A CASE STUDY ON SERVICE OPERATIONAL FLEXIBILITY STUDY IN COVID-19 ISOLATION UNIT AT 1000 BEDDED HOSPITAL IN GUJARAT, INDIA

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Abstract

COVID-19 infection is very new for the world and it impose a global threat in a manner that we faced for prolonged time worldwide. This study mainly focuses on Centre of excellence in COVID-19 unit's service operational flow of the NABH accredited tertiary level Hospital in Gujarat. From setting up of an isolation ward to day to day routine trouble shooting was worth having learning.

The main purpose behind choosing this organization is to know about how the reputed tertiary level Hospital in western India established infection control policy and facility design in place in order to keep both staff and patients safe and protected; as well as learn the complexities of Healthcare Service Operation management during this worldwide COVID-19 pandemic.

During this study period lots of new challenges in terms of communication between patient and relative, transportation of equipments and Hospital staff have been faced. Increasing demand for IPD beds and trained human resources were major issues. Oxygen demand, medication scarcity & high COVID-19 infection rate in the society were our prime issues to address. It was exploratory study where tried to portrait all experienced ground level challenges and the variables of decision making process.

From literature review and standard guidelines from W.H.O, Govt. of India; identified managerial issues mentioned in this study with service operations context. A list of recommendation also advised based to operational experience throughout the period.

Keywords: COVID-19 Excellence, Service Flexibility, Hospital Operations

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Introduction

About COVID-19 infection

As per World health organization (WHO), Corona virus is a huge group of virus which may cause infectious disease in creatures or people. In people, a few corona viruses are known to cause respiratory contaminations extending from the normal virus to increasingly extreme sicknesses, for example, Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The most as of late found corona virus causes corona virus infection is COVID-19.

COVID-19 is the irresistible sickness brought about by the most as of late found corona virus. This new infection and illness were obscure before the episode started in Wuhan, China, in December 2019. SARS-CoV-2 is the strain of corona virus that causes corona virus disease 2019 (COVID-19), the respiratory illness responsible for the COVID-19 pandemic[1].

Infection Control

Initial planning to run the facilities started in collaboration with Hospital doctors, management staff, microbiologist, epidemiologist and Hospital Infection Control Committee (HICC) members. This multidisciplinary team relied greatly on the information available about SARS COV2 infection to determine appropriate PPE and effective preventive measures for all. To maintain social distancing Hospital ensured marked circles outside, pharmacy and other waiting zones in the Hospital. A token based queue management system launched in the facility for less gathering and fast process. Provision to distribute masks to patient and / or relative entering to the facility made available by management. An exclusive rapid training launched to educate all staff regarding corona virus through online videos and education material distributed Hospital wide.

Clinical challenges

• Identifying context-relevant essential services

Hospital highly prioritized to maintain continuity of essential service delivery like Dialysis and Chemotherapy. Apart from these services, all planned surgeries and routine services delayed for a time being. Hospital started Tele-consultation and asked regular patients not to visit facility until unless it is very serious issue.

Standardization

• Establish simplified purpose-designed governance and coordination mechanisms to complement response protocols

A strategized pathway and process set in the facility to differentiate the need of care of COVID-19 Suspect and positive patients from other patients. To deliver safe and quality treatment to vulnerable patients, a well-defined process of patient screening, admission, proper supportive treatment have been shared with all staff associated with COVID-19 operation.

Patients who have confirmed positive reports with them came to Hospital facility directly from home or referred from other facility were admitted to Critical Care Unit directly. The total capacity of Critical Care Unit building is 102 beds comprises of 6 centrally monitored ICU wards in 3 floors (each ICU having a capacity of 17 beds).

