ROLE OF TRAINING IN INFECTION CONTROL MEASURES FOR SAFETY OF HEALTH CARE WORKERS DURING COVID-19 PANDEMIC – A RETROSPECTIVE STUDY IN A MIXED COVID HOSPITAL

A Dissertation submitted to Panjab University, Chandigarh for award of Master of Philosophy in Social Sciences, in partial fulfillment of the requirement for the Advanced Professional Programme in Public Administration (APPPA)

By

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CERTIFICATE

I have the pleasure to certify that the dissertation titled ***"Role of training in infection control measures for safety of Health Care Workers during Covid-19 Pandemic – A Retrospective study in a mixed COVID-19 hospital"*** is a bona-fide research work carried out by Surgeon Commodore (Dr) Manish Subhashrao Honwad under my guidance and supervision. The dissertation is a result of his own research and to the best of my knowledge no part of it has earlier comprised in other monograph, dissertation or book.

This is being submitted to the Panjab University, Chandigarh, for the award of Master of Philosophy in Social Sciences in partial fulfillment of the requirement for the Advanced Professional Programme in Public Administration (APPPA) of the Indian Institute of Public Administration (IIPA), New Delhi.

I recommend that the dissertation of Surgeon Commodore (Dr) Manish Subhashrao Honwad is worthy of consideration for the award of M. Phil degree of the Panjab University, Chandigarh.

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DISCLAIMER

The findings, interpretations, views, recommendations and conclusions in the dissertation are those of the author, and should not be attributed in any manner to any authority, organization or individual.

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LIST OF ABBREVIATIONS

Acronym	Nomenclature
SARS-CoV-2	Severe Acute Respiratory Syndrome Coronavirus 2
COVID-19	Corona Virus Disease 2019
WHO	World Health Organisation
ICMR	Indian council of Medical Research
CDC	Centre for Disease Control
PPE	Personal Protective Equipment
IPC	Infection prevention and control
HEPA	High Efficiency particulate air
NIOSH	National Institute for Occupational Safety and Health
RCT	Randomised controlled trial
RT-PCR	reverse transcriptase-polymerase chain reaction
SARS	Severe Acute Respiratory Syndrome
MERS	Middle East respiratory syndrome

INDEX

LIST OF TABLES

LIST OF CHARTS/ FIGURES

LIST OF PHOTOGRAPHS / FORMS

ABSTRACT

Executive Summary

Key words*-Covid -19, Training, Health care workers, Infection prevention & control, psychological impact.*

1. *Coronavirus disease 2019 (SARS-CoV-2 and COVID-19) poses an occupational health risk to health-care workers[1,2,3],. Preventing intra-hospital transmission of the communicable disease is therefore a priority. A systematic review of the measures taken using a human engineering based safety model , the strategies and training measures given to protect health-care workers in a mixed COVID hospital are described along the domains of work task, technologies and tools, work environmental factors, and organizational conditions. The principle of attaining near - zero occupational infection remains an achievable goal that all health-care systems need to be achieve during the current pandemic[4,5]. Anaesthesiologists are at the frontline of treating COVID-19 cases because of their expertise in Critical care and handling airway management and oxygen flow devices apart from being critical care physicians in the Intensive care unit. They are also adept in handling monitoring equipment and ventilators[4]. It has been seen that due to their inherent training in infection prevention and control in the Operation Theatre and Intensive Care Unit they are the suited advisors in teaching and training staff on these issues[8,9]. COVID-19 pandemic is also a source of anxiety for many clinicians and front-liners. While there is a general tendency to feel anxious it is necessary to provide training about infection control measures to mitigate anxiety amongst the health care workers to reduce the psychological stress felt. Equally important is to promote emotional well being which is an essential*

component of healthy living and important to improve work efficiency. It is also observed that due to fear of the unknown anxiety levels were not constant but changing through the various stages of the pandemic and a deeper insight into this issue brought out several factors which if implemented correctly can mitigate any anxiety inducing crisis.

2. The health-care worker is at the center of the COVID -19 crisis in the clinical and hospital-based setting. All other system components, namely work tasks, technologies and tools, environmental factors, and organizational conditions, serve to enable the health-care worker to perform his or her role safely and effectively during the pandemic. It is imperative in a novel coronavirus pandemic where changing scenarios, guidelines and protocols are guiding healthcare practices current review of best practices and standard operating procedures and protocols to be emulated in future infectious disease outbreaks and to mitigate effects of the current pandemic on health care workers and patients.

3. The research objectives of the study were :-

(a) To document the Standard Operating Procedures to be adopted for infection prevention and control in hospitals treating COVID-19 patients.

(b) To identify the psychological and mental stressors faced by frontline workers treating COVID-19 patients in hospitals.

(c) To study the role of training in controlling the infection and stress mitigation in frontline workers treating COVID–19 patients.

(d) To re-define the role of Anaesthesiology & Critical Care specialities in training and requirements for the same.

4. The research was limited to the Indian Scenario specific to a mixed COVID-19 hospital INHS Sanjivani at Kochi in the Southern Naval command. Kerala was affected first during the pandemic and so, this hospital which was modified to serve as a Covid Care Centre for Armed forces personnel, ex-servicemen and their dependants and to provide manpower and expertise in Quarantine and Screening centres setup by the Indian Navy at Kochi. The hospital also provided the medical infrastructure for various Naval operations(Op Samudra setu) to bring back Indians abroad during the pandemic by Sea . Hence, this case study was conducted with assessment of concurrent national and international data to date to study aspects of Covid-19 training, infection prevention and control and psychological impact on Health Care workers in the Indian Scenario.

5. A 'Mixed' research strategy was adopted. To study the current primary and secondary data on SOPs, procedures related to Training, infection prevention and control in a COVID-19 treating hospital. The COVID-19 Pandemic has highlighted many public 'health aspects we need to be prepared for in case of an infectious pandemic. Many aspects which were needed in hospital working, design and in its infection prevention and control and training, staffing and management issues were studied and standard guidelines were specified using current protocols.

6. In our study we found a significant increase in post training knowledge from 45% to 85% after a two day training capsule for medical and non-medical volunteers for Covid duties while the 88% participants agreed an significant increase in confidence levels post training in handling Covid care duties (58% agreed + 42% Strongly agreed.The programme received praise and was emulated in all service hospitals and was aired on National television prime time .

7. In our study there was a significant percentage of personnel who showed features of Depression (57.1%), Anxiety (26%) and Stress (13%) in group I(paramedics) vis-a -vis Depression (None) , Anxiety (9.5%) and Stress (none) amongst group II personne (doctors, Nurses). This is statistically significant though further study is corroborated in view of small sample size(n= 56). It is generally known that level of education and training of a desired level can prevent Depression, anxiety and Stress and can thus be easily explained in the difference between Group I and II . It is obvious thar with training fear of the unknown and the confidence gained with just in time training will help in lower levels of depression , anxiety and stress especially amongst those with basic education as compared to experts in the field.

8. The potential risks faced by the frontline healthcare workers adds to their anxiety and working under protective equipment needs mitigation of their psychological distress . The various methods adopted and analysis into the reasons for mental anxiety needs further study in the Indian scenario. At present most infection care procedures and handling of ventilators and monitoring were primary skills of Anaesthesiologists. Role of Anaesthesiologists needs to be highlighted and aspects of training to be given to other doctors and nursing staff needs a review to provide optimal care to critical patients.

9. Knowledge on the protocols for training and skilling of health care workers of a hospital in dealing with COVID-19 cases helps in better infection prevention and control and mitigates stress faced by the healthcare workers and frontline staff treating Covid-19 patients.Indian data for stress / anxiety among frontline COVID-19 health care workers corelates with available literature on the subject to date. The role of

Anaesthesiologists needs to be highlighted as front-runners and team leaders in treating Covid- 19 cases in the operating room and intensive care unit in the pandemic.

Chapter I

ROLE OF TRAINING IN INFECTION CONTROL MEASURES FOR SAFETY OF HEALTH CARE WORKERS DURING COVID-19 PANDEMIC - A RETROSPECTIVE STUDY IN A MIXED COVID HOSPITAL

Introduction

1.0 Coronavirus disease 2019 (SARS-CoV-2 and COVID-19) poses an occupational health risk to health-care workers[1,2,3],. Preventing intra-hospital transmission of the communicable disease is therefore a priority. A systematic review of the measures taken using a human engineering based safety model , the strategies and training measures given to protect health-care workers in a mixed COVID hospital are described along the domains of work task, technologies and tools, work environmental factors, and organizational conditions. The principle of attaining near - zero occupational infection remains an achievable goal that all health-care systems needs to be achieved during the current pandemic[4,5].

1.1 Anaesthesiologists are at the frontline of treating COVID-19 cases because of their expertise in Critical care and handling airway management and oxygen flow devices apart from being critical care physicians in the Intensive care unit. They are also adept in handling monitoring equipment and ventilators[4]. It has been seen that due to their inherent training in infection prevention and control in the Operation Theatre and Intensive Care Unit they are the suited advisors in teaching and training staff on these issues[8,9]. The importance of having specialists in anaesthesiology to treat critically ill patients from COVID -19 to be at the helm of affairs in training of medical staff.

The future requirements and role of this speciality in training of life saving and infection control skills is rapidly re-emerging in the new normal as perceived after the pandemic.

1.2 COVID-19 pandemic is also a source of anxiety for many clinicians and front-liners . While there is a general tendency to feel anxious it is necessary to provide training about infection control measures to mitigate anxiety amongst the health care workers to reduce the psychological stress felt. Equally important is to promote emotional well being which is an essential component of healthy living and important to improve work efficiency. It is also observed that due to fear of the unknown anxiety levels were not constant but changing through the various stages of the pandemic and a deeper insight into this issue brought out several factors which if implemented correctly can mitigate any anxiety inducing crisis.

Statement of the Problem

1.3 The health-care worker is at the centre of the COVID -19 crisis in the clinical and hospital-based setting. All other system components, namely work tasks, technologies and tools, environmental factors, and organizational conditions, serve to enable the health-care worker to perform his or her role safely and effectively during the pandemic. It is imperative in a novel coronavirus pandemic where changing scenarios, guidelines and protocols are guiding healthcare practices current review of best practices and standard operating procedures and protocols to be emulated in future infectious disease outbreaks and to mitigate effects of the current pandemic on health care workers and patients.

Rationale / Justification

1.4 The COVID-19 Pandemic has highlighted many public 'health aspects we need to be prepared for in case of an infectious pandemic . Many aspects which are needed in hospital working, design and in its infection prevention and control and training, staffing and management issues need research and standard guidelines need to be specified.

The potential risks faced by the frontline healthcare workers adds to their anxiety and working under protective equipment needs mitigation of their psychological distress . The various methods adopted and analysis into the reasons for mental anxiety needs further study in the Indian scenario.

At present most infection care procedures and handling of ventilators and monitoring were primary skills of Anaesthesiologists. Role of Anaesthesiologists needs to be highlighted and aspects of training to be given to other doctors and nursing staff needs a review to provide optimal care to critical patients.

Research Objectives

1.5 The research objectives of the study are :-

(e) To document the Standard Operating Procedures to be adopted for infection prevention and control in hospitals treating COVID-19 patients.

(f) To identify the psychological and mental stressors faced by frontline workers treating COVID-19 patients in hospitals.

(g) To study the role of training in controlling the infection and stress mitigation in frontline workers treating COVID–19 patients.

(h) To re-define the role of Anaesthesiology & Critical Care specialities in training and requirements for the same.

Research Questions

1.6 The research questions that arise are as under : -

(a) What are the standard operating procedures to convert a hospital to receive COVID- 19 cases?

(b) What are the psychological and mental stressors and their mitigation for health care workers on the frontline of treating COVID- 19 cases?

(c) What training is required to be given to Doctors, Nursing staff, Paramedics to train them to look after COVID 19 wards and OPD patients?

(d) How has the impact of training in physical distancing and wearing masks been on person-to-person transmission of SARS CoV -2 and COVID-19 from present data?

(e) What is the role of training in the management of COVID -19 cases on the confidence and stress mitigation amongst health care workers ?

(f) What is the new role of Anaesthesiology & Critical care specialities in the training and infection control and treatment in the infective pandemic ?

(g) How is the new normal going to shape up the role of these key functionaries and what preparations are required for the same ?

Scope / Limitations/ Delimitation

1.7 The research is limited to the Indian Scenario specific to a mixed COVID-19 hospital case study with assessment of concurrent national and international data to date.

Research strategy

1.8 'Mixed' research strategy . To study the current primary and secondary data on SOPs, procedures related to Training, infection prevention and control in a COVID-19 treating hospital.

(a) Qualitative methods. An observational cross sectional study using a validated scale. Interview, on line - questionnaire and analysis of secondary data.

(b) Quantitative methods. Analysis of primary data and the results of the on- line questionnaire.

Research Design

1.9 **Mixed Research design was adopted**. Descriptive study and analysis of secondary data for infection, prevention and control and treatment of Covid- 19 cases . On line questionnaire to Doctors, nurses and paramedics using a validated form for psychological stressors namely DASS-21. Sample size – 50 (for Case study in mixed COVID-19 hospital). Data collection through structured, open ended questionnaires to all stakeholders, viz Doctors, Nursing Staff and paramedics. Qualitative descriptive study for role of Anaesthesiologists in treatment of COVID-19 cases.

Secondary Data Sources

1.10 (a) Research papers published by distinguished authors.

(b) National COVID-19 dashboard data.

(c) World Health organisation data on the subject.

Methods to be Applied and Data Sources

1.10 The method of research would be a balanced blend of Qualitative and Quantitative methods. Primary data was collected through Observation, Case study of a scenario of a mixed COVID-19 hospital, feedback through questionnaires and National COVID-19 dashboard. Secondary data was garnered from reports & guidelines from Min of Health and Family Welfare and WHO and ICMR data and data from a mixed COVID-19 hospital in the services.

1.11 Data for Training was collected from a training capsule conducted at INHS Sanjivani, a multispeciality Naval hospital in the Southern Naval Command

after clearance from its ethics committee addressed as “mixed Covid-19 treating hospital” in this study. The author was the Commanding Officer of the hospital and being a Senior Anaesthesiologist was directly involved in all aspects of the implementation, treatment and management of the hospital .

1.12 Data for assessing psychological impact and stressors was done by using the DASS -21 form , a validated questionaaire to assess levels of anxiety, depression and Stress amongst healthcare workers (doctors, Nurses and Paramedical Staff in the current case) . The Doctors and Nurses were further clubbed into one group while the paramedical Staff were grouped in another group to compare any differences. Anonymity was maintained during data collection and results were analysed using the DASS-21 scoring system , Students “t”test, Fischer exact test, and Mann Whitney U tests to find out significance.

1.13 A cross-sectional questionnaire was used to focus on doctors, Nursing staff and paramedical staff working in a mixed COVID-19 hospital in the COVID-19 wards and acute care areas. The impact on the anxiety, depression and stress levels amongst health care workers was evaluated with the help of DASS 21, a validated tool for such assessment being a simple questionnaire-based survey. The level of Anxiety, depression and stress was evaluated using the scoring system of DASS- 21.

1.14 The highly contagious nature of COVID-19 along with a changing knowledge on its transmission, symptoms and having no definitive treatment had induced mass hysteria worldwide. Many researches have shown that pandemics/ epidemics such as SARS, in the past have had profound effect on the mental health status of the individuals. The fear of getting infected, dying and the social stigma associated with

such pandemics often result in wide range of psychological impact including depression. Hence, significant attention needs to be given on the mental health status of health care workers too during such outbreaks. Health care workers including doctors, nurses and paramedical staff are at high risk of COVID-19 infections, due to direct contact with oro-pharyngeal secretions and aerosols. In view of the current pandemic situation several infection prevention and control protocols have been implemented.

1.15 The aim of this study was to assess the incidence of anxiety state, depression and stress amongst health care workers working with COVID-19- 19 patients in the hospital. The sudden and highly infectious outbreak has shown a rise in anxiety, depression and other stress related reactions. Doctors and Nurses and paramedics were handed out a questionnaire covering 21 points dealing with incidents and severity of stress, anxiety and depression on a scoring sheet , viz DASS-21 format. The DASS-21 is a validated scoring examination to assess he levels of mental health viz stress, anxiety and depression. The Depression, Anxiety and Stress Scale - 21 Items (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress.

1.16 The DASS-21 is based on a dimensional rather than a categorical conception of psychological disorder. The assumption on which the DASS-21 development was based (and which was confirmed by the research data) is that the differences between the depression, anxiety and the stress experienced by normal subjects and clinical populations are essentially differences of degree. The DASS-21 therefore has no direct implications for the allocation of patients to discrete diagnostic categories postulated in classificatory systems such as the DSM and ICD.

DASS21

Name: Date:

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you **over the past week**. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree or a good part of time
3 Applied to me very much or most of the time

1 (s)	I found it hard to wind down	0	1	2	3
2 (a)	I was aware of dryness of my mouth	0	1	2	3
3 (d)	I couldn't seem to experience any positive feeling at all	0	1	2	3
4 (a)	I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
5 (d)	I found it difficult to work up the initiative to do things	0	1	2	3
6 (s)	I tended to over-react to situations	0	1	2	3
7 (a)	I experienced trembling (e.g. in the hands)	0	1	2	3
8 (s)	I felt that I was using a lot of nervous energy	0	1	2	3
9 (a)	I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
10 (d)	I felt that I had nothing to look forward to	0	1	2	3
11 (s)	I found myself getting agitated	0	1	2	3
12 (s)	I found it difficult to relax	0	1	2	3
13 (d)	I felt down-hearted and blue	0	1	2	3
14 (s)	I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
15 (a)	I felt I was close to panic	0	1	2	3
16 (d)	I was unable to become enthusiastic about anything	0	1	2	3
17 (d)	I felt I wasn't worth much as a person	0	1	2	3
18 (s)	I felt that I was rather touchy	0	1	2	3
19 (a)	I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	0	1	2	3
20 (a)	I felt scared without any good reason	0	1	2	3
21 (d)	I felt that life was meaningless	0	1	2	3

Source : Lovibond, S.H. & Lovibond, P.F. (1995). Manual for the Depression Anxiety & Stress Scales. (2nd Ed.)Sydney: Psychology Foundation.

Recommended cut-off scores for conventional severity labels (normal, moderate, severe) are as follows:

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

NB Scores on the DASS-21 will need to be multiplied by 2 to calculate the final score (Source: Lovibond, S.H. & Lovibond, P.F. (1995). Manual for the Depression Anxiety & Stress Scales. (2nd Ed.)Sydney: Psychology Foundation)

1.17 **Depression Anxiety Stress Scales–21 (DASS–21).** The DASS–21 is a self-report measure designed to assess the negative emotional states of depression, anxiety, and stress (Lovibond & Lovibond, 1995; measure available from www.psy.unsw.edu.au/dass/). This 21-item measure is comprised of three subscales (Depression, Anxiety, Stress) that each contain seven items. The Depression subscale assesses dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest, anhedonia, and inertia. The Anxiety subscale assesses autonomic arousal, skeletal muscle effects, situational anxiety, and anxious affect. The Stress subscale measures levels of chronic non-specific arousal, assessing difficulty relaxing, nervous arousal, and ease to agitation, irritability, and impatience. Respondents use a 4-point response scale ranging from 0 (did not apply to me at all) to 3 (applied to me most of the time) to rate the extent to which each item applied to them over the past week. A sum score

is created for each scale and then doubled to correspond to scores on the 42-item DASS, which aids in the interpretation of severity of scores.

1.18 The mechanism of panic and anxiety is known as psychological stress wherein interaction of internal and external factors reduces the objective ability of an individual. The knowledge about the rapid spread and the restrictions imposed induces a general sense of anxiety which affects their routine day to day life. This affects the coping ability and is variable in different people. It is a known fact that military medical personnel are highly motivated are more accustomed to coping stress and have lesser anxiety levels and depressive episodes.

1.19 This study is discussed under the following heads ;

Chapter I : Introduction
Chapter II : Understanding Covid-19 and its SOPs
Chapter III : Review of Literature
Chapter IV : Training in Infection, Prevention & Control
Chapter V : Conversion to Mixed Covid -19 treating hospital
Chapter VI : Standard Operating Procedures for infection prevention
Chapter VII : Role of Anaesthesiologists in Covid-19 care in hospital
Chapter VIII Anxiety, Stress & Mental health of Health Care Workers
ChapterIX : Results and Discussion of Study
Chapter X : Conclusion and Recommendations
References and Bibliography
Annexures/ Forms

Chapter II

Understanding Covid -19 and its SOPs

(Standard Operating procedures)

2.1. **Origin of outbreak and aetiology :** A cluster of pneumonia cases of unknown origin were reported in Wuhan on December 31, 2019 which were all linked to the Huanan Seafood Wholesale Market where the variety of live and deceased exotic wildlife, including live bamboo rats, palm civets, badgers, and wolf cubs in are available. Within a few days, the offending agent was identified as a novel coronavirus (2019-nCoV) and WHO issued a warning on 19th January 2020 that the virus may spread from human to human. By 30th Jan 2020, WHO declared this infection as Public Health Emergency of International Concern (PHEIC) and by 11th Mar 2020, this epidemic was given the status of a pandemic.

2.2 The aetiologic agent 2019-n Cov or SARS-CoV-2 is a positive-stranded, enveloped RNA virus belonging to Coronaviridae family. The family derives its name from latin word '*coronam*' for crown because it has a crown like appearance under an electron microscope due to the presence of spike glycoproteins on the envelope.

2.3 Coronaviridae family consists of various viruses which can infect humans and several animal species. Around seven human coronaviruses have been identified till now: HCoV-NL63, HCoV-229E, HCoV-HKU1, HCoV-OC43, MERS-CoV, SARS-CoV and SARS-CoV-2. Sarbecovirus is the subgenus to which SARS-CoV-2 belongs and closely resembles a bat virus. In genetic terms, Chan et al. have proven that the

genome of the new HCoV, isolated from a cluster-patient with atypical pneumonia after visiting Wuhan, had 89% nucleotide identity with bat SARS-like-CoVZXC21 and 82% with that of human SARS-CoV. COVID-19 was introduced to humans through an intermediate animal carrier is the current belief and after the introduction to humans, the virus has shown human to human transmission through respiratory droplets and exposure to contaminated surfaces. The average incubation period ranges from 1 to 14 days.

Epidemiologic Characteristics

2.4. **Source and Mode of Transmission.**

Initially the animal-to-human transmission was presumed and later human-to-human transmission has been assumed. Isolation is considered the best way to contain this spread of infection. Transmission is believed to occur through respiratory droplets (particles >5-10 μm in diameter) from coughing and sneezing. Aerosol transmission is also possible in case of protracted exposure to elevated aerosol concentrations in closed spaces. A study disclosed that SARS-CoV-2 can be found on stainless steel and plastic for up to 2-3 days, , cardboard for up to 1 day, copper for up to 4 hours. SARS-Cov-2 can be found on floors, computers, trash cans and sickbed handrails as well as in air up to 4 meters from patients.

2.5. **Incubation Period**: Based on data from the first cases in Wuhan and investigations conducted by the China CDC and local CDCs, the incubation time could be generally within 3 to 7 days (median 5.1 days, similar to SARS and up to 2 weeks as the longest time from infection to symptoms was 12.5 days (95% CI, 9.2 to 18). On average, each patient transmits the infection to an additional 2.2 individuals.

