aware of all the terminologies, adequately trained in managing non-critical COVID cases, and be an integral part of the planning strategy involved in dealing pandemic. The guidelines are changing and evolving on daily basis, so it is very likely that protocols and procedures will require revision and updates on a daily basis.

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Conflicts of interest

There are no conflicts of interest.

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