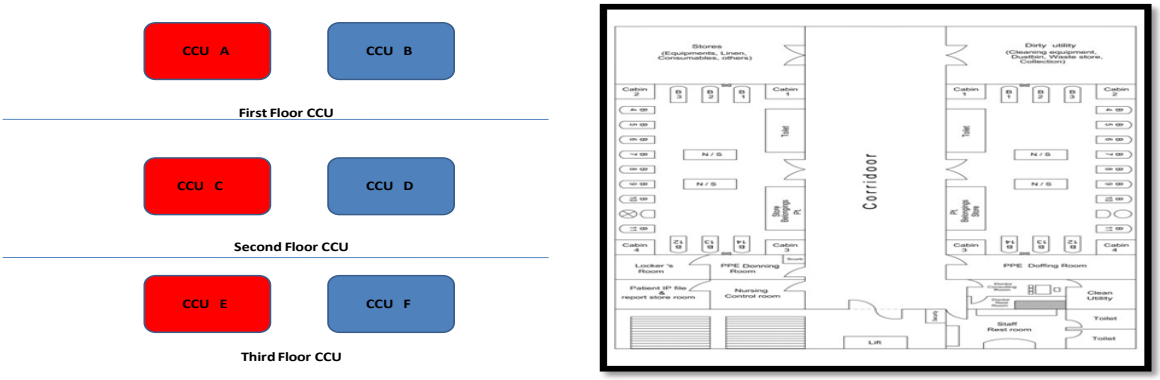


Figure 1: ICU Floor Layout

On each floor, wards are divided on basis of patient status i.e. Red marked CCUs (CCU A, CCU C and CCU E) are dedicated for COVID-19 confirmed positive patients and Blue marked CCUs (CCU B, CCU D and CCU F) are dedicated for COVID-19 suspect patients. Consultants of TEC and Flu OPD discussed with patient case before shifting or admission to CCU from their end considering the status and condition of the patient with bed availability of the ward. A proper

layout was set up for smooth patient flow in the COVID-19 unit.

Review of Literature

SR. NO.	Paper Name	AUTHOR	AIM	CONCLUSION
1	Report into a nosocomial outbreak of coronavirus disease 2019 (COVID-19) at Netcare St. Augustine's Hospital[2].	**Lesselles et. al.** [2]	Analyzed detailed timeline of patient cases constructed to generate hypotheses as to the spread of infection through the hospital[2].	The evidence suggests that indirect contact and fomite transmission were likely to be the predominant modes of patient to patient transmission[2].
2	Managing mental health challenges faced by healthcare workers during covid-19 pandemic[3]	**Greenberg N et. al.** [3]	The Aim of the study was to set out measures that healthcare managers need to put in place to protect the mental health of healthcare staff having to make morally challenging decisions[3].	The study concluded that healthcare staffs are at increased risk of mental health problems when dealing with challenges of the COVID-19. Healthcare managers need to proactively take steps to protect the mental wellbeing of staff. Staff can be supported by reinforcing teams and providing regular contact to discuss decisions and check on wellbeing[3].
3	COVID-19: operational guidance for maintaining essential health services during an outbreak: interim guidance, 25 March 2020[4]	**W.H.O**[4]	W.H.O carried out Interim guidance to medical institutes throughout the world about COVID-19 operational mechanism[4].	It concluded that WHO simplified purpose-designed in a such a way where Identify & Optimize service delivery settings. Identify mechanisms to maintain availability of 10 essential medications, equipment and supplies[4].
4	Hospital preparedness for COVID-19: a practical guide from a critical care perspective[5]	**Kelly M. Griffin et. al.** [5]	The Paper is aimed to encounter challenges like infection control, ICUs search capacity efficient bed management staffing & protocol develop focused on the clinical decisions.	The approaches here provide a potential roadmap centers that must rapidly adapt to the tremendous challenges posed by this & potential future pandemics.
5	Challenges and priorities in responding to COVID-19 in inpatient psychiatry[6]	**Luming Li et. al.** [6]	Aim to develop an open forum to describe the nuanced considerations in responding to COVID-19 in inpatient psychiatry facilities and to provide conceptual & operational suggestions regarding early priorities to prepare for COVID-19[6].	It concluded that Organized leadership and clear communication are identified as early priorities in pandemic response to minimize misinformation and address immediate challenges[6].
6	Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient[7]	**SeanWei Xiang Ong et. al.** [7]	Aim to conducted this study to understand the rate of contamination and the transmission medium[7]	It concluded that there was extensive environmental contamination by 1 SARS-CoV-2 patient with mild upper respiratory tract involvement. Toilet bowl and sink samples were positive, suggesting that viral shedding in stool could be a potential route of transmission[7].
7	Gender specific differences in COVID-19 knowledge, behavior and health effects among adolescents and young adults in Uttar	**Rajib Acharya et. al.** [8]	this study examines gender differences in knowledge of COVID-19 symptoms and preventive behaviors, as well as the adverse	It concluded that women were less likely to know the main symptoms of COVID-19. There was variation in knowledge by