2.6 Case definitions and contact-categorisation

WHO has updated the case definitions as follows.

Suspect Case:

A patient with acute respiratory illness {fever and at least one sign/symptom of respiratory disease (e.g., cough, shortness of breath)}, AND a history of travel to orresidence in a country/area or territory reporting local transmission (See NCDC website for updated list) of COVID-19 disease during the 14 days prior to symptom onset;

OR

A patient/Health care worker with any acute respiratory illness AND having been in contact with a confirmed COVID-19 case in the last 14 days prior to onset of symptoms;

OR

A patient with severe acute respiratory infection {fever and at least one sign / symptom

of respiratory disease (e.g., cough, shortness breath)} AND requiring hospitalization AND with no other etiology that fully explains the clinical presentation;

OR

A case for whom testing for COVID-19 is inconclusiveLaboratory Confirmed case

A person with laboratory confirmation of COVID-19 infection, irrespective of clinical signs and symptoms.

Updated definition of contact:

A contact is a person that is involved in any of the following:

• Providing direct care without proper personal protective equipment (PPE) for COVID-19 patients. Staying in the same close environment of a COVID-19 patient (including workplace, classroom, household, gatherings).

• Traveling together in close proximity (1 m) with a symptomatic person who later tested positive for COVID-19.

High Risk Contact:

• Touched body fluids of the patient (Respiratory tract secretions, blood, vomit, saliva, urine, faeces)

• Had direct physical contact with the body of the patient including physical examination without PPE.

• Touched or cleaned the linens, clothes, or dishes of the patient.

• Lives in the same household as the patient.

• Anyone in close proximity (within 3 ft) of the confirmed case without precautions.

• Passenger in close proximity (within 3 ft) of a conveyance with a symptomatic person who later tested positive for COVID-19 for more than 6 hours.

Low Risk Contact:

• Shared the same space (Same class for school/worked in same room/similar and not having a high risk exposure to confirmed or suspect case of COVID-19).

• Travelled in same environment (bus/train/flight/any mode of transit) but not having a high-risk exposure.

WHO Stages of a Flu Pandemic

Phase 1: The period during which no animal viruses are reported to cause infection in humans.

Phase 2: The first level of threat wherein a virus is confirmed to have transmitted from an animal to humans.

Phase 3: When sporadic, intermittent cases or small clusters of the disease are confirmed, but transmission from a human to another human has either not occurred or is not considered to continue to an outbreak.

Phase 4: It is the point where either human to human transmission or a human to the animal virus has caused an outbreak widely among a community.

Phase 5: It is when human to human transmission of the virus has caused the spread of disease to at least two countries.

Phase 6: It is the point at which the disease has declared a pandemic that has spread to at least one other country.

The duration for each phase can vary considerably, ranging from months to decades. It is not necessary that all the outbreaks will move to phase 6, and some of the outbreaks may even revert if a virus spontaneously weakens.

2.7. **Fatality Rate**.

The case fatality rate (CFR) is the number of people who die due to COVID-19 for every 100 people who developed COVID-19. A high CFR in a country implies that a high fraction of the reported COVID-19 patients are succumbing to the disease. Initially the CFR for India was amongst the highest in al South east Asian countries (2.95%), however, as per Govt statistics, it has fallen to 2.5% as on 20 Jul 2020. However, the numbers are climbing each day and the statistics as on 04 Aug show, 1.91 million confirmed cases, with 1.28 million cases who have recovered. Death accounted for are 39975 as on 04 Aug 2020.

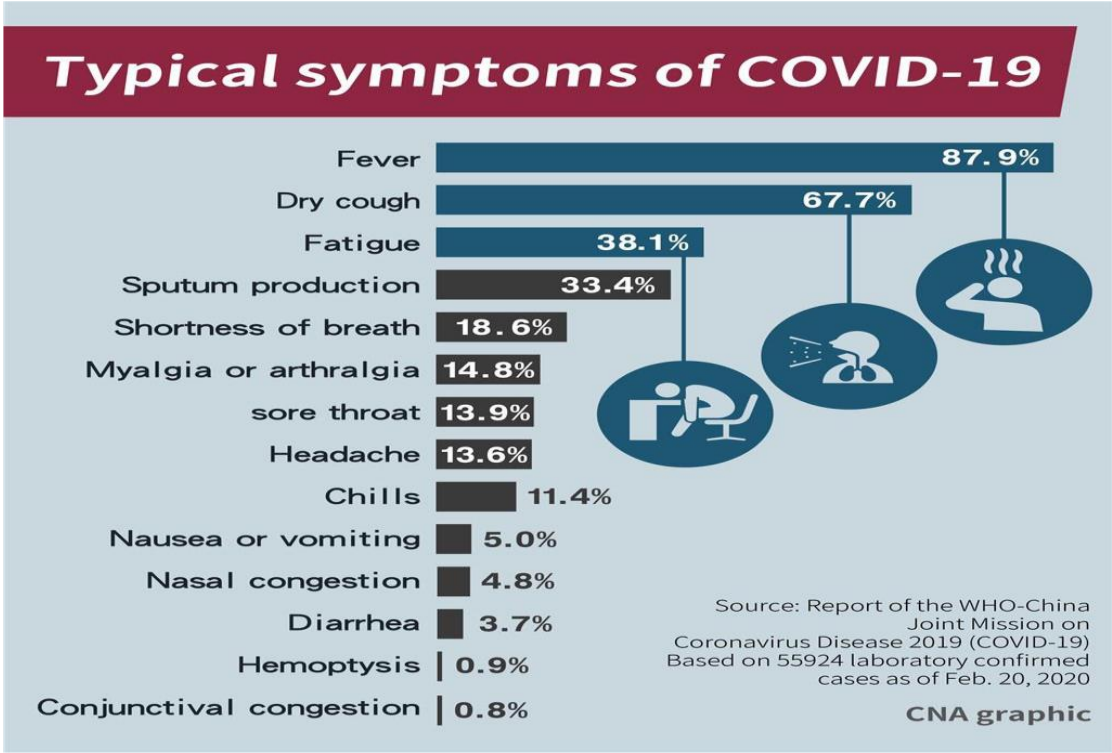
2.8 **High Risk Population**

People of any age with certain underlying medical conditions are at increased risk for severe illness from COVID-19:

- Chronic kidney disease
- COPD (chronic obstructive pulmonary disease)
- Immunocompromised state (weakened immune system) from solid organ transplant
- Obesity (body mass index [BMI] of 30 or higher)
- Serious heart conditions, such as heart failure, coronary artery disease, or cardiomyopathies
- Sickle cell disease
- Type 2 diabetes mellitus
- Children who have neurologic, genetic, metabolic conditions or have congenital heart disease

2.9 **Clinical Manifestations**

- Mild disease: non-pneumonia and mild pneumonia; may occcur in 81% of cases.
- Severe disease: dyspnea, respiratory frequency ≥ 30/min, blood oxygen saturation (SpO2) ≤ 93%, PaO2/FiO2 ratio [the ratio between the partial pressure of the oxygen and the percentage of oxygen supplied] < 300, and/or lung infiltrates > 50% within 24 to 48 hours; may occur in 14% of cases, Acute Respiratory Distress Syndrome (ARDS) around 3%
- Critical disease: respiratory failure, septic shock, and/or multiple organ dysfunction syndrome (MODS); may occur in 5% of cases.
- Other symptoms: Fever (87.9%), Fatigue (38.1%), Headache (13.6%), Myalgia or arthralgia (14.8%), Chills (11.4%), Nausea or vomiting (5.0%), Diarrhea (3.7%), Hemoptysis (0.9%), Conjunctival congestion (0.8%)



(Fig 2.1 : Source : WHO report mission on Covid-19 Feb 2020)

Chest imaging utilized includes chest radiograph, CT scan, or lung ultrasound demonstrating bilateral opacities (lung infiltrates > 50%), not fully explained by effusions, lobar, or lung collapse.

2.10 **Diagnosis**

(a) Sample collection

Preferred sample: Throat and nasal swab in viral transport media (VTM) and transported on ice.

Upper respiratory tract : Nasopharyngeal swab AND oropharyngeal swab

Lower respiratory tract: Alternate: Nasopharyngeal swab, BAL or endotracheal aspirate which has to be mixed with the viral transport medium and transported on ice.

2.11 General guidelines

a) Trained health care professionals are to wear appropriate PPE while collecting the sample from the patient. To maintain proper infection control when collecting specimens
b) Minimum personnel to be involved in sample collection
c) To complete the requisition form for each specimen submitted.
d) Proper disposal of all waste generated.

2.12 Laboratory Examinations

Concerning laboratory examinations. Total Leucocyte count (TLC), Liver enzymes, lactate dehydrogenase (LDH), muscle enzymes, and C-reactive protein, renal function test (blood urea, serum creatinine) and increased D-dimers.

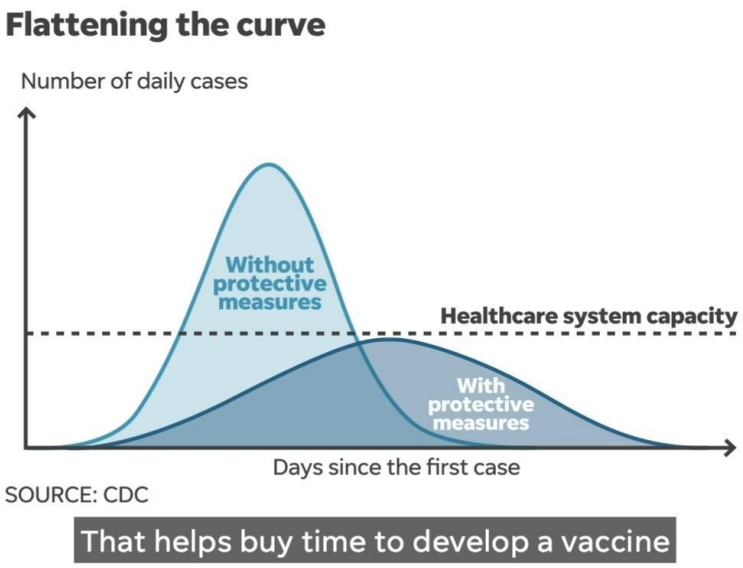
- Imaging: Chest X-ray examination showing bilateral multifocal alveolar opacities plus/minus Pleural effusion. Chest computed tomography (CT) may display multifocal bilateral "ground or ground glass" areas associated with consolidation areas with patchy distribution, mainly peripheral/subpleural and with greater involvement of the posterior regions and lower lobes. Lung ultrasound helps in appraising the evolution of the disease.

2.13 Treatment

There is no specific antiviral treatment recommended for COVID-19, and no vaccine is currently available. However, certain antiviral drugs like Lopinavir, Ritonavir and Remdesivir have shown some success. The treatment is symptomatic, and oxygen therapy represents the first step for addressing respiratory impairment. Non-invasive (NIV) and invasive mechanical ventilation (IVM) may be necessary in cases of respiratory failure refractory to oxygen therapy. Dexamethasone, though is a steroid, but has also proved to be successful in the treatment of COVID-19 cases. these patients are also found to be at high risk for thromboembolic phenomenon and hence anticoagulants have also proven to be of some use in these patients.

The care of patients with COVID-19 is similar to that of patients with other viral pneumonias. It consists primarily of supportive care and oxygen supplementation when needed. Dexamethasone has been reported to decrease the mortality rate of patients with severe respiratory illness. Remdesivir, a nucleoside prodrug that inhibits transcription of many RNA viruses, may shorten COVID-19-related hospital stays by an average of three days. Tocilizumab, a monoclonal antibody to IL-6, is being trialed in patients with cytokine storm and severe respiratory disease. Additionally, lopinavir/ritonavir (Kaletra), a mixture of two HIV protease inhibitors, is under investigation. Recently, China approved the use of favilavir (Favipiravir), an antiviral drug used for influenza, as an investigational therapy for COVID-19.

On March 24, 2020, the FDA approved the investigational use of convalescent plasma, which contains antibodies to SARS-CoV-2, for patients with serious or life-threatening disease. COVID-19 convalescent plasma (CCP) is a potentially safe and effective, therapeutic modality for COVID-19.



(Fig 2.2 : Effect of flattening the curve to prevent overwhelming healthcare facilities

)

(Fig 2.3 : Preventive measures : Handwashing, Masks , Avoid touching face Social distancing)

(Fig 2.4 : Preventive measures : Social distancing)

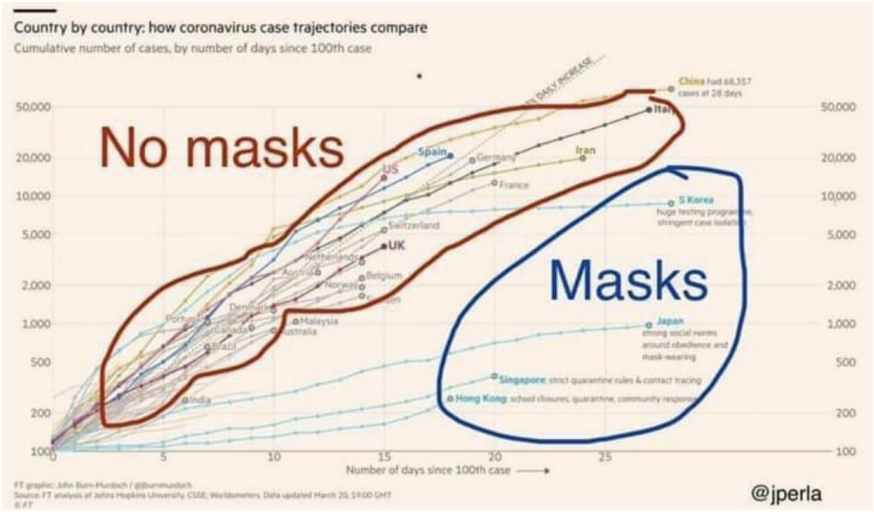
(Source : www.icmr.org)

STANDARD MASKS & PPEs FOR HEALTH CARE WORKERS

(Fig 2. 5 : Types of Masks in use during coronavirus pandemic)

STANDARD COVERALL PPE RECOMMENDED FOR STAFF MANAGING CORONA CASES

(Fig 2.6 : PPEs for Health Care workers ; coverall for complete protection)



(Fig 2.7 : DATA of total infections vs use of masks as a community preventive measure in various countries)

(Source : www.worldometer.org)

Chapter III

Literature Review

3.1 Majority of the literature available on the subject covers the issues during the current pandemic in India and the world scenario.

(a) **Carlyn Harris, Gail Carson, et al. An evidence-based framework for priority clinical research questions for COVID. Journal of Global Health June 2020[1].** This article presents a summary of learning points in epidemiological infection control from the SARS epidemic, alongside a review of evidence connecting current understanding of the virologic and environmental contamination. The paper analyses high risk clinical and nursing procedures requiring PPE and specific infection control measures for critical care, obstetrics, and paediatrics to minimise transmission.

(b) **Hongyue Zhang and Rajib Shaw. Identifying Research Trends and Gaps in the Context of COVID-19. Int. J. Environ. Res. Public Health (2020)** Analysing 20 years of published scientific papers, this article points out the highlights of coronavirus-related research. Significant progress is observed in the past research related to virology, epidemiology, infectious diseases among others. However, in research linked to public health, its governance, technology, and risk communication there seem to be gap areas

(c) **Philip W. H. Peng1,*, Pak-Leung Ho2 and Susy S. Hota3, Outbreak of a new coronavirus: What anaesthetists should know, British Journal of**

Anaesthesia 2020)[3]. The article analyses the epidemiology of COVID-19 and compares it with SARS and MERS . The authors have identified the risk associated to anaesthesiologists treating patients and suggested measures to minimise the risk and to take measures for infection control.

(d) **Manping Yang, Hailong Dong and Zhihong Lu. Role of anaesthesiologists during the COVID-19 outbreak in China British Journal of Anaesthesia (2020)[4].** In the battle against COVID-19, Chinese anaesthesiologists explored new working models to improve patient outcomes and minimize the risk of contracting COVID-19.

(e) **Noreen N, Dil S et al. Coronavirus disease (COVID-19) Pandemic and Pakistan; Limitations and Gaps. Global Biosecurity, 2020[5].** The authors examined the current state of the COVID-19 epidemic in Pakistan and Pakistan's preparedness, using publicly available data and documents on the COVID-19 government dashboard. They noted that low literacy rates and a general lack of awareness was leading to people not seriously adopting social distancing and hand hygiene. The high population density in major cities of Pakistan would facilitate the spread of virus. The authors have suggested a three-pronged approach of trace, test and treat aggressively to halt progression of the disease.

(f) **Peter M. Odor1, Maximilian Neun et al Anaesthesia and COVID-19: infection control. British Journal of Anaesthesia (2020)[6]**. This article presents a summary of learning points in epidemiological infection control from the SARS epidemic, alongside a review of evidence connecting current understanding of the

virologic and environmental contamination and suggests measures to minimize infection.

(g) **Trudie Lang. Plug COVID-19 research gaps. Nature, Vol 583, 16 July 2020[7].** The author has studied the various research work and clinical trials with anti malaria drugs on COVID-19 19 in the UK and has opined that in a viral pandemic the key points and gaps in research are that most research is hospital based rather than focusing on community health care, case detection and public communications. The author felt the need for qualitative studies to know which interventions are acceptable around mental health and domestic violence during the pandemic rather than treatment and hospital based trials alone.

(h) **Theng W. Foong*, Elizabeth S. Hui et al, Rapid training of healthcare staff for protected cardiopulmonary resuscitation in the COVID-19 pandemic. British Journal of Anaesthesia (2020)[8].** The authors conducted a simulated Code Blue exercise in a protected negative pressure ICU environment . The aim was to train cohorts of Doctors and Nursing staff in infection control protocols and Cardio pulmonary resuscitation in a scenario with Personal Protective Equipment.

(i) **Rafael Ortega and Rosalyn Chen. Beyond the operating room: the roles of Anaesthesiologists in pandemics. British Journal of Anaesthesia(2020)[9]**. The authors have reviewed on how historical cholera, polio, and SARS epidemics redefined the role of anaesthesiology, and how anaesthesiologists in turn helped developed contact tracing, intensive care, and infection control. Lessons learnt from these previous epidemics provide guidance in our management of COVID-19 today.

Anaesthesiologists continue to lead in the front lines during the current pandemic both in the treatment of acute cases in the ICU and operation theatre and also as managers of infection control in the hospital.

(j) **Lee A. Fleisher, Rachel E. Sweeney et al. Managing Anxiety in Anesthesiology and Intensive Care Providers during the Covid-19 Pandemic: An Analysis of the Psychosocial Response of a Front-Line Department NEJM (Jul 2020)**[10]. The authors studied the factors most related to front-line providers' anxiety, and thereby developed effective responses, by surveying the clinical members of the frontline department to better understand the effect of providing care during the pandemic on their self-reported levels of anxiety. The authors provide a number of suggestions for reducing the anxiety felt during this anxiety-inducing crisis, as well as promoting the emotional wellbeing and effectiveness of front-line providers in addressing the Covid-19 pandemic .

(k) **Melvin C. C. Lee1,*, Swapna Thampi1,et al. Psychological distress during the COVID-19 pandemic amongst anaesthesiologists and nurses. British Journal of Anaesthesia (2020)**[11] . This observational, cross-sectional study was conducted at a 1240-bed tertiary academic medical centre in Singapore. During this pandemic, anaesthesiologists were invited to participate with a one-time self-administered online questionnaire Key mental health outcomes were measured using two validated self-reporting instruments for identifying psychological distress: the 12-item General Health Questionnaire (GHQ-12) and Hospital Anxiety and Depression Scale (HADS). Their results found a high prevalence of anxiety

and screening of at-risk individuals and adoption of early psychological support interventions for affected staff was advised.

(l) **Zhen Liu, Zhouyang Wu, et al . Personal protective equipment during tracheal intubation in patients with COVID-19 in China: a cross-sectional survey. British Journal of Anaesthesia(2020)[12].** Tracheal intubation is an aerosol generating procedure. Healthcare workers (HCWs) who perform tracheal intubations have a three to six times greater risk of getting infected. By collecting information on PPE use by HCWs, the authors aimed to evaluate the protective efficiency of different levels of PPE to make suggestions for the minimum PPE level required during tracheal intubation.

(m) **Massimiliano Sorbello1, Kariem El-Boghdadly et al. Personal protective equipment, airway management, and systematic reviews. British Journal of Anaesthesia(2020)[13]** . The authors studied and emphasised priority factors, such as the need to identify dedicated airway teams and intubation spots, the need for team preparedness and pre-procedural planning (including cognitive aids and airway management and PPE donning/doffing checklists), and the need for clear indications for correct PPE and operative instructions to improve user compliance and acceptance.

(n) **Gordon Y. S. Choi, Winnie T. P. Wan et al. Preparedness for COVID-19: In situ simulation to enhance infection control systems in the intensive care unit. British Journal of Anaesthesia(2020) [14]**. The authors used a high fidelity simulator to simulate a controlled ICU environment simulating a COVID-19 patient

requiring ventilation and monitoring and studied the work flow processes for training and refining protocols.

(o) **Derek K Chu, Elie A Akl, et al . Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis . The Lancet (Jun 2020)[15].** This systematic review and meta-analysis investigated the optimum distance for avoiding person to person virus transmission and the use of face masks and eye protection to prevent transmission of viruses from data of SARS and MERS epidemics. The findings of this systematic review and meta-analysis support physical distancing of 1 m or more and provide quantitative estimates for models and contact tracing to inform policy. Optimum use of face masks, respirators, and eye protection in public and health-care settings should be currently best available evidence.

3.2. **Research Gaps**. The following research gaps were found :-

(a) Limited knowledge on the protocols for training and skilling of health care workers of a hospital in dealing with COVID-19 cases.

(b) Indian data for stress / anxiety among frontline COVID-19 health care workers is feeble.

(c) Evaluation of the role of Anaesthesiologists with a role beyond the operating room and intensive care unit in the pandemic and relevance to Indian context.

Chapter IV

Training of Medical and Non- medical personnel in infection prevention and control practices

Background ;

4.1 It was important to offer just-in-time training to all Health care workers

(Doctors, nurses, paramedical and ancillary staff) working in the hospital Referred to as Medical personnel and also to indict non-medical sailors as volunteers (referred to as Non-medical workers) to act as force multipliers and assist the medical teams at Quarantine centres, Screening centres and Documentation , helping staff in hospitals to augment the precious Medical workforce. A training programme would offer in-depth training to Medical staff on procedures and skills required by them in Covid-19 wards and OPDs, reception, diagnostics etc and a basic capsule on infection , prevention and control to the non-medical volunteers to make them confident in handwashing , Donning doffing PPEs and transport of patients.

4.2 Coronaviruses are large group of viruses that cause illness in humans and animals. Rarely, animal coronaviruses can evolve and infect people and then spread between people such as has been seen with MERS and SARS. The outbreak of Novel coronavirus disease (COVID-19) was initially noticed in a seafood market in Wuhan city in Hubei Province of China in mid-December, 2019, has now spread to 214 countries/territories/areas worldwide. WHO (under International Health Regulations) has declared this outbreak as a “Public Health Emergency of International Concern” (PHEIC) on 30thJanuary 2020. WHO subsequently declared COVID-19 a pandemic on 11th March, 2020.

4.3 Infection prevention control (IPC) is a critical and integral part of clinical management of patients and should be initiated at the point of entry of the patient to hospital (typically the Emergency Department). Standard precautions should always be routinely applied in all areas of health care facilities. Standard precautions include hand hygiene; use of PPE to avoid direct contact with patients' blood, body fluids, secretions (including respiratory secretions) and non-intact skin. Standard precautions also include prevention of needle-stick or sharps injury; safe waste management; cleaning and disinfection of equipment; and cleaning of the environment.

4.4 A two-day capsule was created which consisted of topics about the coronavirus, hand hygiene, environmental disinfection, donning and doffing of PPE, biomedical waste management, carriage of casualty, contact tracing and feedback. The training was done for medical personnel and also non-medical volunteers to help in external services and quarantine centres. Training was organised for non -medical personnel in teams which would work together as one group. The teams to undergo this training consisted of one officer and five sailors coming from various different branches, other than Medical. The training was carried out in batches and initially 12 teams were trained. The course strength was evaluated by various methods and on being found useful and a training CD was developed to continue training at various levels using gained expertise. An improvement in skills (hand hygiene, donning and doffing of PPE) post hands on training vis-à-vis skills post video demonstration was seen when Direct Observation of Procedural Skills(DOPS) was carried out by the training team.

4.5 It was envisaged that the health care workers may get overwhelmed in handling the pandemic surge, hence there was a strong need to create trained manpower to help in non -essential areas and external services of the hospital from amongst the non-medical personnel. Challenges were identified and after addressing each of them a

comprehensive training capsule was created. The strength of the training program was assessed while training the initial twelve teams trained and when it was found to be successful, the training capsule was disseminated in the other medical units so as to reach a larger population. The programme was popular among the Naval Medical fraternity and was also covered on National Television as a successful training capsule for health care workers . The overall training was advised by the Command Medical Officer , Southern Naval command and was planned and implemented by INHS SAnjivani with the Commanding Officer. HOD Anaesthesiology & Critical care and a Team of Medical and Nursing Officers.

4.6 These challenges of training were also faced by the training team and personnel and was reflected in the feedback received from the personnel. These feedbacks helped us to improve our modules and methodology of training . Hovever, as they are relevant in any training programme to be successfully implemented they are enumerated as under:

(a) Training of the non-medical personnel with fundamentals of health care management during the pandemic, which included hand hygiene, concept of Personal Protective Equipment (PPE), donning and doffing as well as essentials of Bio Medical Waste (BMW) Management.

(b) To allay anxiety and apprehension of the non-medical personnel regarding COVID 19 virus and equip them with knowledge and skills to function in quarantine set ups, screening centres etc.

(c) Designing a comprehensive training schedule within a short span of time and conduct training on a regular basis in small batches to keep up with the norms of social distancing.

(d) Sourcing training material in the form of videos for demonstration purposes.

(e) Since the skills of PPE donning & doffing and management of Pandemic due to contagious disease was relatively new to the Health Care workers too, making a comprehensive training program for the trainers to carry out the training of other personnel to ensure rotation and to carry out large scale training was a challenge.

4.7 The Health care workers and other non medical workers were provided with elementary knowledge regarding the novel coronavirus, correct method of hand hygiene, donning and doffing of PPE, fundamentals of Bio Medical Waste(BMW) management so that they can be utilised in optimal handling of COVID 19 Pandemic and to build a reproducible training program which could be utilised at various other places for training purposes. Objectives were to impart correct knowledge regarding coronavirus, biomedical waste management and contact tracing skills viz hand washing and hygiene, donning and doffing of PPE, carriage of casualty.

4.8 A two-day capsule was created by Senior Anaesthesiologist of the hospital and the Commanding Officer (who was also a senior Anaesthesiologist) keeping in view the need for training. The course consisted of topics like Introduction about coronavirus, hand hygiene, environmental disinfection, donning and doffing of PPE, biomedical waste management, carriage of casualty, contact tracing and feedback. 3.8 The teams undergoing this training consisted of one officer and five sailors coming from various different branches, other than Medical. At one point of time three teams were called and social distancing was maintained at all times while carrying out the training. Initially 12 teams were trained in the hospital. The training team consisted of the anaesthesiologist, a nursing officer to demonstrate donning and doffing and a senior and a junior sailor to help with other administration. At the commencement of course, a pre-test was conducted to evaluate cognitive capability and at the end of the course a

post-test was conducted to evaluate knowledge transference. After demonstration for skills (hand hygiene, donning and doffing of PPE) the participants were evaluated by Direct Observation of Procedural Skills (DOPS1). Then hands on training for these skills was conducted and DOPS was carried out again (DOPS 2).

4.9 Any participant who was found lacking in skill or knowledge was given extra training till his performance was successful. The entire training capsule was recorded and a Training CD was developed in ideal conditions with the course overview, training capsule contents, hand hygiene and donning and doffing skills demonstration for training the trainer purposes. The officer in the teams was accomplished as a mentor for the other team members. The skills of hand hygiene, donning and doffing of PPE were evaluated post video demonstration and after that, post hands on training by utilising DOPS by training team. A clear improvement in the skills was noticed post hands on training in all three skills trained in the Command.

4.10 A strong need was felt to train health care workers and non-medical volunteers in the beginning of the Pandemic (Mar 2020) and thus this entire exercise was undertaken before the actual surge of patients. Identification of challenges facilitated to formulate a comprehensive training capsule. The minimum qualification of the participants to be trained was kept at XII standard of schooling amongst non- medical volunteers. The health care workers and non-medical volunteers were counselled, motivated and all their questions were answered so as to allay their anxieties and apprehensions. They were taught the importance of each individual in breaking the chain effort. The feedback of the trained teams was used as motivation kits for the teams to come. Only three teams (18 people) at one time were trained in a large room to honour the social distance norm. A hall which could accommodate 80 people was utilised by the training team and no more than 21 people occupied the room at a given

point of time during training. Getting hold of videos for training purposes was a challenging task, hence, some in house videos were created for hand hygiene, donning and doffing of PPE. Certain other freely available videos on the online social platform were utilised for knowledge dissemination.

4.11 Certain other challenges were faced while conducting the training capsule for the non-medical personnel; they are as under:

(a) Unfamiliarity with medical terminology amongst all participants as they did not belong to medical background.

(b) The understanding of concepts of disease-causing organism, disease transmission, hygiene was variable amongst the various participants as they were of different educational backgrounds

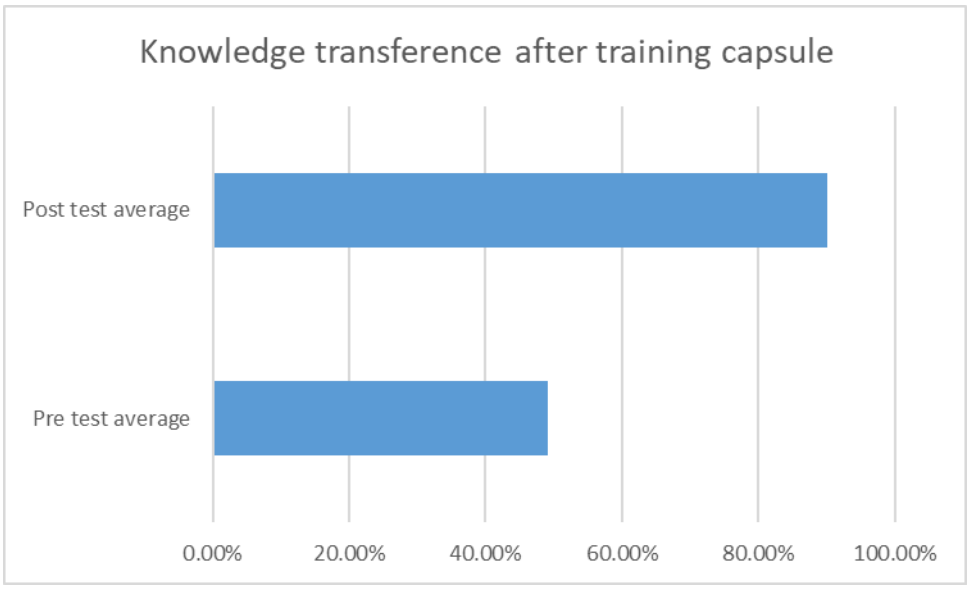
(c) While training was carried out a certain amount of reluctance was noticed amongst the participants in direct interaction with possible COVID-19 19 patients.

Unfamiliarity of the medical terminology was expected and hence care was taken to prepare course contents in lay terminology. However, at times during the conduct of training extra time and attention was given to simplify concepts. Diagrams and pictures, various audio-visual aids. Animated videos available online, flowcharts, lucid PowerPoint lectures were utilised keeping in view that the participants belonged to varied educational backgrounds. Medium of instruction was Hindi and English. The participants were motivated to learn the correct procedure of donning and doffing and reassured that if they take adequate precautions their chances of contracting the disease decreased. They were also reassured that adequate supply of PPE will be made available to them. Most of these non medical volunteers were utilised in screening centres and

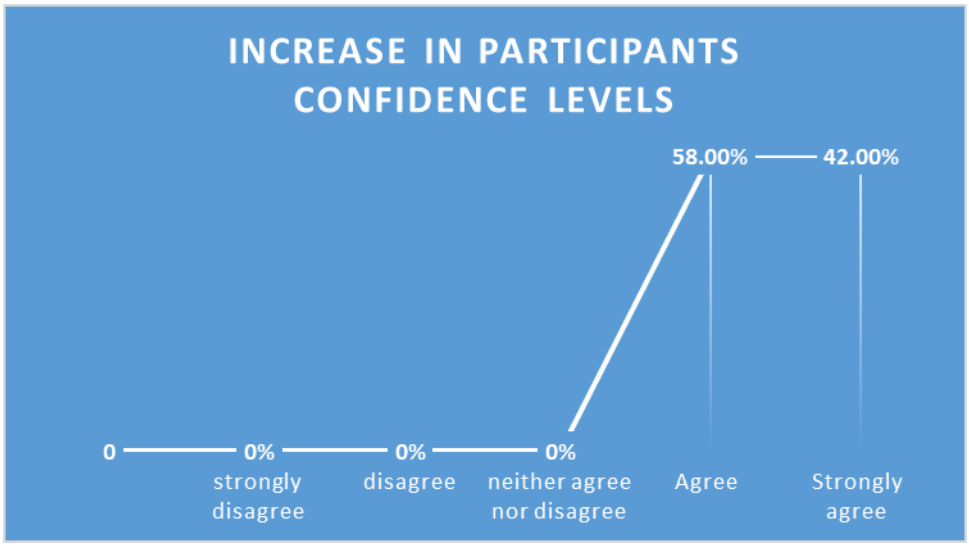
quarantine facilities which saved manpower required to man the core areas of the hospital where health care workers were employed.

4.12 The strength of training was evaluated and on finding it a success, ways and means (in form of Training CD, formal documentation of the training capsule) were deployed to make it reproducible so as install training on larger scale. To make the training interesting videos were shown, and adequate hands on training was imparted to develop skills. Didactic lectures were kept to a minimum and wherever employed they were enabled with audio visual aids. The trained teams were utilised in screening centres, quarantine facilities. The success of these teams was seen on ground and the programme became popular with other medical units in the Command who were distributed this training program (Training CD) so as to carry out the training on a large scale, in turn leading to preparing force multipliers for handling Pandemic surge.

4.13 It is evident that training does have an impact on health care delivery and quality improvement. It is also evident that there are perceived changes in knowledge post training. The competency-based approaches, work-based activities or practical exercises are instrumental in positive changes in the patient outcomes. In the Armed Forces there is an availability of a huge human resource which may be technical in terms other than medical. The Indian Army regularly utilises this source and conducts training of some of them as BFNAs (Battlefield Nursing Assistants) who act as first line health care workers, giving first aid to fellow soldier in times of war on the frontline. This concept of BFNA was selected and tailor made into small training capsules for handling unprecedented times like this pandemic surge in our Naval Command and could be successfully implemented.

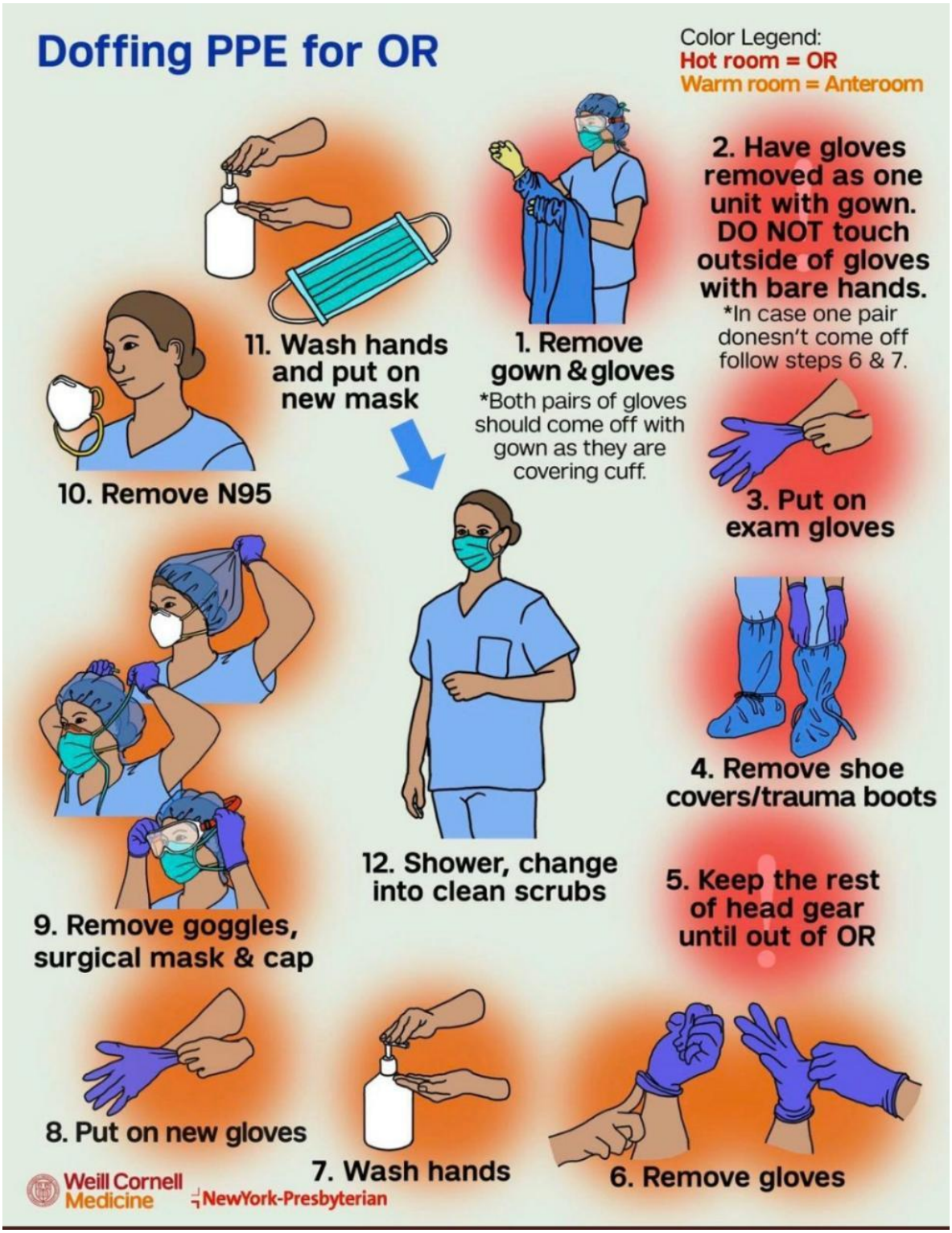


(Fig 4.1 : Training capsule at INHS Sanjivani , Kochi during Covid-19 : Knowledge transfer amongst Health care workers and volunteers)



(Fig 4.2 : Confidence levels after training on Covid -19 protocols at INHS Sanjivani ,Kochi As assessed by after training by participants)

(Fig 4.3 Donning PPE protocol)



(Fig 4.4 : Doffing PPE protocol)

(Fig 4.5 How to Hand rub Source : WHO)

(Fig 4.5 How to Hand rub Source : WHO)

(Fig 4.6 How to Hand Wash ; Source : WHO)

(Fig 4.7 ; Living with someone at Risk)

Chapter V

CONVERSION TO MIXED COVID -19 TREATING HOSPITAL

Hospital actions for COVID-19- 19 preparedness

Background :

5.1 INHS Sanjivani at Kochi is a 300 bedded multi-speciality referral hospital of the Southern Naval Command. When the pandemic started and it was required to expect and treat Covid-19 cases it was important to have a separation of the hospital into two parts Covid-19 wing and Non-covid wing as emergency services had to be continued. Though tele-medicine help lines were started with decentralised distribution of routine medication to patients, the hospital had to clearly have set protocols for a Covid-19 section. A 200 bedded wing complete with ICU, labour room and operation theatre was duplicated , functional in all aspects to function as a Covid Care centre. The processes involved in conversion of hospital to a Covid- 19 care facility is discussed in the succeeding paragraphs.

5.2 The Corona Virus - 2019 (COVID -19) pandemic which started in the late 2019 has spread rapidly throughout the world. With the research on the efficacy of vaccine, as well as the non-availability of suitable therapeutic interventions, mankind is experiencing an unprecedented existential crisis. Since the emergence of Coronavirus, with several lakhs of positive cases and numerous deaths across the country have been reported. Lockdowns, curfews, sealing of Hotspot zones, quarantines, social distancing, hand hygiene, coughing etiquettes have become the norm across the nation.

5.3 The crucial stakeholder of the healthcare systems to withstand this crisis is a healthcare facility/hospital. How the hospital responds in such crisis decides the final outcome or the impact of the pandemic. In our study, we describe the response of such a hospital which was a multi-speciality hospital to continue with its role in a limited

manner for emergency and essential services and to cater to Covid-19 cases as a mixed COVID-19 -19 treating hospital.

Surge capacity

5.4 Surge capacity is defined as 'the ability of a health service to expand beyond its normal capacity to meet an increased demand for clinical care". COVID-19 cases may cause rapid increase in demand over a prolonged period ("rising tide" as opposed to "big bang" of a sudden-onset disaster). One has to calculate the maximal case admission capacity, determined not only by the total number of beds but also by the availability of human resources, the adaptability of facility space for critical care, isolation, cohort, the accessibility of mechanical ventilators and the availability of other resources.

5.5 An estimate was made to cater to increase in demand for hospital services during the outbreak of COVID-19 using available mathematical modelling tools available. Ways of expanding hospital in-patient capacity (including physical space, staff, supplies and processes) were identified. Potential gaps in the provision of healthcare, with an emphasis on critical care were addressed in coordination with the authorities and neighbouring hospitals especially with respect to the requirement of Oxygen delivery , critical care and ventilators etc.

5.6 Additional capacity was created by stopping non-essential services and elective surgery. In coordination with the local authorities, additional sites were identified for conversion to patient care units (e.g. Sailors in-living blocks, schools,) as quarantine centres and surge facility. Admission and discharge criteria and prioritization was done for patients and clinical interventions according to projected treatment capacity and demand.

Infection prevention and control

5.7 An operational infection prevention and control (IPC) programme is essential to minimize the risk of transmission of healthcare-associated infection to patients, hospital staff, and visitors. The following actions were taken for adequate infection prevention and control .It was ensured through training programmes that health care workers (HCW), patients, and visitors were aware of respiratory and hand hygiene and prevention of healthcare-associated infections through verbal instructions, informational posters, cards, etc. Hand hygiene stations (water, soap, paper towel, alcohol-hand rub), and waste bins were installed at strategic locations across the hospital. It was ensured that HCWs were applying standard precautions for all patients.

5.8 Droplets and contact precautions were recommended for suspected or confirmed COVID19 cases. These precautions were recommended to be continued until the patient became asymptomatic.

Patients were placed in adequately ventilated in single rooms (60 L/s per patient). When single rooms were not available, patients suspected of having COVID-19 were grouped together.

5.9 We avoided mixing of suspected and confirmed cases. It was ensured that a one-meter distance was maintained between beds and either single-use / disposable equipment was used . Clinical diagnostic equipment (e.g., stethoscopes, blood pressure cuffs,) needed to be shared among patients, were cleaned and disinfected between use for each patient (e.g., by using ethyl alcohol 70%). Infrared thermometers were used to detect temperature of the non- contact type.

5.10 Surfaces were routinely cleaned and disinfected where the patient was likely to be in contact. Standard operating procedure for routine cleaning and disinfection of

ambulances was followed as per recommended standards and guidelines for COVID-19. It was ensured that HCWs were applying droplet and contact precautions before entering the room where suspected or confirmed COVID-19 patients were admitted. It was also ensured that HCWs were applying airborne precautions for aerosol-generating procedures, such as tracheal intubation, non-invasive ventilation, tracheotomy, cardiopulmonary resuscitation, manual ventilation before intubation, bronchoscopy, collection of nasopharyngeal swap/aspirate and autopsy.

5.11 A team of trained health care workers were designated to care exclusively for suspected or confirmed cases to reduce the risk of transmission. It was ensured that staff (HCW, cleaning personnel) received training on standard, contact, droplets, and airborne precautions (including correct use of PPE, donning and doffing, masks tested for fitting, hand hygiene, respiratory hygiene, etc.) as per a capsule training programme. It was ensured that adequate personal protective equipment (PPE) (i.e., medical/surgical masks, N95 respirators, gloves, gowns, eye protection) were easily accessible to staff.

5.12 Unnecessary moving and transporting patients out of their room or area was avoided unless medically necessary. Designated portable X-ray equipment and/or other designated diagnostic equipment was used as point of care diagnostics. If transport was required, a predetermined transport route was used to minimize exposure for hospital staff and other patients . HCWs who were transporting patients performed hand hygiene and wore full PPE. Department receiving the patient was notified earlier for taking necessary precautions. Department of Radiology had an SOP to deal with Covid-19 patients and preparation /disinfection of X-ray/ CT scan suite. Point of care Ultrasound was used to further minimise requirement of other diagnostic modalities.

5.13 No visitors were allowed in Covid section of the hospital. Smartphones and dedicated two way Motorola sets were used for communication between ward staff , patients and outside staff. Management of laboratory specimens, laundry, food service utensils, and medical waste was done following safe procedures and use of disposables wherever possible and routes of movement of food, bio-medical waste was earmarked.

Patient care

Standard precautions:

5.14 Hand and respiratory hygiene, the use of appropriate PPE according to risk assessment, injection safety practices, safe waste management, proper linens, environmental cleaning and sterilization of patient-care equipment was done meticulously.

Droplet and contact precautions:

5.15 Positive tested patients were placed in adequately ventilated single rooms (as far as possible or combined with those from same cohort/unit with similar status.) HCWs used complete PPEs ie; a medical mask, eye protection (goggles or face shield), clean, non-sterile, long sleeved gown and gloves. After patient care, appropriate doffing and disposal of all PPE and hand hygiene was carried out.

Airborne precautions for aerosol-generating procedures:

5.16 All intubation / aerosol generating procedures were performed in acute care wards/ Covid designated ICU by Anaesthesiologists/ physicians and Operating room technicians and trained nursing Staff. All wards had a Medical Officer, Nursing Officer and Medical assistants working in shifts. They had a designated rest areas when off

duty and were not allowed to mix with other staff till the period of rotation was complete. Foood, logistics was similarly provided to the staff similar to the patients

5.17 All HCWs (Doctors, Nursing staff and medical assistants and ancillary staff) used particulate respirator (N95, or equivalent), eye protection (i.e., goggles or a face shield), clean, non-sterile, long-sleeved gown and gloves as PPE in the Covid wards.