	Pradesh and Bihar, India[8]		effects of the lockdown among adolescents and young adults[8]	education level, urban residence, and household wealth[8].
8	The rise and impact of COVID-19 in India[9]	**S. Udhaya Kumar et. al.** [9]	Aim to found out an easy way to decrease SARS-CoV-2 infection rates is to avoid virus exposure[9].	It concluded that People from India should avoid traveling to countries highly affected with the virus, practice proper hygiene, and avoid consuming food that is not home cooked. Necessary preventive measures, such as wearing a mask, regular hand washing, and avoiding direct contact with infected persons, should also be practiced[9].
9	A study on impact of COVID-19 lockdown on psychological health, economy and social life of people in Kashmir[10]	**Bilal Ahmad Bhat et. al.** [10]	Aim to survey the general public in Kashmir to better understand their levels of psychological impact, anxiety, depression and stress along with the economic downfall disturbing the social life of people during the initial stage of the COVID-19 outbreak[10]	It was observed that 76.5% respondents believe that lockdown is the temporary solution to prevent the spread of COVID-19 infection it can result in many new problems such as psychological problems (67.5%%), social problems (53.5%), economic problems (48.5%), academic problems if COVID-19 lockdown continues[10].
10	Applications of industry 4.0 to overcome the COVID-19 operational challenges[11]	**Shashank Kumar et. al.** [11]	Aim to conducted their study aims to identify the operational challenges faced by retailers in providing efficient services. The study also aimed to propose the roadmap of Industry 4.0 to reduce the impact of COVID-19[11]	They have identified twelve significant challenges for the retail sectors that are acting as operational barriers and provide the application of Industry 4.0 technologies to deal with it. Industry 4.0 can act as a significant driver for reducing the impact of identified challenges on retailers to fight against the pandemic[11].

Research methodology

Objectives

- To learn and understand the complexities and key challenges while establishing Centre of Excellence in Covid-19 Unit.
- To take care of service operations for patient flow of COVID-19 isolation ICUs (suspected and confirmed COVID-19 wards).

Study design

Exploratory research method has been used for this study. A parallel prospective observation, documentation has been presented with literature review. Both primary and secondary data have been used in this study.

Several tools were used time to time to handle the situation and address the contemporary challenges for smoothening of the COVID-19 operational flow. Handling the COVID-19 operation activity, it was very complicated learning and execution challenge for all of us. **"ADDIE"** is used greatly before implement or pilot run of any particular mechanism in the unit as a precautionary strategy; because every action may cause serious consequences for the same in next phase.

A-D-D-I-E

Analyze: Understanding the need and identifying the process. Bottleneck is most important before suggesting or executing any substitute change in the system. Analyzing the environment both micro and macro situation was very crucial to identify variables[12].

Design: A proper planning to address all challenges and process bottlenecks identified in the analyze part issued here. A brainstorming discussion on evidence based experience with effective stakeholder helps to design an effective plan of action. It is a blue print of the whole process[12].

Develop: Organize and managing resources in an efficient manner to allocate them properly in implementation phase. All resources which are needful in implementation phase are arranged here[12].

Implement: It is the most important phase where the execution may take place. The action steps which can address and solve all process bottlenecks are practically converted[12].