5.18 HCWs were taught to perform a seal check with their masks. There was an assistant to help during donning and doffing of the PPEs at these stations outside the ward along with hand washing stations.After patient care, appropriate doffing and disposal of all PPE and hand hygiene was carried out. A new set of PPE was needed for each HCW when care was given to a different patient / change of shifts .

Case management

5.19 An efficient and accurate triage system and an organized in-patient management strategy was required to ensure adequate treatment of COVID-19 acute respiratory infection . A well-equipped triage station was established at the entrance of the Covid care facility, supported by trained staff. A screening centre and fever clinic used questionnaires according to the updated case definitions . Health-care workers were asked to have a high level of clinical suspicion.

5.20 An exclusive waiting and examination area for individuals presenting with respiratory symptoms and/or fever was designated as Fever clinic. The area was well-ventilated, low-transit, and secure. Within that group of patients, those with symptoms of respiratory distress and severe underlying conditions were prioritized for medical evaluation.

5.21 Additional area for triage of patients was designated as a reception centre with screening and self reporting form for all incoming personnel /families returning ex-

leave to the Military Station, outside the hospital. A triage supervisor responsible for overseeing all triage operations was appointed. The team functioned round the clock in shifts. In coordination with local health authorities, the hospital strategy for the admission, internal transfer, referral, and discharge of SARI patients was implemented , in line with relevant criteria and operational protocols issued by higher authorities from time to time.

5.22 For mild cases of COVID-19 home care was instituted with quarantine during later part of the pandemic to save on hospital resources for the more severely affected cases. A caregiver, preferably a family member was identified and progress was tracked using a helpline.

5.23 Hospital admission was advised for cases of COVID-19 acute respiratory infection with comorbidities recognized as posing a risk for a severe or fatal course of COVID-19. Availability of staffed beds for the admission of severe COVID-19 and acute respiratory infection cases requiring supportive care and the continuous/regular monitoring of vital signs, was ensured.

5.24 Monitoring of vital signs (e.g., temperature, blood pressure, pulse, respiratory rate, level of consciousness, clinical signs of dehydration or shock), and oxygen saturation (pulse oximetry or blood gas analyses) was meticulously done.

Human Resources

5.25 A strategy of Watch system (shift duty in teams) as applied in the Navy was used to ensure adequate staff capacity and continuity of operations in response to an increased demand for human resources, while maintaining to establish a clear policy (the policy should define levels of exposure) to monitor and manage staff suspected or

confirmed of having COVID-19 or who have had exposure to a confirmed, probable or suspected COVID-19 patient.

5.26 For each unit or service, the minimum number of health-care workers and other hospital staff needed to ensure the sufficient operation of the unit or service was determined. Prioritize staffing needs by unit or service and distribute personnel accordingly. Additional staff (military personnel in this case)were trained and recruited to work in the reception centres, for documentation and in the Quarantine centres. Staff was rotated with a period of break for those working in high-demand areas (e.g. acute care wards and intensive care units).

Surveillance : Early warning and monitoring

5.27 The Station Health Organisation with their staff doing preventive and community medicine tasks were recognizing and immediately reporting unusual health events (e.g., clusters of cases, atypical clinical presentations, etc.) occurring in health-care facilities were the cornerstone of the early warning function. In addition to serving the early warning function, the laboratory and epidemiological data obtained through systematic collection and analysis allowed the public health authorities to monitor the progression of COVID-19 and inform interventions in time.

Recommended Action Due for In-review progress

5.28 A hospital infection control committee (under the leadership of the registrar or executive officer in our case) with the overall responsibility for activities related to early warning and surveillance in the hospital. Reporting of unusual health events (COVID-19) by health-care workers by establishing communication channels and procedures within the hospital and with public health authorities. Implement data

collection and reporting mechanisms following the national health policy and directives was a task with daily reports compiled on cases, numbers and trends.

5.29 Standardized case definitions, recommended levels of surveillance, and triggers for surveillance escalation or de-escalation in accordance with national criteria were complied with. Reports by health care workers of unusual health events and/or unusual signals detected through monitoring activities were investigated by a surveillance team.

Communication

5.30 Accurate and timely communication is necessary to ensure informed decision-making, effective collaboration and cooperation, and public awareness and trust Communication to streamline the sharing of information between the hospital administration, departments was done using hospital information management system Renewed role and duties of hospital staff in the management of COVID-19 was spelled out to all .

5.31 It is important to ensure that all decisions on clinical triage, patient prioritization (e.g., adapted admission and discharge criteria), infection prevention and control measures, and policies related to case management and hospital epidemiology are communicated to all relevant staff and stakeholders.

5.32 The collection, processing, and reporting of information to higher medical authorities is important to detect changing trends. It is also necessary to keep in advance, key messages, addressing a variety of COVID-19-related scenarios with different target audiences in mind (e.g., patients, visitors, staff, the general public, media) for dissemination to public at large.

5.33 The Public Relations Officer has an important role to coordinate communication with the public, the media, and health authorities. Ensure reliable and

sustainable primary and back- up communication systems (e.g., landlines, the internet, mobile devices, pagers, satellite telephones, two-way radio equipment, unlisted numbers) and access to updated contact lists. Consider having a contact list with roles rather than specific people. Be familiar with referral mechanisms established at the national level and related communication mechanisms.

Logistics and management of supplies including pharmaceuticals

5.34 The continuity of hospital services and the availability of essential equipment and supplies, including pharmaceuticals, require a proactive approach to resource and facility management (Recommended reading 6). Consider taking the following action. establish a shortage alert and reordering mechanism. Develop/maintain an updated inventory of all equipment, supplies, and pharmaceuticals; Estimate the consumption of essential equipment, supplies, and pharmaceuticals (e.g., amount used per week) based on most likely outbreak scenario.

5.35 Consult with authorities to ensure the continuous provision of essential medications and supplies (e.g. institutional and central stockpiles, emergency agreements with local suppliers, donations). Assess the quality of contingency items prior to purchase; request quality certification. Establish contingency agreements (e.g., memorandum of understanding, mutual aid agreement) with vendors to ensure the procurement and prompt delivery of equipment, supplies, and other resources in times of shortage.

5.36 Identify physical space within the hospital for the storage and stockpiling of additional supplies. Factors to consider include accessibility, security, ambient temperature, ventilation, light exposure, and humidity. Ensure an uninterrupted cold chain for essential items requiring refrigeration. Stockpile essential supplies and

pharmaceuticals according to recommended guidelines. Ensure the timely use of stockpiled items to avoid loss due to expiry.

5.37 Define the role of the hospital pharmacy in providing pharmaceuticals for cases treated at home or other alternative treatment sites. Ensure a mechanism for the prompt maintenance and repair of the equipment required for the essential services. Postpone non-essential maintenance and repair.

5.38 Coordinate with pre-hospital networks and transportation services in establishing a contingency transportation strategy to ensure continual patient referrals and transfers, such as designated ambulance teams for the same.

Laboratory services

5.39 Maintenance of the essential laboratory services is necessary for the appropriate clinical management of both pandemic and other patients, as well as for the hospital-based surveillance of COVID-19.

5.40 The continuous availability of basic laboratory testing (e.g., complete blood count, biochemistry profile, electrolytes, blood gas analysis, blood culture, and sputum examination) is the cornerstone in management of patients and diagnosis/ screening of cases. It is important to identify essential laboratory supplies and resources and ensure their continuous availability. Identify back-up laboratory personnel and/or alternative laboratory services in case of failure/breakdown of equipment.

5.41 For hospital-based surveillance, ensure mechanisms for the prompt provision of laboratory data to the physicians and health authorities responsible for clinical management and surveillance. Prioritize testing for respiratory viruses (e.g., COVID-19) according to clinical requirements and hospital-based surveillance needs.

Essential support services

5.42 It is important to optimize patient care during the COVID-19 outbreak, it is necessary to identify and maintain essential support services of the hospital such as those for laundry, cleaning, waste management, dietary services, and security. Estimate the additional supplies required by the support services and introduce a mechanism to ensure the continuous availability of these supplies. Enable the adaptation of the support services to cope with increased demand.

5.43 Anticipate the impact of COVID-19 on hospital food supplies; take proactive measures to ensure the availability of food. Ensure the availability of appropriate back-up arrangements for essential life-lines, including water, power, and oxygen. Solicit the input of hospital security in identifying potential security constraints and optimizing the control of facility access, essential pharmaceutical stocks, patient flow, traffic, and parking. Ensure the availability and serviceability of hospital mortuary services and also a place for a temporary mortuary if additional numbers are required with adequate supply of body bags .

Challenges in Hosp Preparedness During COVID Pandemic

5.44 At the hospital level, the following were the key elements of the response to COVID-19, including the challenges and issues faced during conversion and management of the hospital as a COVID-19 care centre. A coordinated and multi-disciplinary management between specialists and medical officers was maintained for the management of ICUs, and infection prevention and control (IPC) to provide optimal care to patients. The management of the first infected patients was based on scientific data and protocols promulgated since the start of the outbreak, as well as our experience from previous outbreaks (a recent H1N1 outbreak management in a sister hospital) .

5.45 Informing all the healthcare workers (HCWs) of the new guidelines is a challenge that we met with regular information meetings and with the use of the intranet of the hospital. Education, training and exercises have been regularly organized since the beginning of the outbreak for frontline HCWs to ensure that all HCWs caring for patients receive adequate information and training on personal protective equipment (PPE) and clinical management of the patients. Our training programmes for both medical and non-medical workers were useful increased confidence levels of staff to continue working unhindered and with a just-in-time training on relevant information , skills required to treat Covid-19 cases.

5.46 Based on the guidelines & directions from the WHO, ICMR & and higher medical formations, the hospital modulated its structures & processes for adopting them in the current guidelines. Over a period of 03 to 04 weeks the hospital had developed a better care handling system in place to handle an expected number of cases/ peaks.

5.47 The hospital coordinated with the local administration in Kerala to setup a streamlined process to send the samples of suspected cases to Ernakulam general hospital , where RT-PCR confirmatory testing was being carried out. . The hospital also developed an in-house testing facility with a limited capacity through the GeneXpert testing (which was being used earlier for Tuberculosis testing) within a short period of time and also obtained new equipment specific for Covid- 19 detection. The process of training and recognition of the facility by ICMR and the state health authorities was done in record time.

5.48. The continuous movement of Sailors and families (which is a regular process for leave, training course) also posed a bigger threat. Along with the higher authorities,

the hospital developed a plan screening of all entering the Naval Base with a self reporting form which was digitised for contact tracing and the establishment of Quarantine, Segregation & Observation centres .

5.49 One entire wing of the hospital was designated as COVID-19 block are designated for the COVID care wards with 200 bedded capabilities to handle Intensive Care, High Dependency, Operation theatre and Labour room with COVID Care Centres and phased isolation units for male & female patients. The Naval Watch system was planned to manage the staff for ensuring continuity in medical services.

5.50 **Preparedness phase** :

(a) Identifying facilities in the hospital and ensuring technical maintenance

(b) Training frontline healthcare workers on the management of outbreaks

(c) Carrying out practical simulation exercises within the various units (Acute wards, ICUs, OT, Trauma Centre, Laboratory and Radiology departments)

(d) Anticipating the links between pre-hospital care and hospital care

(e) Testing the system during suspected cases .

(f) Implementing the technical supervision across departments by head nurses who had sufficient experience and were regularly trained to supervise the training and on ground implementation of guidelines and protocols.

5.51 **Adapting to a new microorganism**

(a) Setting up scientific and epidemiological approach to the new disease.

(b) Local adaptation of national and international protocols

(c) Regular crisis meetings involving healthcare workers, head of departments and administrative staff to ensure a comprehensive and collective strategy

(d) Adapting the strategy in real time to the evolution of the epidemiology and scientific knowledge

5.52 **Biosafety levels and laboratory examinations**

(a) Having on-site Gene xpert for screening of cases and Rt-PCR testing at local Govt facility within a acceptable time frame .

(b) Regular training of laboratory technicians on biosafety levels.

(c) Developing point-of-care testing at the bedside (sample collection) in Covid-wards and fever clinic using Covid-19 sample collection kiosks.

5.53 **Anticipating the increase of cases**

(a) Setting up a fever clinic in the hospital early detection for possible cases

(b) Planning for a sustained and increased response involving every hospital Department.

(c) Anticipating the activities to be implemented in the event of an increase in Cases. Securing central storage of PPE & medical consumables by medical stores department and early procurement to avoid shortages.

5.54 **Moving patients in the hospital for radiological examinations**

(a) Information and training of the healthcare workers with simulated transfer to various anticipated departments viz Radiology/ OT/ ICU.

(b) Safety activities for patients including frequent sanitization of spaces.

(c) Mobilizing the special transport pods to prevent any infections during intra-hospital transport.

5.55 **Hazardous waste management**

(a) Anticipating the risk of outbreaks with the health & hygiene section

(b) Communicating with the health section about the epidemic

(c) Involving hospital management team in proper biomedical waste management and disposal .

(d) Difficulties were faced as the volume of infected waste was increasing and regular disposal management by the teams was essential .

Managing and taking care of healthcare workers

5.56 Healthcare workers' anxiety

(a) Common instructions to the dependant population in order to limit the spread of rumours coming from outside

(b) Real-time information of the healthcare workforce and of all the hospital staff

(c) Effective leadership by the heads of department and the hospital management

(d) Regular communication on the local situation (e.g. on the intranet)

(e) Organizing psychological support and team feedback and a dedicated round the clock helpline was made operational.

(f) Systematic surveillance of exposed healthcare workers

Innovations

5.57 Several innovations were possible from both within the hospital and with the help of local organisations/units with engineers from Naval Ship Repair Yard and Diving School , at Kochi. The useful innovations which could be easily replicated locally were as follows ;

(a) Portable manifold System for Oxygen delivery to patients

(b) No touch hand wash systems

(c) Examination Kiosks for handling & collecting samples

(d) Evacuation Pods for Air-Transfer of patients

(e) Intubation boxes for barrier care while doing aerosol generation procedures.

(FIG 5.1CONVERSION OF 300 BEDDED HOSPITAL TO MIXED COVID HOSPITAL WITH 200 BEDS FOR COVID CASES)

(Fig 5.2 ; Infection prevention and control : PPEs, intubation box, physical barriers, infrared thermometers)

(Fig 5.3 ; Mixed Covid hospital innovations : Covid wisk, sanitizer dispenser, oxygen manifold)

(Setting up of Covid Wards with Ventilators , Patient transport Pod Transfer of patients)

(GeneXpert & Tru- NAT for Covid-19 testing in Laboratory ; Innovation of Scuba mask to provide closed CPAP/ Non invasive ventilation to augment ventilation capacity)

(Fig 5.4 ;Mixed Covid hospital : Actions taken to treat Covid- 19 patients during the pandemic)

(Care in the operation theatre /ICU : Operating on coronavirus positive cases for emergencies)

(Fig 5.5 ; Handling of samples of Coronavirus patients , Convalescent donor plasma as treatment)

(Fig 5.6 Biomedical waste disposal and care during Sample handling of coronavirus patients)

Chapter VI

Standard Operating Procedures for control of pandemic

6.1 Coronavirus spreads through respiratory droplets, which typically travel about one to two meters and settle on surfaces, where they can live for a few hours up to several days. There is a risk of contracting the disease by inhaling those particles or by touching frequently touched surfaces such as desks, handrails, or doorknobs, etc., where those droplets may have settled. Therefore, the two simplest and important steps to prevent coronavirus infection are to wash hands regularly and follow good cough etiquettes.

6.2 **When to Wash Hands**. One should wash hands as often as possible, however certain key times when it is essential to wash hands to prevent the spread of germs are as follows:-

(a) After coming from outside to home/ office.

(b) After having travelled in public transport

(c) After blowing nose, coughing, or sneezing

(d) Before and after caring for someone at home who is sick.

(e) Before and after treating a cut or wound.

(f) Before eating food.

(g) After using the toilet.

(h) After changing diapers or cleaning up a child who has used the toilet.

(j) Before, during, and after preparing food

(k) After touching an animal, animal feed, or animal waste.

(l) After touching garbage.

6.3 Washing Hands the Right Way.

(a) Wet hands with clean, running water (warm or cold), turn off the tap, and apply soap.

(b) Lather hands by rubbing them together with the soap. Lather the backs of hands, between fingers, and under nails.

(c) Scrub hands for at least 20 seconds. Need a timer? Hum the "Happy Birthday" song from beginning to end twice.

(d) Rinse hands well under clean, running water.

(e) Dry hands using a clean towel or air dry them.

6.4 Use Hand Sanitizer When You Can't Use Soap and Water. Washing hands with soap and water is the best way to get rid of germs in most situations. If soap and water are not readily available, an alcohol-based hand sanitizer that contains at least 60% alcohol can be used. Sanitizers can quickly reduce the number of germs on hands in many situations. However, the following points are to be noted:-

(a) Sanitizers do not get rid of all types of germs.

(b) Hand sanitizers may not be as effective when hands are visibly dirty or greasy.

(c) Hand sanitizers are not a substitute for hand washing.

6. 5 Using a Hand Sanitizer

(a) Apply the gel product to the palm of one hand (read the label to learn the correct amount).

(b) Rub your hands together.

(c) Rub the gel over all the surfaces of hands and fingers until hands are dry. This should take around 20 seconds.

6.6 Respiratory etiquette and guidelines on use of masks

Respiratory Etiquette.

(a) Cover mouth and nose with a handkerchief/ tissue when you cough or sneeze.

(b) Put used tissue in a waste basket.

(c) If there is no tissue, cough or sneeze into upper sleeve, not hands.

(d) Remember to wash hands after coughing or sneezing.

6.7. **Guidelines on Use of Masks**.

(a) **Types of Mask**.

(i) **N-95 Mask**. To be by Health Care Workers, Sanitary staff working in hospitals and people directly dealing with suspected / confirmed COVID-19 patients.

(ii) **Triple-layered Surgical Mask**. To be used by the individuals having symptoms like cold, cough, sore-throat and breathing problems.

(iii) **Hand-made Re-usable Cloth Mask**. To be used by all the individuals who do not fall under the above two categories.

(b) **Using Hand-made Re-usable Cloth Mask**.

(i) It is advised that at least two sets of cloth masks be made so that one can be washed while the other is used.

(ii) Thoroughly wash the mask as well as your hands before wearing it.

(iii) As soon as the mask becomes damp or humid, switch to another mask and clean the used mask. Never reuse a mask after single use without cleaning it.

(iv) Never share the mask with anyone. Every member in a family should have separate mask.

(v) While removing the mask, do not touch the front or any other surface of the mask, remove it only with strings behind (always untie the string below and then the string above), drop it directly into a soap solution or boiling water to which salt has been added and wash hands thoroughly with soap.

(vi) Ensure that the mask fits around your mouth and nose and there is no gap between it and your face.

(vii) When wearing the mask, the side facing you should show the pleats as facing downwards.

6.8 Social distancing measures

With the rising trend of COVID – 19 cases in India, there is a susceptibility to wide-spread community transmission. Since the main mode of transmission of the disease is through respiratory droplets, it is of paramount importance that cough/sneeze etiquettes be followed diligently and frequent hand washing be undertaken by all. In addition, social distancing is an effective way to prevent direct ingress of respiratory droplets from an affected person when he/she coughs/ sneezes in close proximity of a healthy person.

Recommended Social Distancing Measures

6.9 (a) Stagger meal timings and provide one metre distance between two personnel in dining halls and have different timings for different wards patients.

(b) Events such as family welfare meets, clinical meetings be held via online modes or be postponed/ cancelled.

(c) All non-essential social gatherings be cancelled/ postponed till the situation improves.

(d) Promote the use of local area networks/ telephones/ mobile communication wherever feasible to reduce physical movement of personnel

(e) All should make necessary internal arrangements at workplace to ensure adequate physical distance between the personnel working in the same compartment.

(f) Shaking of hands and hugging as modes of greeting to be avoided.

(g) Use mask and maintain adequate distance from others when canteens, shopping complexes and other public places are visited

During the pandemic, depending on the level of viral transmission in a community, extreme measures of social distancing may be required to be adopted for a certain duration of time. Such measures may include complete lock down of cities or running of offices for essential/emergency purposes with minimum mandatory attendance.

6.10 Safe travel: format for travel advisory

Do's

a) To maintain personal hygiene and physical distancing of one metre from others.

b) To practice frequent hand washing with soap and water, particularly after touching frequently touched surfaces. Alternatively, use alcohol-based hand rub.

c) To cover nose and mouth with handkerchief/tissue while sneezing and coughing or to sneeze in the inner side of your elbow .

d) To throw used tissues into closed bins immediately after use.

e) Use Mask if travelling in public transport

f) To maintain a safe distance from persons during interaction, especially with those having flu-like symptoms.

g) To check for respiratory symptoms. If unwell (fever, difficulty in breathing and coughing), visit nearest civil / service medical facility. While visiting doctor, wear a mask/cloth to cover mouth and nose.

Don'ts

a) Shake hands.

b) Have a close contact with anyone, if experiencing cough and fever.

c) Touch eyes, nose and mouth.

d) Sneeze or cough into palms of hands or spit in public.

e) Travel unnecessarily, particularly to any affected region.

f) Participate in large gatherings, including sitting in groups at canteens.

g) Visit gymnasium, clubs and crowded places such as shopping malls, festivals, etc.

6.11 Environmental cleaning and disinfection

Coronavirus spreads through respiratory droplets, which typically travel about one to two metres and settle on surfaces, where they can live for a few hours up to several days. There is a risk of contracting the disease by inhaling those particles or by touching frequently touched surfaces such as desks, handrails, or doorknobs, etc., where those droplets may have settled. Therefore, cleaning and disinfection of all surfaces which commonly come in contact is a key measure to prevent the virus transmission.

6.12 The basic principles of environmental cleaning and disinfection are as follows

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(a) Environmental cleaning is a routine daily cleaning activity and Disinfection involves additional cleaning of areas likely to have exposure to the Corona virus with specially recommended disinfectants.

(b) Disinfectants recommended for Coronavirus are 1% Sodium hypochlorite (bleach) and Cresol or commercially available Lyzol where Sodium hypochlorite is not suitable (eg., for metallic surfaces like door handles, security locks, keys etc, Sodium hypochlorite can be corrosive).

(c) **Identify risk areas** of the hospital before planning disinfection based on likelihood of having exposure to the Corona virus.

(i) **High-Risk Areas**. OPDs, Wards, Quarantine and Isolation Compartments, where symptomatics or contacts of symptomatics move.

(ii) **Moderately High-Risk Areas**. Dining halls, messes, barracks, alleyways, which are common areas with relatively higher footfall.

(iii) **Low or No Risk Areas**. Other hospital spaces where only authorized personnel on duty are allowed.

(d) The personnel involved in disinfection of compartments and areas visited by suspected cases should wear full PPE (Mask, gloves, head cover, goggle, shoe, gown). The personnel involved in disinfection of other areas should use mask and gloves.

(e) Disinfection of high-risk areas should be done as frequently as possible based on movement of patients/contacts, while disinfection of other areas should be carried out twice daily. Cleaning and disinfection efforts should be targeted primarily on high-risk and moderately high-risk areas for optimal utilization of hygiene and sanitation staff.