Evaluation: It involves with active monitoring to identify all deviation of implementation from the action plan and resurrecting the procedure as per plan through modification or changes[12].

Data collection

A proper surveillance system was set up to capture each-possible information of patients visiting Flu clinic, Trauma & Emergency Care (TEC) and COVID-19 isolation ward directly or through reference of other Hospital. To verify the data authenticity, both active and passive surveillance tools were used. A proper snapshot reporting system implemented in the process with proper timeline.

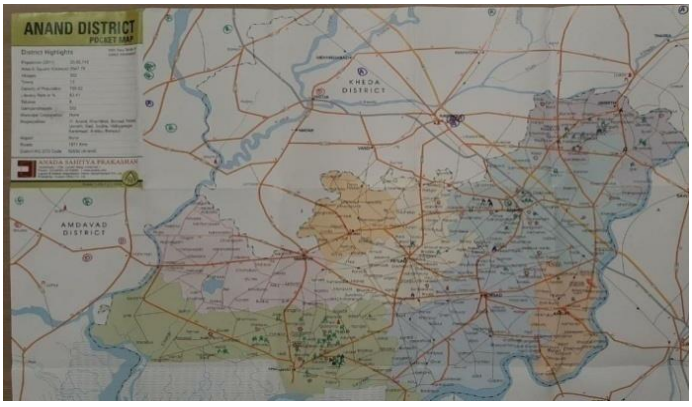


Figure 2: Geographical mapping for Covid-19 Positive cases

To identify high risk patients and improve triaging system for better performance, a COVID-19 positive patients mapping has been done on a district map based on the address proof of the patients who visited this facility. Soon staff understood, the areas where most of the people affected by the virus.

A total number of 113 COVID-19 positive patient's data were used who were diagnosed positive from March to July, 2020 and were admitted in the Hospital. These entire positive patients's address with possible accuracy tried to portrait in the district map for better understanding of affected regions.

Statement of problem

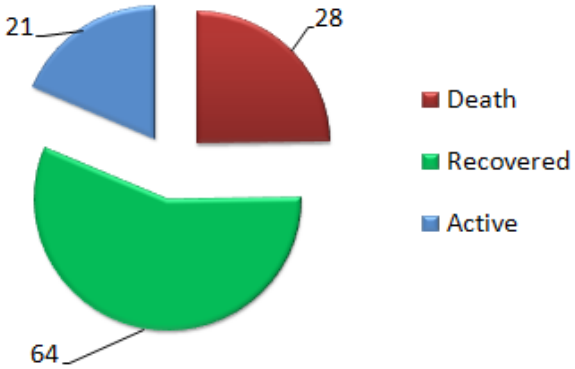
After a few months, major issues came in urge to address are follows:

- High contagious infection nature
- Patient urge to meet dear ones
- High hospitalization/ bed demand
- After quarantine, limited workforce (Doctors & Staff) strength

Data analysis

Datasheet have been analyzed using Microsoft office Excel 2007 version. All data was distributed equally and analysis has been done in an aggregated manner to ensure the individual data privacy. Both primary and secondary data have been used in this study.

The mental dissonance, anxiety and frustration, staff suffered through this period was a life changing mile stone to understand the worth and purpose of life.



Pie-Chart: Total COVID-19 Cases

Text of the study including analysis

A total number of 113 COVID-19 positive patients included in this study during the time period of March to July, 2020. Out of total sample size, 21 active cases, 28 death cases and 64 recovered cases.

Observation and findings

This study strongly urge for involvement of frontline staff in the decision making part for better compliance and outcome over period. Involvement of all level staff in decision making process, team work and interdepartmental coordination along with staff cross training is very important. By addressing these key issues, staff at all level doesn't only helped to overcome their prejudice, stigma or fear of unknown; it also helps to understand them the process, cause beyond their service and to perform in much better way. An active monitoring and good information dissemination by supervisor or team leader can help to avoid serious mental health conditions among healthcare professionals like depression, post-traumatic disorder.

Minimizing exposure

• Optimize service delivery settings and platforms

For any operation where the desire is to reach optimum outcome of the process, facility design plays a crucial role into this.

The gate 1 is exclusively used for the ambulances and other vehicles of COVID-19 patients. A general partition has been done to separate the way of general patients from COVID-19 patients. Even the staffs working in non-COVID-19 zone were also not allowed to enter to the COVID-19 zone.

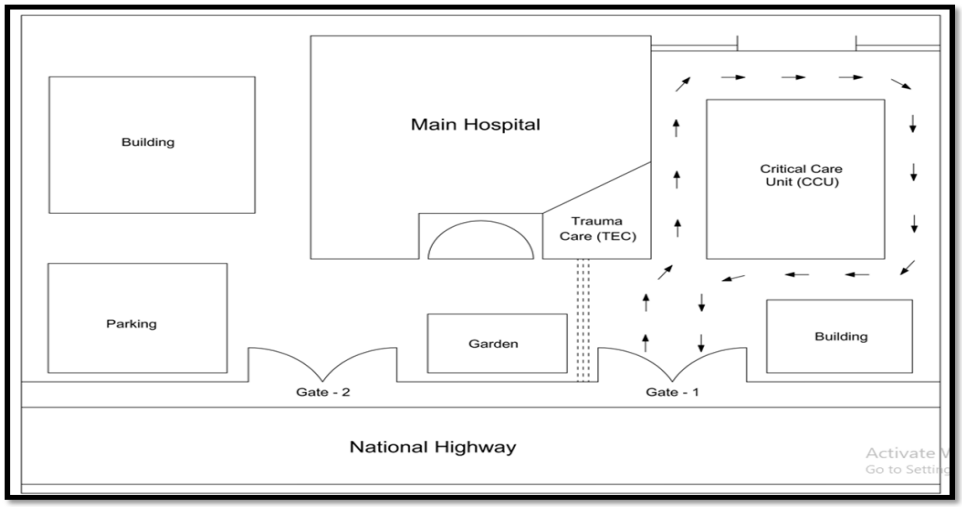


Figure 3: Separate Route Layout for COVID-19 Isolation Unit

Communication with families

Communication and daily counseling about the status of patients who are admitted in COVID-19 isolation ward is very crucial as family and close relatives as they can't visit the patient in ward. Digital platform used for ethical consent of

procedures and proper information collection, dissemination and documentation purpose. Two new tablets were installed to facilitate video calling between patients and their relative.

Intensive care unit (ICU) surge capacity

CCU building is 102 bedded fully equipped and modified facility based isolation building. Each ICU has 17 beds, centralized heat ventilation and air cooling (HVAC) system, vital parameter monitor, 4 separate negative pressure cabins. The building has total 53 portable ventilators to support vulnerable critical patients.

But as patient flow increases and there was a societal need for more Hospitalization of critical patients; Hospital ensure sufficient amount of bed by integrating 3 more step down units of ICU. Extended COVID-19 wards are situated in main building and adjoined by second Floor Bridge. To ensure restricted entry to COVID-19 ward, entry and exit doors to CCU G, CCU I and CCU J were sealed from HOSPITAL main building site.