(f) Start cleaning from cleaner areas and proceed towards dirtier areas.

(g) In addition, all personnel should consider cleaning the work area in front of them with a disinfecting wipe prior to use on daily basis.

(h) Do not use disinfectants spray on potentially highly contaminated areas (such as toilet or surrounding surfaces) as it may create splashes which can further spread the virus.

(j) To prevent cross contamination, discard cleaning material made of cloth (mop and wiping cloth) in appropriate bags after cleaning and disinfecting. Wear a new pair of gloves and fasten the bag.

(k) Disinfect all cleaning equipment after use and before using in other area. Disinfect buckets by soaking in bleach solution or rinse in hot water.

(l) Masks are effective if worn according to instructions and properly fitted. Masks should be discarded and changed if they become physically damaged or soaked.

6.13 Keeping mentally and physically fit during covid-19 crisis

As we hear about spread of COVID-19 from all over the world through television, social media, newspapers, family and friends and other sources, these can be difficult times for everyone. The most common emotion faced by all is anxiety. Staying at home can be quite nice for some time,but can also be boring and restricting if it extended for longer periods. The following measures are some of the recommended ways for keeping mentally and physically fit during difficult times.

(a) **Keeping the daily routine busy** with working on pending official tasks, household chores and playing with children. Distract yourself from negative emotions by listening to music, reading, watching an entertaining programme on television.

(b) **Rediscover hobbies**. If you had old hobbies like painting, gardening or stitching, go back to them.

(c) **Eat balanced diet** with plenty of vegetables and fruits, and drink plenty of fluids.

(d) **Be physically active**. Do simple indoor exercises that will keep you fit and feeling fit.

(e) **Knowledge is power**; the more you know about a certain issue, the less fearful you may feel. Make sure to access and believe only the most reliable sources of information for self-protection. Do not spread or share any unverified news or information further.

(f) **Practice Meditation and Yoga**. At times of anxiety, practice breathing slowly for a few minutes. Try and distance the thoughts that are making you anxious. Think of something calm and serene, and slow down your mind. When feeling angry and irritated, calming your mind, counting back from 10 to 1, distracting yourself helps.

(g) **Stay connected with others**. Feeling lonely or sad is also quite common. Communication can help you to connect with family and friends. Call up people whom you haven't spoken to and surprise them. Discuss happy events, common interests, exchange cooking tips, share music.

(h) **Seek professional advice**. If any of these emotions persist continuously for several days, despite your trying to get out of it, talk about it with someone. If the feelings worsen, a person may feel helpless, hopeless and feel that life is not worth living. If that happens, seek professional advice.

(j) **Avoid tobacco, alcohol and other drugs**. Use of tobacco or alcohol or other drugs to cope with emotions or boredom can worsen physical, mental health and reduce immunity.

(k) **Do not shun or judge people with a COVID infection**. While you need to maintain a physical distance and keep yourself safe to prevent such infection, remember they need care and concern. If you know someone who might have the infection, tell them about precautions, and how to get medical assistance, if required.

(l) If you happen to get infected with Corona, remember most people get better. Do not panic. Follow medical advise.

(m) **Be supportive to colleagues and family members**. Just as you can recognise your own mental health problems, be sensitive to such problems in your near and dear ones, which may include changes in sleep patterns, difficulty in sleeping and concentrating, worsening of health problems, increased use of alcohol/ tobacco/ drugs. Be supportive to them. If the problems persist, please seek professional advise.

General Preventive Measures to be followed by Corona Warriors

6.14 All corona warriors should maintain Social Distancing. They should lead by example and defer their personal and social engagements. They should focus only on health care responsibilities and duties. They should also spread awareness about social distancing amongst patients and their attendants. Wash hands frequently with soap and water or alcohol based sanitizer. Wash your hands after removing gloves, after contact with the patient or medical equipment. There can be an interface with droplets, sputum, or bodily fluids while performing routine procedures.

6.15 Use face masks and N 95 masks. N95 masks offer protection against droplet and airborne transmission of 95% of particles more than 0.3 microns in size. Surgical face masks protect against COVID-19 droplet transmission but do not protect against aerosolized small particles. Wear disposable caps and beard covers to decrease the risk of hand contamination by touching hair that may have been exposed to droplets.

Do mock drills for correct donning and doffing of Personal Protective Equipment (PPE) including gown, face mask, eye shields and gloves. Do Mock intubation/ extubation drills wearing PPE.

6.16 Aerosol-generating procedures are tracheal intubation and extubation, suctioning, nebulization, mechanical ventilation or high flow nasal oxygen therapy. Aerosolization is also increased when more than one attempt at intubation is required.

Out patient Clinics:

6.17 Every patient entering the hospital should be considered as COVID-19 positive and corona warriors should wear mask all the time. Wash your hands with alcohol based sanitizer or soap and water frequently. Restrict the number of attendants coming to OPD. Only one attendant to be allowed with the patient. Manage inflow of patients and prevent crowding inside the out patient Clinics.

6.18 History of fever should be elicited/record patients' body temperature before entering the Clinic. If the body temperature is higher than 37.3°C, patient should be asked to restrict him/herself at home and report to flu clinics in case of worsening of symptoms. All patients with cough should be immediately provided with a surgical mask at the reception and they should not be made to wait in queues.

6.19 Do detailed examination of all patients. Ask specifically about international travel or domestic travel in the affected areas in last fortnight by the patient or his family members. It is reemphasized to enquire about history of cough, fever and sore throat and a careful chest auscultation. All reusable equipment stethoscopes, BP instruments etc., should be frequently sanitized.

6.20 At the end of the day, clean and disinfect clinics by thoroughly wiping the surfaces of furniture, equipment and floor with 2 to 3% hydrogen peroxide. Learn the correct method of using and disposing surgical masks. All PPEs after exposure should be locked in a double zip lock plastic bag and discarded in a touch-free disposal.

6.21 After returning from hospital, take bath before greeting family members. Change the clothes and keep them in wash bucket. Institutes should counsel patients actively to reschedule elective/semi-emergency surgical procedures. This is especially for the elderly, paediatric and immuno-compromised patients. Defer interventional chronic pain procedures. Only emergency procedures to be done.

Peri-Operative Care

6.22 Any patient with history of cough, fever or sore throat is usually investigated before surgery. Such patients should not undergo elective surgery and be investigated appropriately. Suspected cases should be kept in designated isolation area by the institute and reported to appropriate authorities.

Emergency Surgery in suspected/confirmed COVID 19 Patients:

6.23 Dedicated Operation Theatres to be used for all confirmed or suspected COVID-19 infected patients. These operation theatres should be labeled “COVID-19 Operation Theatre” and large clear bill boards and signage, visible from a distance, should be placed outside such OTs. COVID-19 infected patients should be wheeled through separate/isolated corridors to the operation theatre. The patients should be wheeled directly in to the OT. They should not stay in pre-medication room at all.

6.24 Since majority of operation theatres in India are not negatively pressurized, the positive pressure system and air conditioning must be turned off. Laminar flow and the functional high-efficiency filters are preferable. All operation theatre staff should wear

PPE including anaesthesiologists, surgeons, nurses, technician, bearer, sweeper, etc. PPE included one piece special gown, properly fitted N95/N99 mask, eye shield and double gloves. Wear hospital scrubs inside and protective coveralls outside; wear a medical protective mask, disposable surgical cap, and goggles/face shield; and wear disposable medical latex gloves and boot covers.

6.25 The suggested sequence for putting on personal protective equipment is as follows:

- putting on scrubs and hair cover.
- performing hand hygiene.
- putting on the mask.
- putting on inner gloves.
- putting on the coverall.
- putting on eye protection (goggles/face shield).
- putting on foot protection.
- putting on the isolation gown.
- putting on outer gloves.

Correct use of PPEs by healthcare professionals

6.26 Due to close patient contact and the need for airway instrumentation, anesthesia professionals are at increased risk of exposure and infection for all diagnostic, therapeutic, and surgical procedures during this rapidly escalating COVID pandemic. Ideally, medical professionals should use properly fitted N95 masks or powered air purifying respirators (PAPRs). For those who are not N95 fit-tested, have facial hair, or fail N95 fit-testing, PAPRs should be used if possible. Surgical face masks protect

against COVID-19 droplet transmission but do not protect against aerosolized small particles.

6.27 Recommendations for those exposed to a person with symptomatic COVID-19 during period from 48 hours before symptoms onset until that person meets criteria for discontinuing home isolation.

These patients should be instructed as follows:

a) Stay home until 14 days after last exposure and maintain social distance (at least 6 feet) from others at all times;
b) Self-monitor for symptoms (check temperature twice a day and watch for fever, cough, or shortness of breath) and follow CDC guidelines if symptoms develop;
c) Avoid contact with people at higher risk for severe illness (unless they live in the same home and had same exposure).

6.28 A patient scheduled for elective surgery who has close contact with someone infected with SARS-CoV-2 should have their case deferred for at least 14 days. There can be a 5-day or longer incubation time between exposure to SARS-CoV-2 virus and development of symptoms. Individuals who are COVID-positive may also be asymptomatic or have minimal symptoms. A patient may be infected with SARS-CoV-2 and have a negative SARS-CoV-2 test. The diagnostic sensitivity of the SARS-CoV-2 test is dependent on sampling technique, fluid sampled, the test performed and the timing of the test relative to the infectious course. Therefore, it is recommended that as optimal practice that all medical professionals should utilize appropriate PPE during aerosol generating procedures for all patients.

6.29 Appropriate PPE includes: fitted N95 masks; powered air purifying respirators (PAPRs); and may include other NIOSH or CDC approved respirator. PAPRs should be used by individuals who are not N95 fit-tested, have facial hair, or fail N95 fit-testing. Surgical face masks protect against SARS-CoV-2 droplet transmission but do not protect against aerosolized particles. All components of appropriate PPE should be carefully addressed. Personnel participating in aerosol-generating procedures should wear eye protection (goggles or a disposable face shield that covers the front and sides of the face), a gown, and gloves, in addition to airway protection with N95 masks or PAPRs.

Usage of N-95 masks by healthcare professionals

6.30 The inventor of the material used in the N95 mask, Dr. Peter Tsai, suggests that droplets and viable viruses will dry and no longer carry risk of transmission if the masks are not obviously soiled and are carefully stored in brown paper bags (so that air can circulate to them for drying) for at least 3 days. The Centre for Disease Control (Atlanta, USA) supports this approach if really necessary to allow re-use but suggests a 5 day period of drying. A practical application, if sufficient numbers of N95 masks are available, would be to issue 5 masks to everyone, and then have them rotate the use and storage of masks in a cycle. Information circulating through social media suggests that placing N95 masks in ovens at 70° C for 30 minutes will decontaminate N95 masks, also. The manufacturers, too do not support this approach to decontaminating N95 masks, suggesting that the dry heat may harm the protective integrity of the masks.

Usage of barriers during critical care procedures

6.31 Any device or shield that deflects or contains droplets (e.g. viral particles) might reduce exposure. There is no guidance on whether they are actually effective or if any technique is superior. Some alternatives are using the plastic intubation tubes/boxes, placing a sheet of clear plastic over the patient while intubating, or using clear plastic drape over a Mayo stand covering the patients head during intubation. Some people have added placing suction under the drape to reduce droplet exposure further. While these might aid in the reduction of airborne particles, some clinicians believe that they slow down intubation times.

Social Distancing in the ICU and Operation Theatre

6.32 Social distancing in our OR and ICU practices were also followed using the available guidelines and recommendations.

(a) Minimize talking in OR and ICU rooms because phonation may generate aerosolization of respiratory and oral-nasal secretions. This may underlie community spread. Only those conversations necessary for patient care should occur.

(b) Only people with active duties should remain in OR and ICU rooms. Staff violating this practice should be politely asked to leave.

(c) Do not congregate in work areas. Patient care discussions should be done between the minimum number of providers necessary or over the telephone. Within OR rooms, breaks are an important part of patient safety for anesthesia professionals. Staff should continue to work collaboratively to facilitate breaks, especially those involved in prolonged surgical procedures.

Returning to Work after contacting Covid-19

6.33 Symptomatic HCP with suspected or confirmed COVID-19 (Either strategy is acceptable depending on local circumstances):

(a) **Symptom-based strategy**.

Exclude from work until at least 3 days (72 hours) have passed since recovery defined as resolution of fever without the use of fever- reducing medications and improvement in respiratory symptoms (e.g., cough, shortness of breath); and at least 10 days have passed since symptoms first appeared.

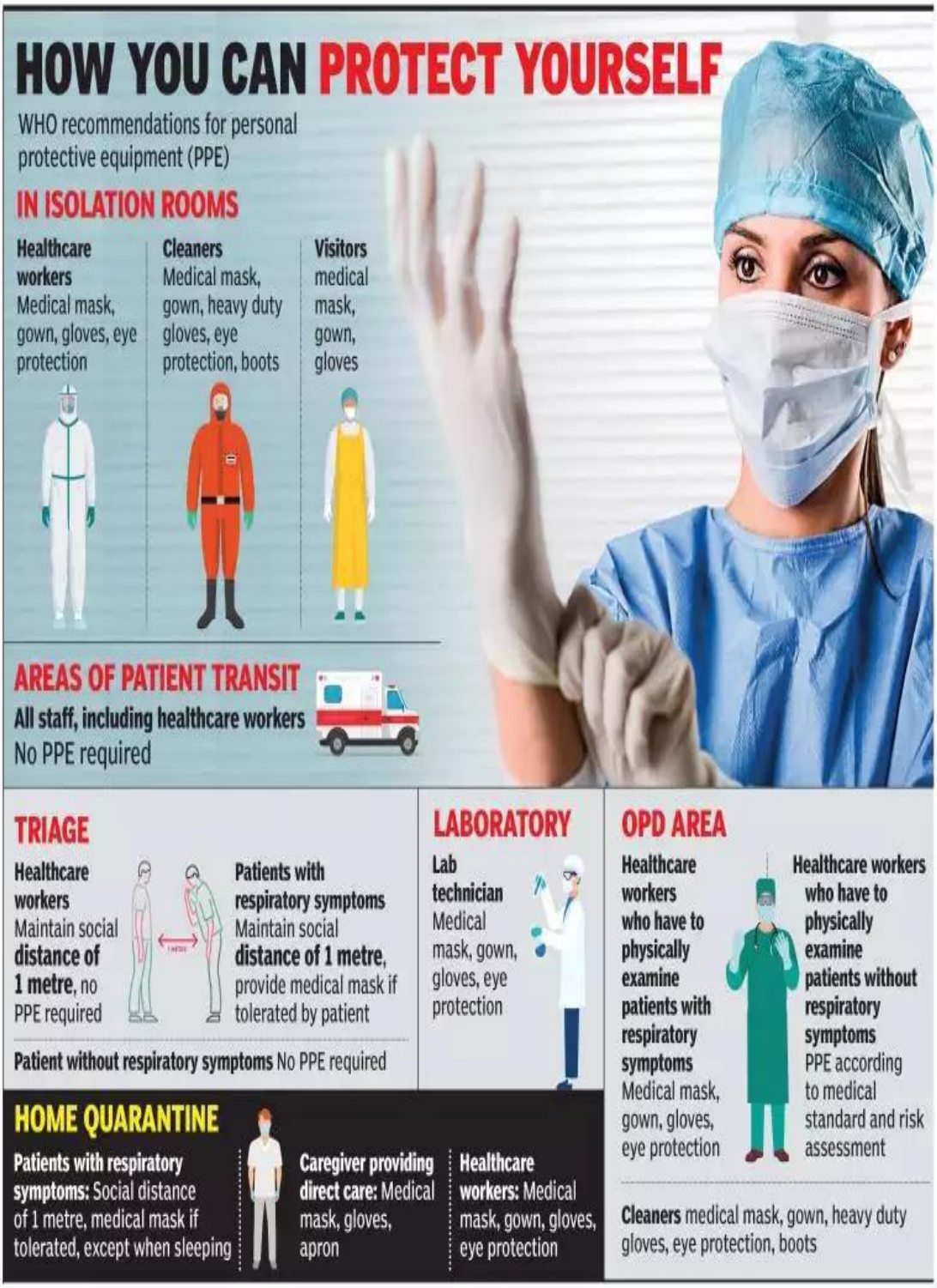
(b) Test-based strategy.

Exclude from work until resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms (e.g., cough, shortness of breath), and negative results COVID-19 molecular assay for detection of SARS-CoV-2 RNA from at least two consecutive respiratory specimens collected =24 hours apart (total of two negative specimens). Of note, there have been reports of prolonged detection of RNA without direct correlation to viral culture.

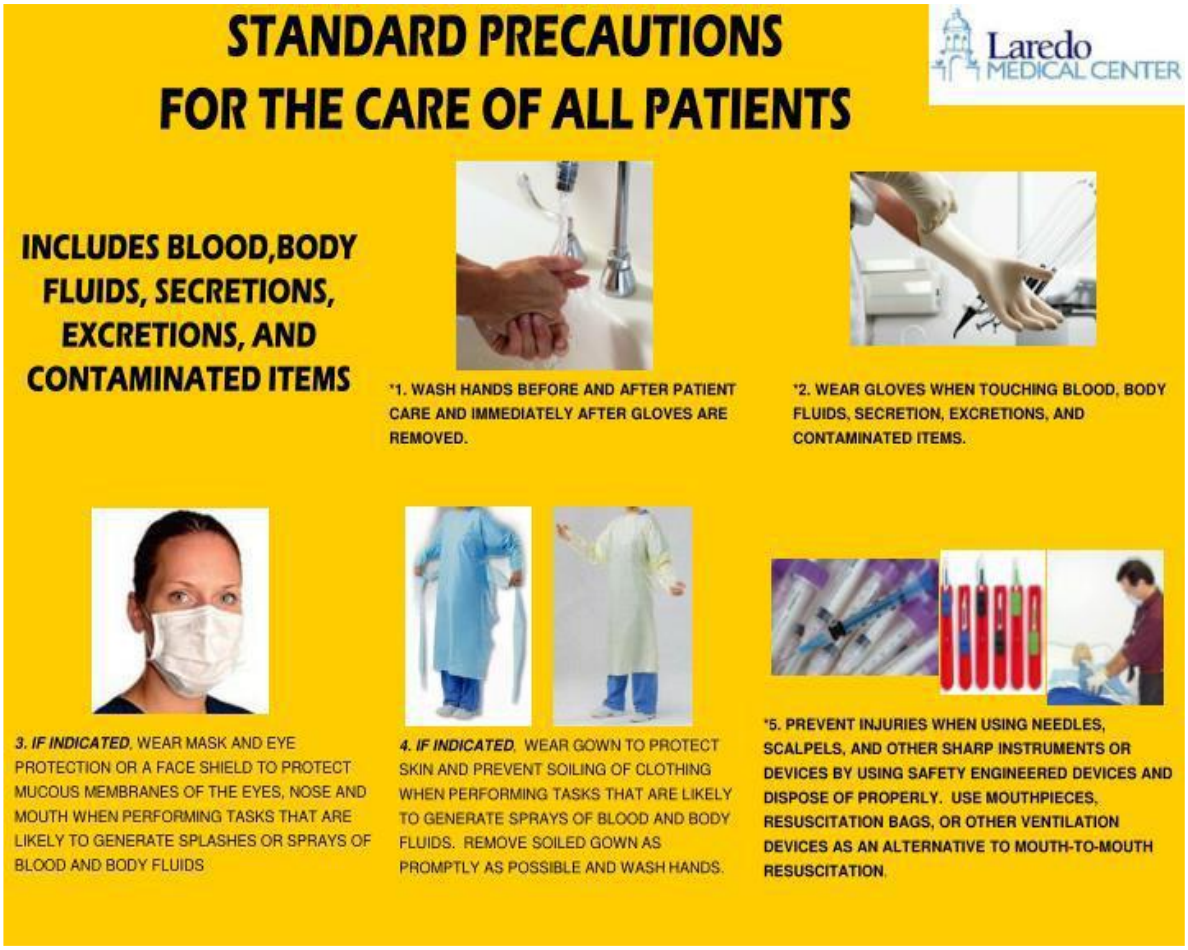
6.34 After returning to work, Health Care Professional should wear a facemask for source control at all times while in the healthcare facility until all symptoms are completely resolved or at baseline. A facemask instead of a cloth face covering should be used by these HCP for source control during this time period while in the facility. After this time period, these HCP should revert to their facility policy regarding universal source control during the pandemic.

A facemask for source control does not replace the need to wear an N95 or higher-level respirator (or other recommended PPE) when indicated, including when caring for patients with suspected or confirmed COVID-19. Of note, N95 or other respirators with an exhaust valve might not provide source control. Self-monitor for symptoms, and seek re-evaluation from occupational health if respiratory symptoms recur or worsen.

(Fig 6.1 ;Infection prevention for Health care workers during Covid-19 pandemic)



(Fig 6.2 Personal Protective measures during the corona virus pandemic for Healthcare workers)



(Fig 6.3 ; Protocols for Health care workers for IPC during Covid-19 pandemic)

Chapter VII

Role of Anaesthesiologists in the current Covid -19 pandemic in hospitals

7.1 The role of anaesthesiologists has been recognised by everyone in the community like never before during this pandemic. Being experts in airway management, ventilator management and critical care, anaesthesiologists have gained an important role in managing all facets of COVID-19. The Anaesthesiologist has been skilled in team management strategies in operation theatre, Intensive Care Unit and during disaster management hence it is not difficult to adapt during a pandemic. It is essential to sensitise the Anaesthesiology fraternity to the unique challenges faced during a pandemic, so that their existing knowledge and skills can be utilized to full potential in overcoming the pandemic.

7.2 Various strategies have to be followed to minimise exposure of healthcare professionals working in COVID hospitals and wards. This includes but is not limited to usage of protective gear, simple innovations like aerosol boxes, modifications in intubation and extubation techniques, changes in guidelines of resuscitation etc

7.3 Life of an anaesthesiologist has taken altogether an abrupt turn globally including in our nation since the beginning of this lockdown. Few important insights have been brought to the fore in this pandemic. A new restricted workspace does create a variable degree of stress which can prove extremely harmful if this battle with corona is long drawn where everyone is advised to confine in their homes and shelters. Anaesthesiologists and intensivists have to create a virtual protective shell around them so as to thwart the dangers of infection, boredom, stress, minimal family time, health,

and many others. Thus, considering the present circumstances, it seems absolutely necessary that before going to duty, donning or doffing PPE, during surgeries and dealing with various other professional commitments, he is well motivated and counselled for stress mitigation.

7.4 We should train the non-core healthcare personnel to get involved in mainstream clinical care to take the burden off from at least some of the critical care activities. The existing number of anaesthesiologists and critical care physicians might not be sufficient in case there is a massive surge in the number of critical cases or if there is a future pandemic. Hence, it is essential that we train doctors from non-anaesthesiology background in ventilator management and critical care.

7.5 This pandemic has underscored the importance of clinical healthcare and medical research. Anaesthesiologists have gained immense recognition and responsibility among the medical community in managing this pandemic. This pandemic has proved that medical science is ever-changing and it is imperative for medical professionals to stay updated . This emphasises the need for inclusion of the subject of management of pandemics in the medical curriculum so that the medical fraternity would be able to manage future pandemics efficiently.

7.6 Anaesthesiologists are experts in airway management and will be on the frontlines of managing critically ill patients. Learning from previous experiences with SARS and understanding the current epidemiological factors of the COVID-19, anaesthesiologists are much better prepared to protect themselves during aerosol-generating medical procedures. A good knowledge of infection prevention and control, vigilance in protective measures, strict adhesion of donning and doffing of PPE, and preparedness for the care of infected patients are of utmost importance.

Chapter VIII

Anxiety , Stress and Mental Health of Health Care workers during Covid-19 pandemic

8.1 The COVID-19 pandemic has overwhelmed mankind since its onset in Nov 2019, crippling economies and healthcare facilities worldwide, leaving no nation, race or gender untouched. It has not only outstretched the medical services but has had an undeniable psychological affect on the society, reverberations of which are yet to be discerned by the populace. The short-term psychological effects have insidiously affected every healthcare worker seeing the scale of this human tragedy. In the long term, Mental health care services, have a very crucial role to play, both in mitigating the onslaught of psychiatric morbidity and also in shaping the response towards infection - while safeguarding and fostering human connection and contact.

8.2 During any crises, the Medical staff have a critical role to play in providing essential mental health care and psycho-social support to those affected. They play a vital role in planning the needs of safety of healthcare staff by organizing decontamination procedures, furthering education and continuing feedback from the co-workers. The healthcare workers further have a crucial role to play in the dissemination of information, model an empathetic approach and above all does this while preserving the motto of service with a smile. However, the knowledge of spread of the outbreak has led to development of anxiety amongst the healthcare workers which in turn affects their mental health status and their ability to work in a hazardous environment .

8.3 Emotional needs of HCWs must not be ignored: health care workers at the front-line of COVID-19 are under extreme physical and mental stress. They are physically overworked beyond conceivable limits, they are forced to make tormenting triage decisions, and are racked by guilt and pain from losing patients and colleagues. This is in addition to worrying about their own health and the constant anxiety of passing infection on to their families. A study conducted by Chinese doctors and published in the Lancet showed that 70% of health workers on the frontline in Hubei, suffered from extreme levels of stress, 50% had depressive orders, 44% had anxiety and 34% insomnia.

8.4 This study can play a significant role in understanding the impact of COVID-19 on mental health status of health care workers and thus helping in formulating protocols to control the spread of fear and anxiety amongst the medical staff working in COVID-19 wards. Anxiety in general population can be attributed to highly contagious nature of the outbreak, lack of COVID-19 awareness, social stigma associated with it and conflicting data being spread by media and public. However, health care workers were trained with a capsule on infection prevention and control with a better understanding of the COVID-19 -19 disease giving them a greater confidence while washing hands, donning /doffing PPEs and working for hours in shifts in the wards . They were also isolated in a bubble from other health care workers for 14 days and rotation of workers was ensured. On completion of a time of 14 days each paramedic was removed for a period of isolation for a week to observe for symptoms, if any.

8.5 The significance of psychosocial skills for COVID- 19 responders was highlighted by WHO on 01 Jun 2020. WHO emphasised on taking care of one's own mental health, demonstrating empathy and helping people suffering from stress or

severe distress. Basic psychosocial skills, a guide for essential healthcare workers was introduced during their training programme and a dedicated counselling helpline with psychiatrist and psychological counsellor was activated to function round the clock in the hospital.

8.6 Accurate knowledge regarding the COVID-19 is often associated with less anxiety amongst the individuals. Hence, more importance needs to be given to providing correct updated data and revising protocols as more knowledge of the pandemic surfaced over time. Our minimal knowledge on COVID-19 due to its novel nature resulted in numerous new data being unearthed every day leading to revision of protocols by WHO, ICMR and MoHFW guidelines. This further necessitated the need of updating the knowledge of this disease and disseminating it to the health care workers.

8.7 The aim of this study was to conduct a survey to assess the psychological impact amongst doctors, Nursing staff and paramedics working in Covid-19 wards of our hospital (N= 56) They were separated into two groups with Group I being paramedics (n1= 35) and Group II being Doctors and nursing staff (n2 = 21) . Total study involved all healthcare workers who had completed at least two cycles of working in shifts in Corona positive wards. The sudden and highly infectious outbreak the time has shown a rise in anxiety, depression and other stress related reactions. The current study is based on a questionnaire which evaluated 56 doctors, nurses and paramedics from our hospital who were doing duties in the Covid-19 wards. They were given the DASS -21 questionnaire and results were tabulated. further, the group of doctors and nurses (Group I) were compared with the results of paramedics(Group -II) to assess the anxiety , depression levels and stress amongst these two groups.

Results of Study

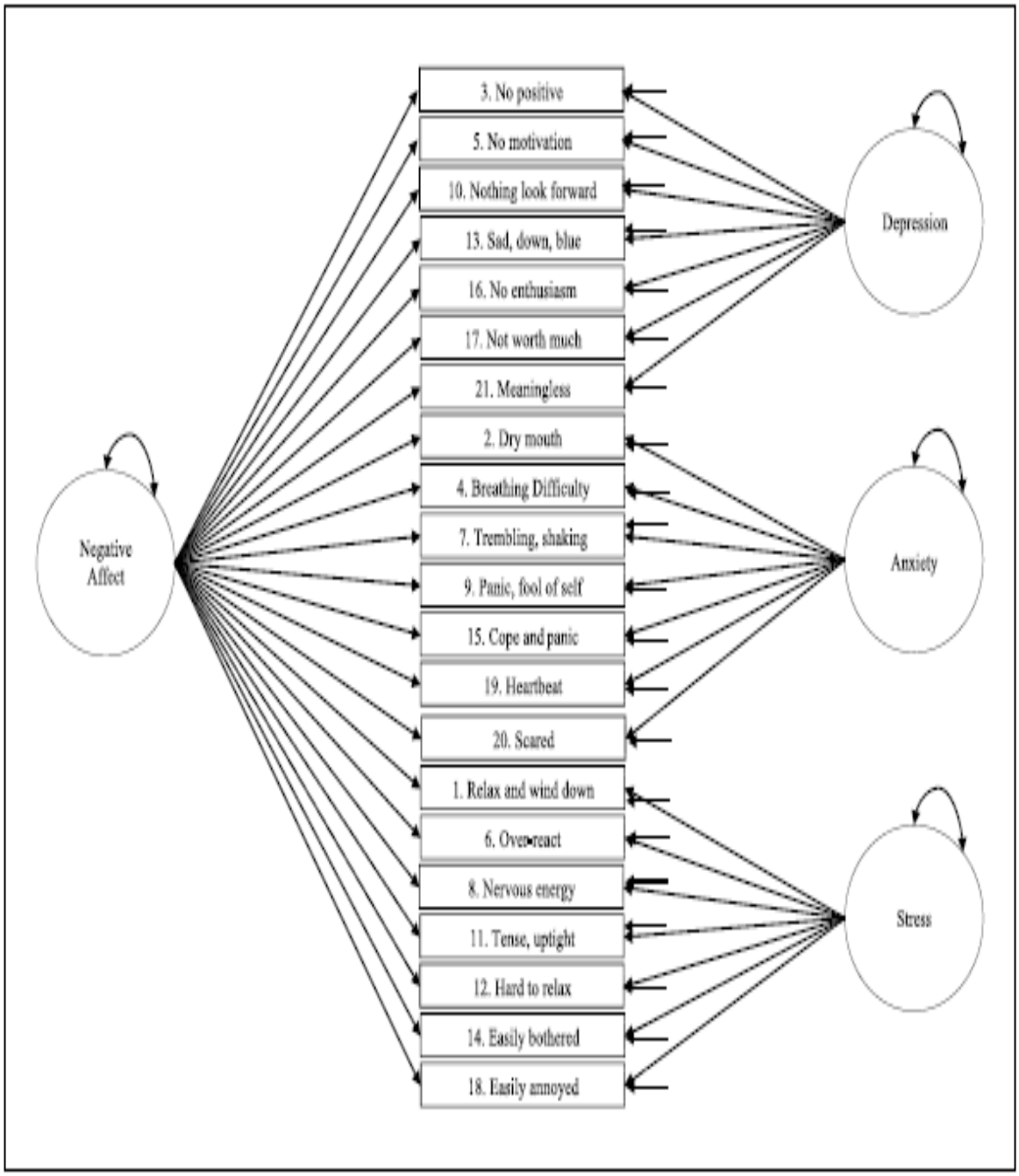
8.8 The study was conducted amongst Health care workers in our hospital on the levels of anxiety, stress and mental health as perceived by them while caring for Covid -19 patients in the hospital. The 2019 novel Corona virus disease (Covid-19) pandemic has overwhelmed healthcare systems worldwide profoundly impacting the lives of healthcare workers caring for the critically ill and imposes a significant physical and cognitive burden which is further compounded by increase in workloads, staff deficiencies and equipment shortages studies on healthcare workers from China and Italy have described stress related anxiety and depression during the Covid-19 pandemic. In this study we sought to determine the prevalence and severity of psychological distress among healthcare workers working in Covid-19 wards during this pandemic and to identify potential risk factors.

8.9 This observational cross-sectional study was conducted at are 300 bedded multi-speciality hospital of the Indian Navy. Ethical approval was obtained from the institutional Ethics Committee before commencement of the study. All healthcare workers, doctors, nurses and paramedical staff working in the Covid-19 wards were invited to participate in a one time self-administered questionnaire. A total of 61 participants completed the 21 question closed ended self-reporting questionnaire, the DASS-21 form. No identifying information was collected. The anonymized questions collected participant characteristics, age, sex, workplace characteristics Covid-19 patient care, availability of PPE, perceptions and concern surrounding the Covid-19 pandemic and direct impact of the pandemic.

8.10 Key mental health outcomes were measured using the DASS- 21 format which comprises anxiety, depression and stress levels. The responses where coded and scored.

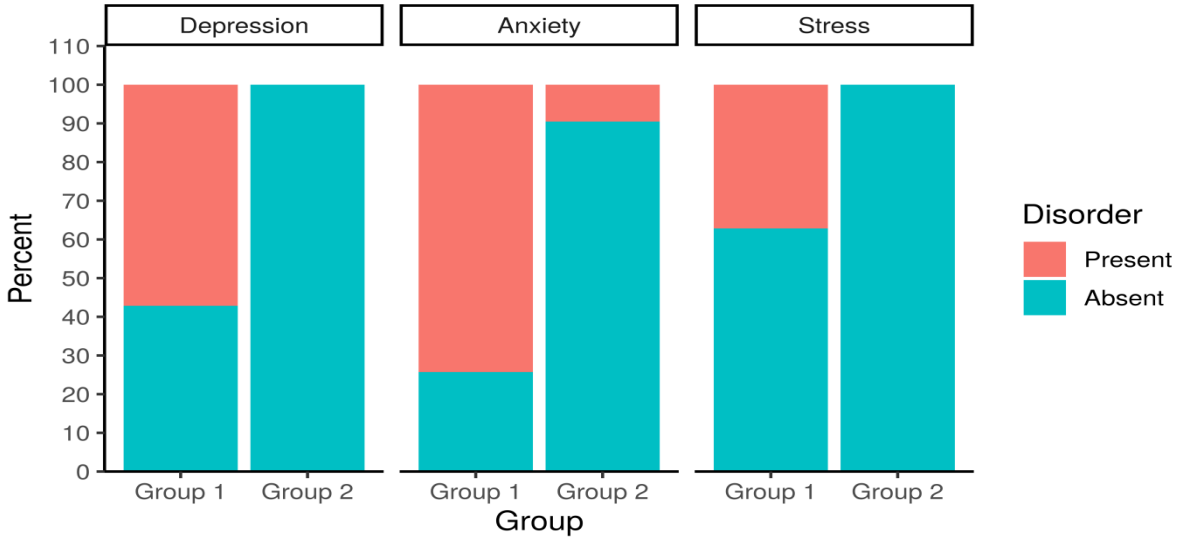
The Depression, Anxiety and Stress Scale - 21 (DASS-21) is a set of three self-report scales designed to measure the emotional states of depression, anxiety and stress.

8.11 The DASS-21 is based on a dimensional rather than a categorical conception of psychological disorder. The assumption on which the DASS-21 development was based (and which was confirmed by the research data) is that the differences between the depression, anxiety and the stress experienced by normal subjects and clinical populations are essentially differences of degree. The DASS-21 therefore has no direct implications for the allocation of patients to discrete diagnostic categories postulated in classificatory systems such as the DSM and ICD.



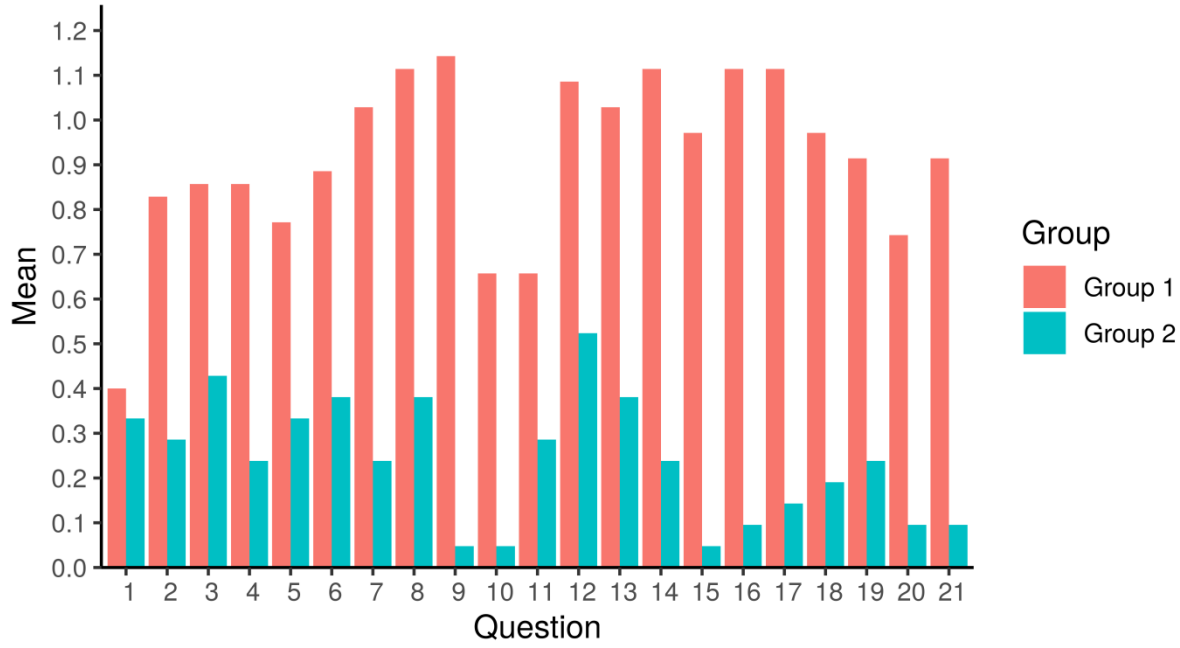
(Fig 8.1The DASS-21 Scoring system and evaluation of Depression, anxiety & Stress)

Graph 1 : Association between Group I and II for incidence of Depression, Anxiety & Stress

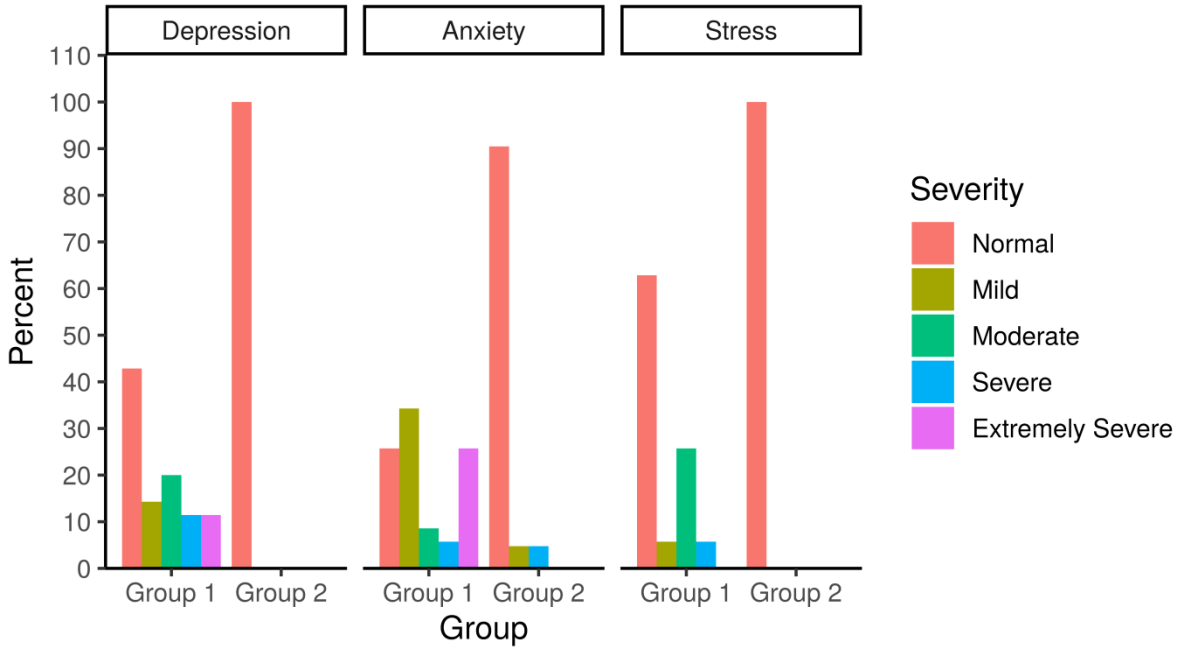


(Group I = 35 (paramedics) , Group II = 21 (Doctors, Nursing Officers) Total N = n1+n2 = 56)

Graph 2 : Association between Group I and II for Depression, Anxiety & Stress scores

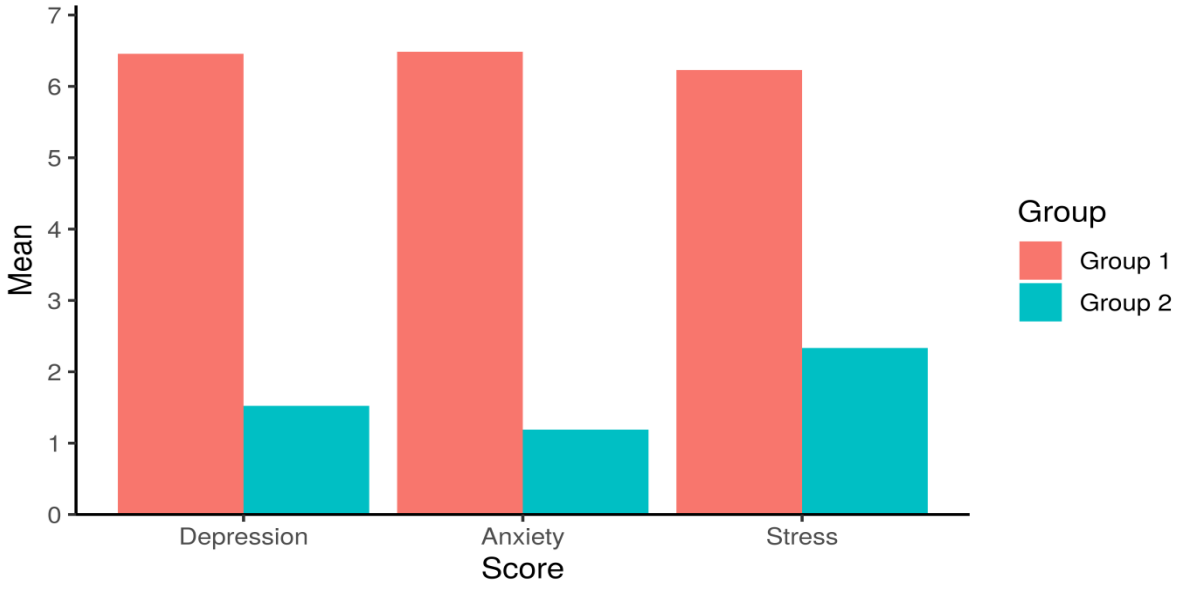


Graph 3 : Association between Group I and II for severity of Depression, Anxiety & Stress



(Group I = 35 (paramedics) , Group II = 21 (Doctors, Nursing Officers) Total N = n1+n2 = 56)

Graph 4 : Association between Group I and II for Depression, Anxiety & Stress scores



DASS-21	Group		p value
	Group 1 (n = 35)	Group 2 (n = 21)	
Question 1	0.40 ± 0.69	0.33 ± 0.58	0.817[1]
Question 2* **	0.83 ± 0.82	0.29 ± 0.72	0.005[1]
Question 3	0.86 ± 0.91	0.43 ± 0.51	0.095[1]
Question 4* **	0.86 ± 0.88	0.24 ± 0.44	0.008[1]
Question 5	0.77 ± 1.03	0.33 ± 0.58	0.153[1]
Question 6* **	0.89 ± 0.99	0.38 ± 0.74	0.041[1]
Question 7* **	1.03 ± 1.07	0.24 ± 0.70	0.001[1]
Question 8* **	1.11 ± 0.83	0.38 ± 0.67	0.001[1]
Question 9* **	1.14 ± 1.09	0.05 ± 0.22	<0.001[1]
Question 10* **	0.66 ± 0.80	0.05 ± 0.22	0.001[1]
Question 11	0.66 ± 0.84	0.29 ± 0.56	0.085[1]
Question 12* **	1.09 ± 0.92	0.52 ± 0.75	0.025[1]
Question 13* **	1.03 ± 0.86	0.38 ± 0.50	0.004[1]
Question 14* **	1.11 ± 0.93	0.24 ± 0.44	<0.001[1]
Question 15* **	0.97 ± 1.07	0.05 ± 0.22	<0.001[1]
Question 16* **	1.11 ± 0.93	0.10 ± 0.30	<0.001[1]
Question 17* **	1.11 ± 0.93	0.14 ± 0.36	<0.001[1]
Question 18* **	0.97 ± 1.01	0.19 ± 0.40	0.003[1]
Question 19* **	0.91 ± 0.95	0.24 ± 0.70	0.002[1]
Question 20* **	0.74 ± 0.78	0.10 ± 0.30	0.001[1]
Question 21* **	0.91 ± 0.89	0.10 ± 0.30	<0.001[1]

Table 1: Association between Group and DASS-21

****Significant at p<0.05, 1: Wilcoxon-Mann-Whitney U Test*

(Group I = 35 (paramedics) , Group II = 21 (Doctors, Nursing Officers) Total N = n1+n2 = 56)

8.12 The following variables were significantly associated (p<0.05) with the variable 'Group': , Question 2, Question 4, Question 6, Question 7, Question 8, Question 9, Question 10, Question 12, Question 13, Question 14, Question 15, Question 16, Question 17, Question 18, Question 19, Question 20, Question 21. To summarise all three states namely depression, anxiety and stress on which the questions are based showed significance amongst the two groups being significantly greater in Group I as compared to Group II.

Table 2: Association between Group and DASS-21 Score

DASS-21 Score	Group		p value
	Group 1 (n = 35)	Group 2 (n = 21)	
Depression* **	6.46 ± 4.37	1.52 ± 1.36	<0.001[1]
Anxiety* **	6.49 ± 4.43	1.19 ± 1.99	<0.001[1]
Stress* **	6.23 ± 3.99	2.33 ± 2.82	<0.001[1]

****Significant at p<0.05, 1: Wilcoxon-Mann-Whitney U Test*

(Group I = 35 (paramedics) , Group II = 21 (Doctors, Nursing Officers) Total N = n1+n2 = 56)

8.13 The following variables were significantly associated (p<0.05) with the variable 'Group': , Depression, Anxiety, Stress . This shows that in our study there was significantly greater depression, anxiety and stress amongst paramedics as compared with Doctors and Nurses group.