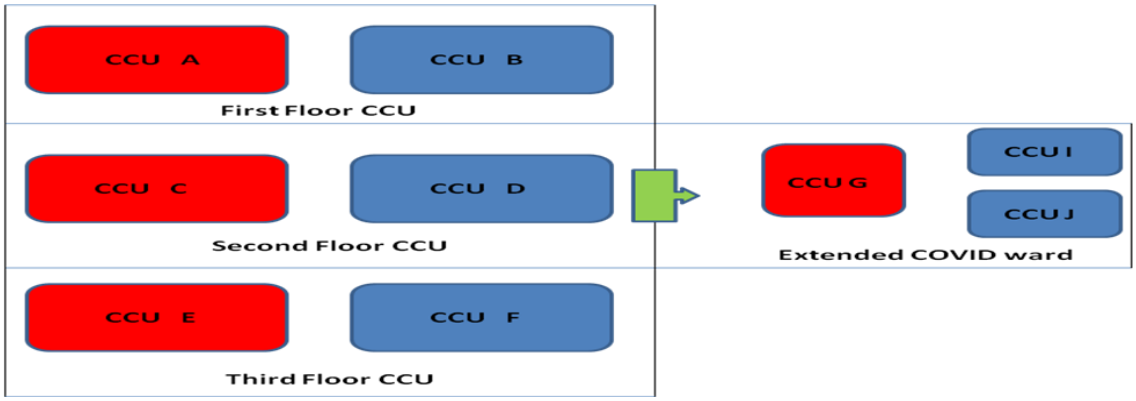


Figure 4: Extended ICU Floor Layout

Efficient bed management

• Established effective patient flow (screening, triage, and targeted referral) at all levels

Hospital appointed a clinical bed manager for better management of bed distribution and crisis handling. A board displayed outside of CCU building explaining distribution and current situation of COVID-19 isolation wards. Hospital reorganized its resources and staff to differentiate COVID-19 operations service based on the requirement and condition of patients admitted in the facility. A new action plan is formed with consultation of top management, intensivists, emergency physicians and admin staff.

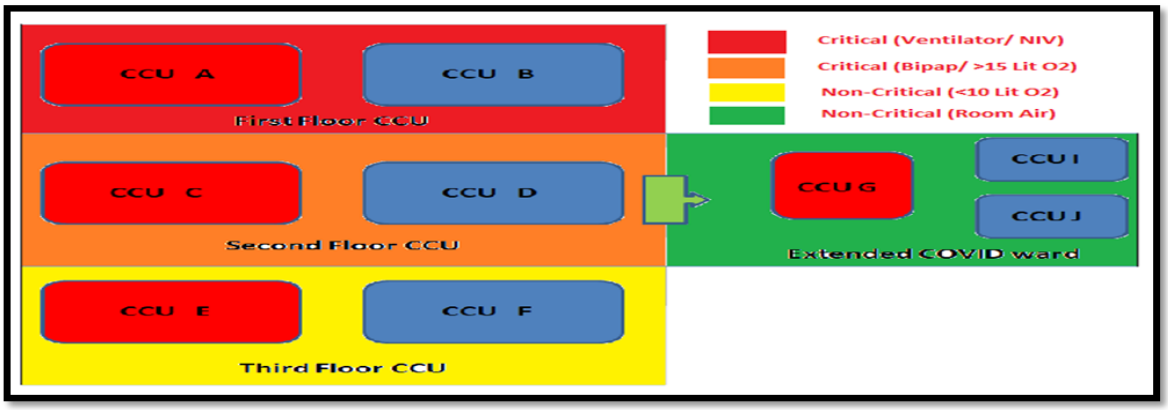


Figure 5: Critical Care Unit Floor Layout

Staffing/ Rational human resource allocation

• Rapidly re-distribute health workforce capacity, including by re-assignment and task sharing

A straight hike in the patient admission in the COVID-19 ward after Lockdown demanded for an efficient team to take care of the whole operation process 24x7, and meantime Hospital faced many challenges regarding long term posting of the staff as well as need of experienced staff in the COVID-19 ward. The patients were given beds based on their requirement and doctors & staff were posted in the zones accordingly.

After extension of COVID-19 isolation ICU and increasing patient flow and work overload; Hospital started a cross-check plan to ensure doctor scarcity problem throughout 24x7 hrs. For each floor, one senior consultant (Intensivist) was appointed and two residents for each ICU have been allocated. The resident doctors of chest medicine, medicine and anesthesia are dedicated to COVID-19 Critical ICUs while residents from other departments (Surgery, Skin, Pediatric, Gynecology etc.) dedicated to COVID-19 non-critical ICUs where consultant will be on call in case of emergency [Figure 4].