Table 3: Association between Group and DASS-21 Severity

DASS-21 Severity	Group		p value
	Group 1 (n = 35)	Group 2 (n = 21)	
Depression* **			<0.001[1]
Normal	15 (42.9%)	21 (100.0%)	
Mild	5 (14.3%)	0 (0.0%)	
Moderate	7 (20.0%)	0 (0.0%)	
Severe	4 (11.4%)	0 (0.0%)	
Extremely Severe	4 (11.4%)	0 (0.0%)	
Anxiety* **			<0.001[1]
Normal	9 (25.7%)	19 (90.5%)	
Mild	12 (34.3%)	1 (4.8%)	
Moderate	3 (8.6%)	0 (0.0%)	
Severe	2 (5.7%)	1 (4.8%)	
Extremely Severe	9 (25.7%)	0 (0.0%)	
Stress* **			0.005[1]
Normal	22 (62.9%)	21 (100.0%)	
Mild	2 (5.7%)	0 (0.0%)	
Moderate	9 (25.7%)	0 (0.0%)	
Severe	2 (5.7%)	0 (0.0%)	

****Significant at p<0.05, 1: Fisher's Exact Test*

(Group I = 35 (paramedics) , Group II = 21 (Doctors, Nursing Officers) Total N = n1+n2 = 56)

8.14 The following variables were significantly associated (p<0.05) with the variable 'Group': , Depression, Anxiety, Stress.

Table 4: Association between Group and DASS-21

DASS-21	Group		p value
	Group 1 (n = 35)	Group 2 (n = 21)	
Depression (Present)* **	20 (57.1%)	0 (0.0%)	<0.001[1]
Anxiety (Present)* **	26 (74.3%)	2 (9.5%)	<0.001[1]
Stress (Present)* **	13 (37.1%)	0 (0.0%)	<0.001[2]

****Significant at p<0.05, 1: Chi-Squared Test, 2: Fisher's Exact Test*

The following variables were significantly associated (p<0.05) with the variable 'Group': , Depression, Anxiety, Stress

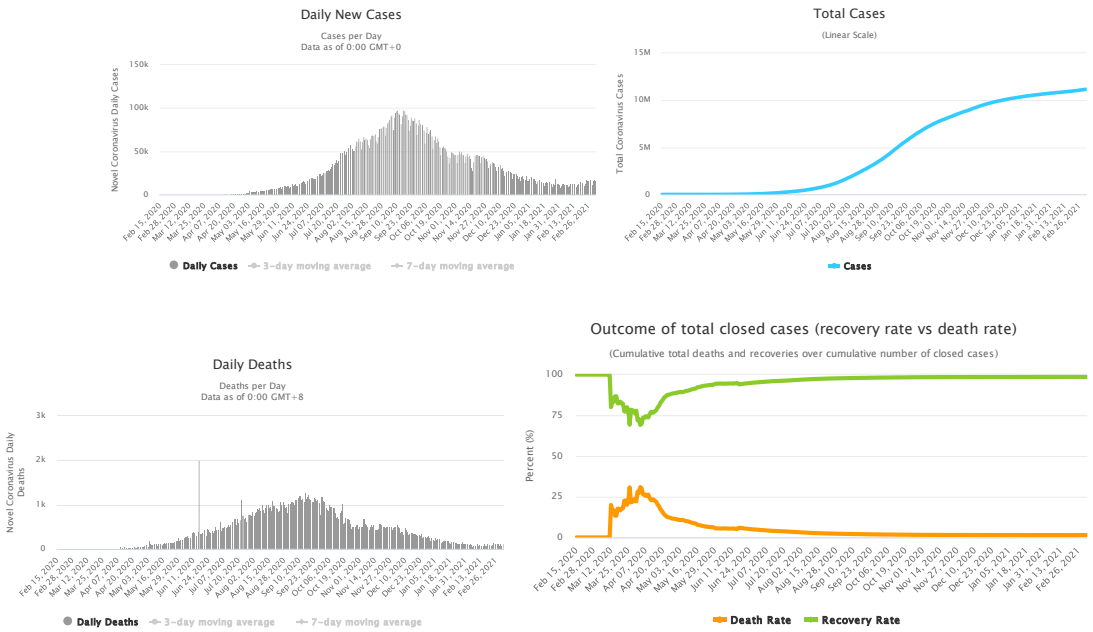
(Group I = 35 (paramedics) , Group II = 21 (Doctors, Nursing Officers) Total N = n1+n2 = 56)

8.15 In our study there was a significant percentage of personnel who showed features of Depression (57.1%), Anxiety (26%) and Stress (13%) in group I vis-a -vis Depression (None) , Anxiety (9.5%) and Stress (none) amongst group II personnel. This is statistically significant though further study is corroborated in view of small sample size.). It is generally known that level of education and training of a desired level can prevent Depression, anxiety and Stress and can thus be easily explained in the difference between Group I and II . It is obvious thar with training fear of the unknown and the confidence gained with just in time training will help in lower levels of depression , anxiety and stress especially amongst those with basic education as compared to experts in the field.

8.16 However, this opens a new dimension in handling of paramedics and the necessity of constant training, communication, encouragement which may be required for routine health care workers . On the external countenance though no apparent distress was observed amongst this highly motivated group of soldiers committed to work beyond the call of duty

but it is clear from the responses received that there is in fact a level of anxiety, depression and stress amongst these individuals.

INDIA : CORONAVIRUS DATA 05 MAR 2021(FLATTENED CURVE : RECOVERY 99%)



(Source : https://www.worldometers.info/coronavirus/country/india/)

(Fig 8.1 Coronavirus Dashboard for India Source)

Chapter IX

Discussion and Way Forward

The Pandemic story

9.1 The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing pandemic of coronavirus disease 2019 (COVID-19) caused by the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which was first identified in December 2019 in Wuhan, China. The outbreak was declared a Public Health Emergency of International Concern in January 2020, and a pandemic in March 2020. The disease caused by the SARS-CoV-2 virus is known as coronavirus disease 2019 – or COVID-19.

The Indian perspective ;

9.2 India reported the first confirmed case of the coronavirus infection on 30 January 2020 in the state of Kerala. The affected had a travel history from Wuhan, China. New confirmed cases were soon reported in multiple cities such as New Delhi, Mumbai, Bengaluru, Hyderabad, and Patna. A nation-wide curfew or janta curfew was announced by the prime minister on 22 March from 7 am to 9 pm. People were urged to not leave the house on that day unless for emergencies. The citizen curfew was a precursor to the nation-wide lock-down announced on 26 March.

9.3 A 21-day lock-down across the country was imposed from 26 March to 14 April to curb the spread of the coronavirus pandemic. All factories, schools, colleges, offices and transportation services have been closed, while essential services such as

supermarkets, and pharmacies remain open. The World Health Organization declared COVID-19 to be a pandemic on March 11, 2020.

9.4 Initial stage of spread in India was from contact with persons having travel history to affected nations or tourists from European countries. India was able to prevent an exponential rise in the cases till Jun due to prolonged compulsory lockdown of 21 days from 24 Mar 2020, which was further extended twice till 03 May 2020 and 17 May 2020. Unlocking was announced in stages and as per severity of situation from 03 Jun 2020. During the month of Jun rise in daily cases has increased manifold with states like Maharashtra, Telangana, Delhi and Gujrat facing major crisis.

The Leadership asserted

9.5 Prime Minister Narendra Modi addressed the Nation on a number of occasions during the pandemic. During his address on 12 May 2020, he said "The state of world today teaches us that Self-Reliant India is the only path. Aatm Nirbhar Bharat and that culture and tradition of India speaks of self-reliance with soul in "Vasudhaiva Kutumbakam". During his address, the Prime Minister emphasized on five pillars for self-reliant India:-

(a) Economy

(b) Infrastructure

(c) Technology Driven System

(d) Demography

(e) Demand

9.6 The PM announced an economic package of Rs 20 lakh crore and was focused towards resolve for self-reliant India. He said that Corona crisis has explained the importance of local manufacturing, local market and local supply chain. He exhorted that every Indian should become self-reliant.

The Cruise Ship story

9.7 All 3,711 passengers and crew members aboard the Diamond Princess cruise ship were tested and 19 percent were positive for COVID-19. The case fatality rate, which included only symptomatic individuals, was 2.6 percent. However, 47 percent of passengers who tested positive were asymptomatic at the time of testing. The infection fatality rate, which included both symptomatic and asymptomatic individuals who tested positive, was 1.3 percent.

The China factor

9.8 When whole world was fighting the pandemic endangering the entire humanity, Chinese troops reportedly intruded in Eastern Ladakh, Sikkim and increased to build up opposite Pangong Lake. Despite high level military meeting, violent skirmishes took place in Galwan valley on 15-16 Jun 20 resulting in 18 casualties on our side. Even today despite several rounds of talks the situation along LAC with China remains tense. Many strategic analysts have linked these skirmishes as China's actions to divert the World from the primary issue of focus on the origins of the novel Coronavirus pandemic.

Natural history of the disease

9.9 Current evidence suggests that transmission of SARS-CoV-2 occurs primarily between people through direct, indirect, or close contact with infected people through infected secretions such as saliva and respiratory secretions, or through their respiratory droplets, which are expelled when an infected person coughs, sneezes, talks or sings. Human-to-human transmission of SARS-CoV-2 was confirmed on 20 January 2020, during the COVID-19 pandemic.

Transmission was initially assumed to occur primarily via respiratory droplets from coughs and sneezes within a range of about 1.8 metres (6 ft)

9.10 The virus is transmitted through direct contact with respiratory droplets of an infected person (generated through coughing and sneezing). Individuals can also be infected from and touching surfaces contaminated with the virus and touching their face (e.g., eyes, nose, mouth). The R factor, a virus' basic reproductive number, is referred to as R_0 – the average number of people someone carrying the virus will infect. The higher the R_0, the faster an epidemic can spread. At the start of the pandemic, R_0 for SARS-CoV-2 was estimated at 2.0 to 2.5, indicating that one patient could transmit the virus to two (or slightly more) other people. The doubling time for COVID-19 cases is estimated at three to six days. is transmitted primarily through droplets 5–10 μm in diameter, released when an infected person coughs, sneezes, talks, or even exhales. These airborne droplets can attach to the respiratory tract mucosa or conjunctiva of another person. They can also settle on surfaces or fomites and be transferred to another person upon contact. SARS-CoV-2 is more stable on plastic and steel (up to three days) than on cardboard (up to one day) or copper.

9.11 Viral transmission is possible if someone touches their face, eyes, nose, or mouth following contact with infected fomites. Transmission may also occur through aerosols, which are particles smaller than 5 μm. SARS-CoV-2 remains viable in these particles for up to three hours. Aerosol transmission is a serious risk to health care workers during procedures such as intubation, bronchoscopy, suctioning, turning a patient to the prone position, or disconnecting a patient from the ventilator.ated surfaces or fomites.

Common symptoms of infection may be in the form of respiratory symptoms such as-

(a) fever,

(b) cough,

(c)shortness of breath and

(d)breathing difficulties.

9.12 The incubation period before the onset of COVID-19 symptoms ranges from one to 14 days, with a median of 5–7 days. Patients, who have a median age of 59 years, present with fever, dry cough, loss of smell or taste, shortness of breath chills, rigor, fatigue, myalgia, headache, sore throat, and diarrhoea.

9.13 COVID-19 has a broad **clinical spectrum**, ranging from asymptomatic infection or mild upper respiratory tract illness to multifocal pneumonia, respiratory failure, and death. Approximately 80 percent of patients experience mild to moderate disease, 15 percent have a severe course requiring intensive care, and 5 percent require mechanical ventilation. Patients may develop pneumonia towards the end of the first week of infection. The mean interval from onset of symptoms to hospitalization is between 9 and 12 days; mean duration from symptom onset to discharge from the hospital is 25 days.

9.14 The most severe cases develop pneumonia and acute respiratory distress syndrome (ARDS). Vital signs predictive of a severe course include respiratory rate

over 24 breaths per minute, heart rate over 125 beats per minute, and oxygen saturation over 90 percent on room air.

9.15 In more severe cases, infection can cause pneumonia, severe acute respiratory syndrome, kidney failure and even death. Symptoms may appear 2-14 days after exposure to the virus. Most people (about 80%) recover from the disease without needing hospital treatment. Older people, and those with underlying medical problems like high blood pressure, heart and lung problems, diabetes, or cancer, are high risk groups of developing serious illness. People of all ages who experience fever and/or cough associated with difficulty breathing/shortness of breath, chest pain/pressure, or loss of speech or movement should seek medical attention immediately.

9.16 The mean duration from symptom onset to death is 18 days. Case fatality rate (CFR), which is calculated by dividing the number of deaths by the number of known cases, has been reported at 6.4 percent worldwide – significantly higher in older patients. But CFR almost certainly overestimates the true lethality of the virus. The number of confirmed cases usually includes only people whose symptoms were severe enough to be tested, resulting in a severity bias.

9.17 Epidemiologists estimate there are five to 10 times more people with asymptomatic infections. Additionally, the number of deaths may be inaccurate at the time of calculation because deaths typically occur one to two months after a person becomes infected and not all deaths are apparent at the same time. COVID-19 deaths that occur at home are underreported compared with those that occur in a hospital.

9.18 The infection fatality rate is the proportion of infected people who will die from COVID-19, including those who do not get tested or become symptomatic. The infection fatality rate is estimated to be between 0.5 and 1 percent. Even at this rate, COVID-19 is a serious public health threat. For comparison, the infection fatality rate of seasonal influenza is approximately 0.1 percent – and it nevertheless kills hundreds of thousands of people each year.

9.19 The most common abnormal laboratory findings include lymphopenia (70 percent), increased CRP (61–86 percent), mildly prolonged prothrombin time (58 percent), elevated lactate dehydrogenase (40 percent), elevated AST and ALT (4–22 percent). Results that predict severe disease include D-dimer >1000 ng/mL, ferritin >300 μg/L, lactate dehydrogenase >245 IU/L, absolute lymphocyte count <800, neutrophil-to-lymphocyte ratio >3, platelet count <35,000/μL, CRP >100 mg/L, and elevated high-sensitivity troponin.

9.20 Cytokine release syndrome (“cytokine storm”) is caused by the overproduction of early-response proinflammatory cytokines, including tumor necrosis factor, IL-1β, and IL-6 (one of the best biomarkers of cytokine storm severity and mortality risk). The major cause of COVID-19 mortality is respiratory failure secondary to ARDS and thrombosis. A recent autopsy report compared the histologic patterns of lungs from patients who died from influenza with patients who died from COVID-19. Both groups had diffuse alveolar damage with hyaline membranes and perivascular T-lymphocyte infiltrates.

9.21 Chest radiographs are abnormal in 60 percent of cases (77 percent if severe). Chest CT is abnormal in 86 percent of cases (95 percent if severe). Chest X-

rays are characterized by bilateral patchy infiltrates and chest CT scans demonstrate ground-glass opacities in 86 percent of cases. There is a peripheral distribution in over 50 percent of cases. “Crazy paving” and consolidation become the dominant CT findings (see Figure 5), peaking 9 to 13 days, followed by slow clearing.

9.22 The lungs from COVID-19 patients had distinctive vascular features due to SARS-CoV-2 invasion of endothelial cells, including disruption of cell membranes and severe endothelial injury. This caused microangiopathy and widespread thrombosis in the small vessels and capillaries of the lungs. Alveolar capillary microthrombi were nine times more prevalent in patients who died from COVID-19 than in those who died from influenza.

COVID-19 and Mental Health

9.23 The effects of the COVID-19 pandemic on mental health are due to bereavement, isolation, loss of income and fear are triggering mental health conditions or exacerbating existing ones. Many people may be facing increased levels of alcohol and drug use, insomnia, and anxiety. Meanwhile, COVID-19 itself can lead to neurological and mental complications, such as delirium, agitation, and stroke. People with pre-existing mental, neurological or substance use disorders are also more vulnerable to SARS-CoV-2 infection−they may stand a higher risk of severe outcomes and even death.

9.24 SARS-CoV-2 RNA has been detected in several body fluids including 93 percent of bronchoalveolar lavage fluid, 72 percent of sputum, 63 percent of nasal swabs, 32 percent of pharyngeal swabs, 29 percent of faeces, and 1 percent of blood samples. No urine specimens have tested positive. The average cycle threshold for all

specimens was 31, which corresponded to a viral load of less than $2.6x10^4$ copies/mL. Nasal swabs had a cycle threshold of 24, indicating a much higher viral load of $1.4x10^6$ copies/mL.

9.25 About 12 percent of COVID-19 patients have gastrointestinal symptoms and 41 percent shed viral RNA in their faeces. The presence of viral RNA does not necessarily indicate the presence of live virus, but raises the possibility of human-to-human transmission by the faecal-oral route. SARS-CoV-2 has also been detected in human breast milk from a single mother on days 10, 12, and 13 after birth. Detection of viral RNA coincided with mild COVID-19 symptoms and a positive PCR in the newborn.

9.26 The sequence of SARS-CoV-2 was published by Chinese scientists on January 11, 2020; the following week, virologists in Berlin, Germany, produced the first reverse transcriptase real-time polymerase chain reaction (RT-PCR) diagnostic test for COVID-19. This test was supplied to the WHO and many countries adopted it. Unfortunately, the US Centres for Disease Control and Prevention (CDC) refused to employ this test and prevented laboratories from producing their own assays. On February 5, the CDC began shipping its own SARS-CoV-2 RT-PCR kit – but it produced unreliable results and was deemed unusable. Although the problems were raised on February 7, more than 50 days passed before the CDC developed an alternative test. Even after kits became available, testing was hampered by a shortage of RNA extraction reagents and nasopharyngeal swabs.

9.27 Eventually, the CDC published primers, probes, and protocols. The US Food and Drug Administration (FDA) issued new guidance on February 29, 2020, so

that labs could develop and use COVID-19 molecular diagnostic tests (but had to apply for Emergency Use Authorization, or EUA, within 15 business days of clinical use). Although clinical labs could purchase primers and probes for the CDC assay from Integrated DNA Technologies (IDT), other reagents had to be procured elsewhere. To remain in FDA compliance, labs had to follow the exact specifications under which the EUA was granted. If they ran the IDT kit on an alternative platform, new EUA approval was required – an ordeal too onerous for most hospital clinical laboratories.

9.28 The WHO's RT-PCR assay targets the SARS-CoV-2 envelope gene and the RNA-dependent RNA polymerase gene. If both targets are detected, the result is reported as positive; if only one is detected, the result is reported as inconclusive. The CDC's original assay included three different amplification regions of the N gene; NS3 was designed to detect all SARS-like coronaviruses, whereas the N1 and N2 regions were specific for SARS-CoV-2. The NS3 target produced too many false positive results and had to be eliminated.

9.29 New Covid-19 vaccines will fail to end the pandemic unless all countries receive doses in a fast and fair manner, disease experts have warned. The authors of an open letter published in the Lancet medical journal said vaccine stockpiling in wealthier countries would only prolong the global health emergency. As on date, Vaccination drives have been started successfully in many countries. India, has once again been in the limelight not only for having controlled the pandemic efficiently and having one of the lowest death rates and the highest recovery rate from covid-19 but also for one of the largest vaccination drives in the world. Apart from this India has exported its vaccine to more than 106 countries creating a "vaccine diplomacy."

Chapter X

Conclusions and Recommendations

10.1 World Health organization declared SARS-CoV-2 outbreak a 'Public Health Emergency of International Concern' on 30 Jan 2020. At that time there were just 98 cases in 18 countries outside China and no deaths had been reported outside China. The world woke up that day to the realization of a pandemic. At that point the global community was sceptical about the future course of action and many mathematical models were used to predict the course of the pandemic. Over the period of time as cases and the knowledge of the disease evolved, clearer "Health Policies" and "Treatment Modalities" were formulated. The pandemic posed multiple challenges to the health care systems in the country

10.2 Insufficient knowledge of the epidemiology of the infection, the course of illness and likely long-term impact on human body left the medical community grappling for answers. The high infectiousness of SARS-CoV-2 led to depletion of workforce of Health Care Workers (HCWs) due to HCWs getting infected with the virus or due to requirement of mandatory quarantine following exposure. The provision of medical services for diseases other than COVID-19 was also a task with essential services having to be maintained . The hospital which was open to patients 24X7 had to put restrictions on entry, exit and movement of patients within their premises and had to create COVID and non-COVID zones. The urgency of requirement of augmentation of the medical resources especially drugs and equipment's to cater to specific management of COVID-19 patients was another formidable challenge.

10.3 The hospital rose up to the occasion and policy formulation and guidance from higher formations and administrative authorities kept pace with the national and international guidelines. various SOPs on COVID-19 like public health measures,

quarantine, testing, treatment, admission, discharge, dead body management, travel etc were issued .

10.4 The aim was to initiate preventive measures to reduce the disease burden by successful management at quarantine camps and isolation facilities. The next step was to prepare the healthcare delivery system to meet the future challenges by augmenting the infrastructure, manpower and equipment including testing capacity at the hospital while maintaining essential services in a Non – COVID-19 zone .

10.5 Multiple quarantine facilities were created, for civilians evacuated from overseas and also for sailors and families returning from leave /duty for quarantine .The hospital kept pace with evolving testing and treatment modalities and for treating COVID-19 patients as per standard protocols.

10.6 To ensure good Mental health amongst health care workers in the hospital a dedicated helpline was setup to function round the clock by psychiatrist and his team. A capsule course was conducted for both medical and non- medical volunteer staff to train them in various aspects of infection prevention and control and treatment and monitoring of COVID-19 patients. The hospital braced for the expected deluge of patients with 200 beds catered for COVID-19 patients. HCWs are well informed and trained, we had sufficient PPEs and other medical supplies with emergency powers of procurement having been instituted.

10.7 The golden principles viz social distancing, wearing masks, cleaning/ disinfection and hand hygiene were emphasised to one and all in the station. Also capability of testing, tracing, isolating and regular screening made a substantial difference towards COVID 19 management in times of crises.

10.8 In our study we have described the evolution of the pandemic to date and the conversion of a multi-speciality hospital of the Indian Navy to function as a Mixed Covid- 19 treating hospital with 200 beds to treat Covid -19 cases alone while maintaining essential services in a separate non -Covid zone/wing. It was done on a war footing with re-allocation of manpower, infrastructure and resources. The Healthcare workers worked round the clock in shifts in both the Covid and non- Covid wards of the hospital with necessary quarantine in between.

10.9 Training was important to educate them on the novel disease and the exacting protocols to be followed for the safety of oneself and the patients. It was important to educate and simulate all eventualities to train all the teams to be prepared and thus instill the confidence necessary to tackle caring for patients in a hazardous and difficult environment. This has also led to mitigation of stress levels and prevent anxiety and depressive episodes as results of our study show low incidence and levels od anxiery and depressive episodes.

10.10 The Anaesthesiologist was an anchor during this pandemic as a specialist trained in infection prevention, airway management, critical care management. He was involved in training these skills to other doctors, Nursing staff and paramedics. He was working round the clock with his team under the most difficult conditions without a break at great risk of getting infected with a heavy viral load due to proximity to positive cases and procedures generating aerosols. It was felt that there was a lacuna of training and acquisition of these critical care skills of airway management and critical care which needs to be imparted to all medical professionals in future to take the burden from this speciality and for better handling of such pandemics in the future. To this a case for increasing number of seats in medical colleges for this speciality is justified considering the shortage to specialists trained in

Anaesthesiology and critical care in our country. The pandemic also highlighted the role of the community medicine specialist who had hitherto been in the background. It also taught the world the importance of community measures against infection are more important at the primary level above all else.

10.11 Amongst the lessons learnt, it is important to recapitulate the things done well in our country to control the pandemic. To summarise, the importance of attentive leadership, the need to ensure that people have enough provisions and financial means to follow public-health guidance, and the shared understanding that individuals and communities must sacrifice to protect the well-being of all has been the cornerstone of success.

10.12 In a decisive crackdown, the country under its leadership barred international tourists, closed schools and public institutions, shut gyms and movie theaters, began flexible working hours and work from home, and relentlessly called for face masks, hand hygiene, and physical distancing, issuing clear, concise daily updates and sharing helpline numbers on a war footing.

10.13 The lockdown and subsequent measures ensured that we bided time required for the health service infrastructure to gear up to build ventilators, get protective equipment, organize our ICUs, get tests ready, prepare the public for what was going to happen to develop proper contact-tracing systems.

10.14 The training measures and capsule conducted for medical and non-medical volunteers in our hospital were one of the first during the pandemic as the State of Kerala had cases earlier on in the pandemic. Also , due to efforts by the Govt of India Indian citizens and diaspora from island nations were evacuated by the sea routes by the Indian Navy as part of Op Samudra setu with our hospital being nodal agency for manpower, support for treatment and care at the quarantine centres setup by the Indian

Navy. It was found that the training boosted the confidence of the doctors, Nurses and paramedics and also the non medical sailor volunteers who were deployed at the screening centres, reception, quarantine centres for documentation, logistics etc. with the medical personnel.

10.15 Overall the training helped in infection prevention and control as there was a clear demarcation between Covid and non- Covid areas of the hospital. Having two separate wings with clear separation helped the hospital to segregate and duplicate the facilities required in both wings to cater to civid and non- covid cases. It also bolstered the confidence amongst the staff, who remained extremely motivated during the pandemic. We had the lowest incidence of anxiety, depression and stress levels as compared to Chinese and Italian figures who had more than 60 % and 50 % affected.

10.16. We did have a greater incidence of depression, anxiety and stress levels amongst the paramedics. However, this can be explained due to difference in education, social background differences of paramedics as compared to Doctors and Nursing Officers. This however, was a pilot study and the sample size was small and further wider studies are needed to corroborate this difference. It is noteworthy that at this point in time we did not have any case of infection as a direct result of Covid- ward care. It is possible that heightened precautions and PPEs with due training and care have prevented infection amongst healthcare workers.

10.17 Having a motivated military workforce as healthcare workers we had no issues of work- place absenteeism, sickness absenteeism and other manpower issues. However, it is seen that there were levels of anxiety, stress and depression which simmer inside an individual and need empathy, care and resolution. Having a 24 x 7 helpline helped the staff vent their feelings and report shortcomings or detection of burnout amongst staff which gave us feedback about inadequacies in the facilities

provided for timely correction. For example , poor quality of PPE in initial procurement was reported , doubtful quality of N -95 masks, which was subsequently rectified as the pandemic progressed and more vendors could provide standardized material .

(Fig 10.1 Public Health messages for infection prevention and Control Source : Mohfw)

(Fig 10.2 Public health message charts Source : WHO)

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ANNEXURES

FORMS USED FOR SCREENING/ EPIDEMIOLOGY

Ministry of Health and Family Welfare
Government of India

SELF REPORTING FORM to BE FILLED BY ALL INTERNATIONAL PASSENGERS

(TO BE PRESENTED AT THE HEALTH/IMMIGRATION COUNTER)

All persons coming to India are required to fill-up this proforma in duplicate and submit a copy each to health and immigration counter.

Personal Information

1	Name of the passenger			
	Seat No.		3. Flight No.	
4	Passport No.			
5	Date of Arrival			
6	Port of origin of Journey			
7	Port of final destination			

Contact Address in India for All Travellers:

	House Number	
2	Street/ Village	
3	Tehsil	
4	District/ City	
5	State	
6	Pin	
7	Residence Number	
8	Mobile Number	
9	E mail ID	

(PART-A)

a. Details of the cities/ countries visited since last 28 days?_____

b. Are you suffering from any of the following symptoms**

- Fever Yes No
- Cough Yes No
- Respiratory distress Yes No

For persons having travel history to china, Hong Kong, Republic of Korea, Italy, Iran, Japan and other Covid-19 affected countries* or contacts with people having such history are requested to undergo mandatory thermal screening at the Health Counters

Signature of the passenger

*CHINA, AS NOTIFIED BY W.H.O FOR LOCAL TRANSMISSION (https://www.who.int/emergencies/diseases/novel- coronavirus-2019/situation-reports/)

**If answer to any of the above questions is "yes", please present yourself to the Airport Health counter for preliminary screening.

In case you develop symptoms such as fever and cough within 28 days of leaving this airport, restrict your outdoor movement and contact MoHFW's 24 hours helpline number 011-23978046. Call operator will tell you whom to contact futher. In the meanwhile, keep yourself isolated in your house/room.

CORONA VIRUS (COVID-19): EPIDEMIOLOGY CASE SHEET

PERSONAL PARTICULARS:

1. Name of Patient		2. Age Sex *(M/F)*	3. Relationship
4.Number	5. Rank	6. Name	7. Unit / Ship
8. Service: *Army / Navy / Air Force*		9. Arm / Corps / Branch / Trade	
10. Single / Family Member			

LEAVE/ TD/ COURSE / NEW POSTING HISTORY:

1. Address of place: TD/ station of leave/ Course/ Old unit	
2. Duration from To	

TRAVEL HISTORY:

1. History of travel out side India:	Yes/ No
2. If yes (With duration) Duration from To	I. High risk countries (Chaina/Japan/Italy/South Korea) II. Low risk countries (.....)

OR

1. History of travel within India:	Yes/ No
2. If yes (With duration) Duration from To	I. II.

CONTACT HISTORY:

1. History of contact with any confirmed/ Suspected case of COVID-19	Yes/ No
2. If yes ,Details: Name: Age/ sex: Contact No:	Address:

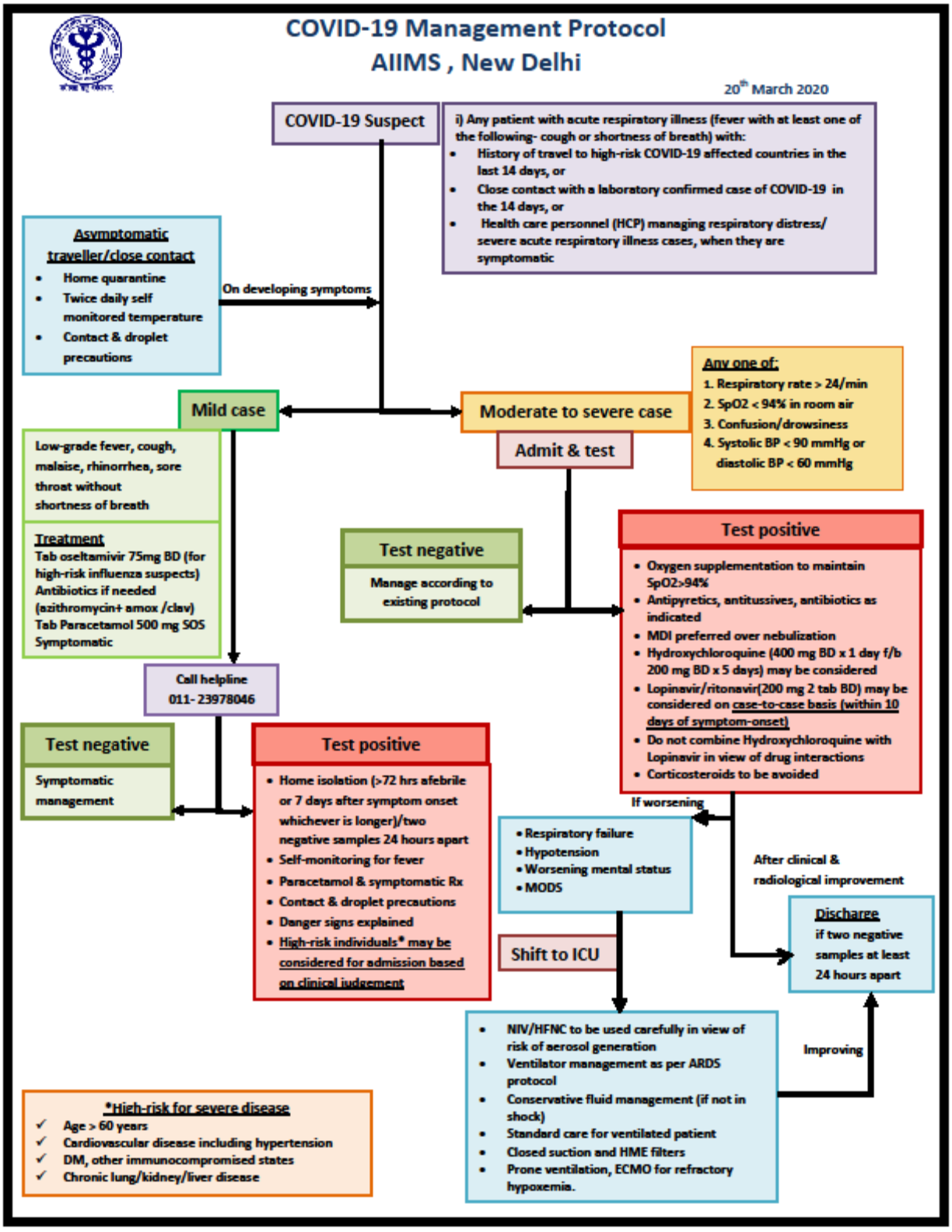
ON EXAMINATION:

Complaints of	1. Fever (Mild/ Moderate/ severe)
2. Cough	3. Difficulty in breathing / shortness of breath
4. Other complaints	
Vitals:	**Systemic examination:**
Temperature	CNS
Pulse Rate	CVS
Respiratory Rate	P/A
BP	RS
Spo2	

REMARKS:

- Isolated/ facility based quarantine/ home base quarantine
- Treatment as URTI OR LRTI case.
- Any others.....

SIGNATURE AND STAMP OF MO


COVID-19 Management Protocol
AIIMS , New Delhi
20th March 2020
COVID-19 Suspect
i) Any patient with acute respiratory illness (fever with at least one of the following- cough or shortness of breath) with:
History of travel to high-risk COVID-19 affected countries in the last 14 days, or
Close contact with a laboratory confirmed case of COVID-19 in the 14 days, or
Health care personnel (HCP) managing respiratory distress/ severe acute respiratory illness cases, when they are symptomatic
Asymptomatic traveller/close contact
Home quarantine
Twice daily self monitored temperature
Contact & droplet precautions
On developing symptoms
Mild case
Low-grade fever, cough, malaise, rhinorrhea, sore throat without shortness of breath
Treatment
Tab oseltamivir 75mg BD (for high-risk influenza suspects)
Antibiotics if needed (azithromycin+ amox /clav)
Tab Paracetamol 500 mg SOS Symptomatic
Call helpline 011- 23978046
Test negative
Symptomatic management
Test positive
Home isolation (>72 hrs afebrile or 7 days after symptom onset whichever is longer)/two negative samples 24 hours apart
Self-monitoring for fever
Paracetamol & symptomatic Rx
Contact & droplet precautions
Danger signs explained
High-risk individuals* may be considered for admission based on clinical judgement
Moderate to severe case
Any one of:
1. Respiratory rate > 24/min
2. SpO2 < 94% in room air
3. Confusion/drowsiness
4. Systolic BP < 90 mmHg or diastolic BP < 60 mmHg
Admit & test
Test negative
Manage according to existing protocol
Test positive
Oxygen supplementation to maintain SpO2>94%
Antipyretics, antitussives, antibiotics as indicated
MDI preferred over nebulization
Hydroxychloroquine (400 mg BD x 1 day f/b 200 mg BD x 5 days) may be considered
Lopinavir/ritonavir(200 mg 2 tab BD) may be considered on case-to-case basis (within 10 days of symptom-onset)
Do not combine Hydroxychloroquine with Lopinavir in view of drug interactions
Corticosteroids to be avoided
If worsening
Respiratory failure
Hypotension
Worsening mental status
MODS
Shift to ICU
NIV/HFNC to be used carefully in view of risk of aerosol generation
Ventilator management as per ARDS protocol
Conservative fluid management (if not in shock)
Standard care for ventilated patient
Closed suction and HME filters
Prone ventilation, ECMO for refractory hypoxemia.
Improving
After clinical & radiological improvement
Discharge
if two negative samples at least 24 hours apart
*High-risk for severe disease
Age > 60 years
Cardiovascular disease including hypertension
DM, other immunocompromised states
Chronic lung/kidney/liver disease

Clinical management protocols for Covid-19 patients in ICU and operation theatre

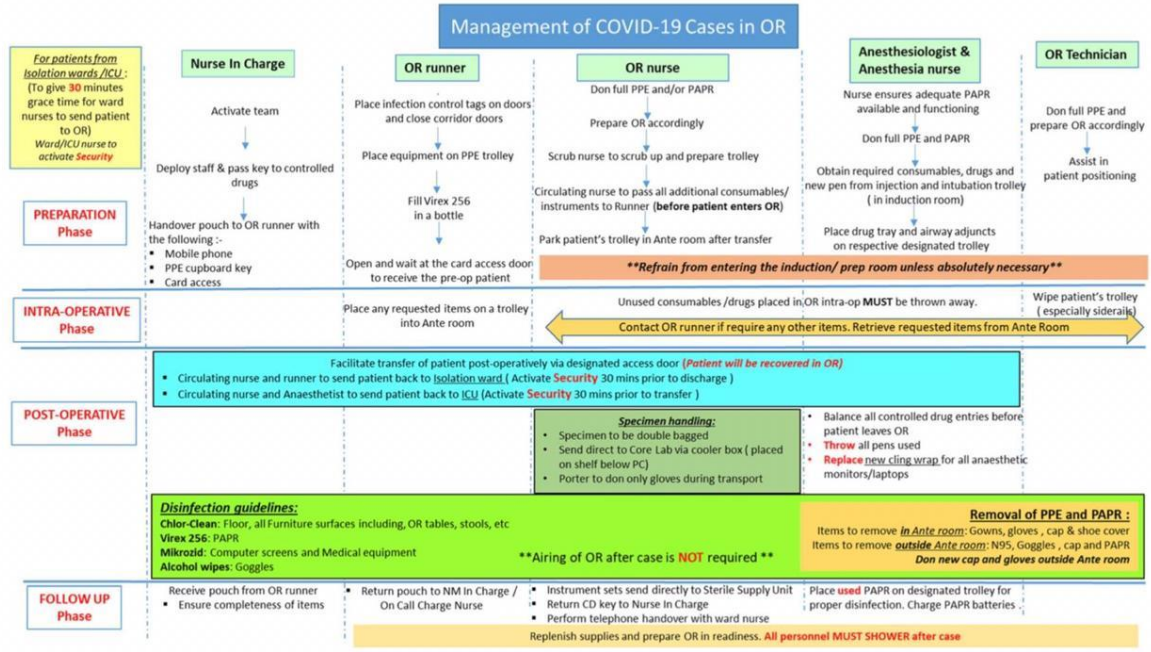
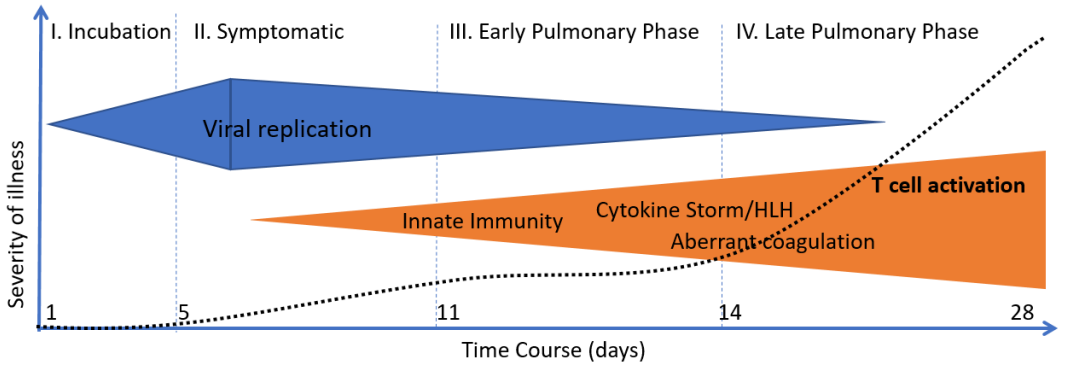
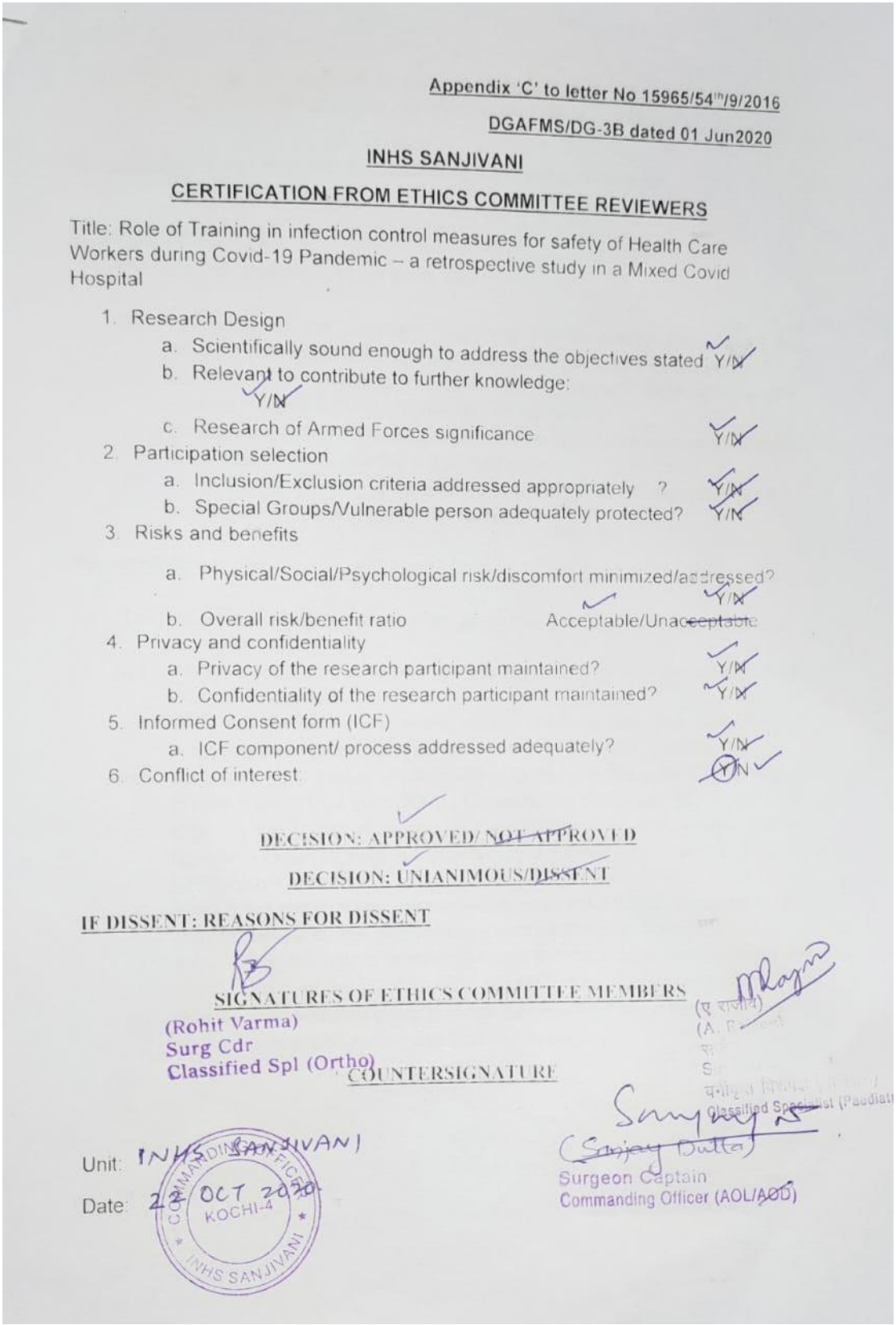


Figure Complete operating room workflow for a coronavirus disease 2019 (COVID-19) case. CD = controlled drugs; ICU = intensive care unit; NM = nurse manager; OR = operating room; PAPR = powered air-purifying respirator; PC = personal computer; PPE = personal protection equipment; pre-op = preoperative



Ground-glass infiltrates	+	++	+++	++++
Clinical Symptoms	Fever, malaise, cough, headache, diarrhea	SOB – Mild hypoxia ≤4 L/min N/C & aSat < 95%		Progressive hypoxia
Treatment approach	Antiviral Rx	Anti-inflammatory: Immune Suppressive Rx		
Potential therapies		MP 40mg/day		Methylprednisolone 80mg/day
		Enoxaparin 40-60 mg/day		Enoxaparin 1mg/kg s/c q 12
	? Hydroxychloroquine 400/200 5 days			
	Vitamin C 500mg PO BID			Vitamin C 3g Iv q 6

Ethical committee clearance certificate for study from Hospital : INHS Sanjivani, Kochi



Appendix 'C' to letter No 15965/54th/9/2016
DGAFMS/DG-3B dated 01 Jun2020

INHS SANJIVANI

CERTIFICATION FROM ETHICS COMMITTEE REVIEWERS

Title: Role of Training in infection control measures for safety of Health Care Workers during Covid-19 Pandemic – a retrospective study in a Mixed Covid Hospital

1. Research Design
   a. Scientifically sound enough to address the objectives stated Y/N
   b. Relevant to contribute to further knowledge: Y/N
   c. Research of Armed Forces significance Y/N
2. Participation selection
   a. Inclusion/Exclusion criteria addressed appropriately ? Y/N
   b. Special Groups/Vulnerable person adequately protected? Y/N
3. Risks and benefits
   a. Physical/Social/Psychological risk/discomfort minimized/addressed? Y/N
   b. Overall risk/benefit ratio Acceptable/Unacceptable
4. Privacy and confidentiality
   a. Privacy of the research participant maintained? Y/N
   b. Confidentiality of the research participant maintained? Y/N
5. Informed Consent form (ICF)
   a. ICF component/ process addressed adequately? Y/N
6. Conflict of interest Y/N

DECISION: APPROVED/ NOT APPROVED

DECISION: UNIANIMOUS/DISSENT

IF DISSENT: REASONS FOR DISSENT

SIGNATURES OF ETHICS COMMITTEE MEMBERS

(Rohit Varma)
Surg Cdr
Classified Spl (Ortho)

COUNTERSIGNATURE

Unit: INHS SANJIVANI

Date: 22 OCT 2020

COMMANDING OFFICER KOCHI-4 INHS SANJIVANI

(Sanjay Dutta)
Surgeon Captain
Commanding Officer (AOL/AOU)

Classified Specialist (Paediatr