Ethical dilemmas

- Mechanisms were identified to maintain essential emergency services and care

As lockdown was imposed, patient relatives were not able to come along with patient as they belonged to containment zone. Whenever any patient admitted to the COVID-19 facility deteriorated or required any special procedure like intubation, central line or ET tubing; relatives did not agree to cooperate in the real time period. Many times few relatives gave negative written consent to doctors through digital platform for not to perform any lifesaving procedure on the patient but as medical professionals it is very hard to resist providing services to the patient.

Staff wellness

The staff who were only working in COVID-19 isolation ICUs, flu OPD and dedicated for supportive care of patients after COVID-19 ward stay were covered in special health insurance scheme by the institute. A regular health check-up, immunity booster medicines for all staff and Hospitalization facility with naso-oro-pharyngeal swab for RT-PCR testing on priority basis provided who were in need. The frontline staffs who were continuously working in COVID-19 ICUs were provided quarantined stay, food and other facilities free of cost by the institute. Hospital infection control committee (HICC) members were pro-active throughout the period to educate staff, patients, relatives and visitors about precaution measures and counseled staff who had any kind of contact (direct or indirect) with any positive case.

Conclusion and recommendations

The COVID-19 pandemic was a widespread concern as there was no vaccine discovered then and mental stress, anxiety during global lockdown impacted individual wellbeing greatly irrespective of race, gender and age groups. Importance of mental health and concept “One Health” is understood by the world.

In this study service flexibility presented from the management prospective focusing on the center of excellence to understand how to better manage communicable infection in a structured Hospital. The ground level operational challenges, decision making variables, brainstorming logical process tried to be addressed. A list of challenges and concerned issues were discussed. A global scarcity of resources, treatment guidance and preparedness was noticed. A fear of uncertainty, unknown nature of infection and magnitude create a lot of chaos but service operations has to be cooperated with solutions and ongoing learning throughout the process to overcome the scarcity of resources. This study strongly focuses on the solutions came out of box for concerned issues like facility structure, staff wellness, surge capacity and minimal exposure to the virus.

A bridge has been made between theoretical phenomenon and ground level operational facts. Practical challenges were acknowledged and tried to smoothen the process bottlenecks. Team work, interdisciplinary collaboration and mutual understanding help to overcome all kinds of challenges and fact avoidance.

This study is suggesting a series of recommendation to Hospital facility for smooth operation process, secured patient flow and safe quality treatment services in developing countries like India (considering the time period limitation of this study itself) as follows:

- To reduce or protect future outbreak, continuous good infection prevention and control practices should be followed. A better compliance strategy should be incorporated with standard guidelines which address these kinds of issues.
- The management of every institute should promote and nurture the culture where safe quality service is center of focus. Infection prevention and control practices play the vital role in the system at every level of organizational hierarchy.
- Induction, training, re-training, cross-training and continuous learning of all staff working in the facility is mandatory. This pandemic teaches us that a nation can’t build or create a pool of trained and experienced efficient workforce over night during crisis.
- Proper documentation with all incidences, plan of treatment and care and patient medical record file should be stored and communicated in soft version to minimize contact exposure.

- Monitoring system should in place with proper surveillance system to address early incidence report, indoor practice compliance.
- Hospital should have a proper triaging system in the emergency department to minimize spread of preventable infections. Separate zones, defined routes, proper sanitization and facility design are required in all sections of the facility.
- A separate entrance and exit route of these communicable or infectious wards should be assigned; maximum safety precautions for issues like sample collection, storage and transportation should be arranged and maintained at all level.
- Biomedical waste management should be very carefully executed and monitored during and after the pandemic.
- An integrated holistic approach towards Corona patients is very much required.

Limitations

Covid-19 is an ongoing threat to the World and demands continuous monitoring and time frame of this study is a prime limitation considered here.
Limited staff was also an important issue during this study. Mental trauma and stress associated with managerial decision were not addressed in this study.

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