ISCCM

CRITICAL CARE

COMMUNICATIONS

Pandemic War Preparedness

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OF INDIAN SOCIETY OF CRITICAL CARE MEDICINE

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ISCCM™

THEME
PANDEMIC WAR PREPAREDNESS

Presidents's MESSAGE

Dear Members,
Greetings from ISCCM!!
The ISCCM had celebrated its 28th foundation day on the 9th of October 2021 at New Delhi with modest fanfare. The program brought together around 130 delegates under a common roof after a long time. Now, at the tail end of the second wave when the numbers are comfortingly low, the ISCCM had taken a strong and determined decision to usher in the bonhomie of old-time conferences by forging ahead with a fully physical Research Conclave and Foundation-day celebration. People were happy to see each other emerge out of their virtual screens and appear real-time. The camaraderie was genuine and it was openly evident that COVID had taken its toll where physical interactions were concerned. The ISCCM day celebrations had a special connotation this year - the theme in keeping with the devastation of the COVID 19 pandemic on the medical fraternity. Celebrations were on a somber mode - the Memorial service being the highlight of the event. The fraternity chose the occasion to pay homage to the brave soldiers whose lives were unfairly cut short. The fraternity stood by their bereaved families and pledged to support them through their loss. They were honored with a silver plaque and financial aid. It may not be enough to compensate for the unsurmountable loss but will surely go some way in mitigating the pain and making them feel honored to have a hero amongst them.

Apart from the Memorial service, the ISCCM day program covered a host of other exciting activities – Drawing / Photography / E-Poster / Extempore competition which were conducted in the weeks leading up to the main event. The theme in keeping with the COVID times – The ISCCM leads the fight against COVID. Our members have shown a lot of enthusiasm in the events and it made for a great experience.
The Research Conclave was scheduled on the 9th and 10th of October 2021 and was a brain-storming session of academic interest. It is the ISCCM's endeavor to put India in the fore-front of clinical research in the near future. The research conclave was organized with a view to increase research collaborations and research output that is relevant to India in the field of critical care. The two-day Research Conclave created a good platform to launch research and it is hoped that this initiative would gain momentum with further discussions at Criticare-2022 and beyond. The society is keen that more members should be actively engaged with the ISCCM to bring in practice changing research to India.

The ISCCM will be organizing the EXAMINER'S CONCLAVE on the 19th of November 2021 again as a physical event with COVID protocols in place.

The ISCCM is scheduled to host the Annual Conference – Criticare - 2022 in Ahmedabad early next year, again as a fully physical conference. CRITICARE 2022 at Ahmedabad will see around 300 faculties of which 50 are from international institutes and approximately 3000 delegates. There will be above 300 lectures across 20 formats and 14 work-shops / skill stations. This time we will see more interactive sessions as opposed to monologue type lectures. We are expecting a robust response from all our members and full participation, so we request all members to please register yourselves early. We are hopeful that COVID 19 will beat a hasty retreat and the conference will be a resounding success.

Happy Deepawali and Best Wishes to all,

Dr. Deepak Govil
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ISCCM

THEME

PANDEMIC WAR PREPAREDNESS

Editor's MESSAGE

Respected members,

Greetings!!!

We are presenting to you yet another insightful edition of the monthly Newsletter, covering articles on preparing for pandemic war. I'm sure the articles in this issue will help us in preparing for future pandemics.

The editorial team will appreciate your positive feedback and encouraging responses. The theme-based concept of the Newsletter has taken off well. Young students have been given an opportunity in the editorial board and have been encouraged to present articles which we hope will go a long way in nurturing future leaders.

Continuing with the momentum, we have planned the next edition dedicated to Post pandemic changes in medical practice and 5 minutes review on key topics of day today .

As the pandemic is gradually receding, we have begun preparation for Criticare-22, Ahmedabad, as a physical conference. The conference is being planned as per the new protocols with full Covid-19 restrictions. We are hopeful that by early 2022 most Indians would be fully vaccinated and the infrastructure of Ahmedabad and Gandhinagar will be ready and functional to welcome us all.

We have received all the book chapters for Critical Care Update Book 22 well in time.

Thanks to all the authors for contributions in time. The chapters are under plagiarism check and editorial review. But I am sure that this time update book will be ready well advance in time. The scientific program of Criticare22 is almost ready and invite will be sent soon. This time we are trying to make scientific program highly interactive with more involvement of delegates. We have introduced the concept talking photo where in any member can send their entries. We have plans to add hands-on during the conference. For the first time few workshops will be done free of cost for healthcare workers whose contribution in today's ICU practice is noteworthy.

With time we hope to grow and change for the betterment of the society. We as an organization pledge our determination to contribute towards strengthening and preparing our workforce to deliver the best.

Thanks,
Jai Hind!!!
Long live ISCCM!!!

Dr Rajesh Chandra Mishra
MBBS ! MD(MEDICINE) ! FNBCCM ! EDICM ! FCCM ! FCCP ! FICCM ! FICP
HONORARY CONSULTANT INTENSIVIST & INTERNIST
EPIC Hospital & Kidney Healthcare Ahmedabad
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ISCCM™

THEME

PANDEMIC WAR PREPAREDNESS

General Secretary's MESSAGE

Dear Members,

Greetings from ISCCM!!

We are presently at the end of the second wave of the Pandemic and by the ongoing trend of the emerging figures, very unlikely to face a Third wave anytime soon. Moreover, with the lessons imbued from the particularly disastrous second wave, we are much better prepared in terms of skill and resources to handle any consequent follow-ups of the pandemic.

So, with a fair amount of confidence that all should be okay with the World in the coming year, we at the ISCCM have decided to forge ahead with a fully physical annual conference – CRITICARE 2022 at Ahmedabad early next year.

The mode of the conference has been modified to suit our times. We will see more interactive sessions as opposed to monologue type seminars. The Communications aspect has been further developed under the able guidance of the President Elect - Dr. Rajesh Mishra.

I hope to see a whole hearted participation by all our members in the collective effort of the ISCCM to spread knowledge and empower our ICUs with skill, technology and the latest in clinical practices.

Best wishes,

Dr. Arindam Kar
Chief Intensivist, Dept. of Critical Care Medicine
Sir HN Reliance Foundation Hospital, Mumbai
National General Secretary 2021-22, ISCCM
Former Asia-Pacific Representative, ESICM 2015-18
Center Director, EDIC Examination Part 1, India Chapter

ISCCM DAY CELEBRATIONS 9TH OCTOBER 2021

Dr Rajesh Pande
Chairman, ISCCM Day
Senior Director & Head
BLK Centre of Excellence for Critical Care
BLK Superspeciality Hospital, New Delhi
General Secretary Elect, ISCCM

The ISCCM celebrated its 28th foundation day- "ISCCM Day" on the 9th of October 2021 at New Delhi with modest fanfare. As we are aware, India had to face a deadly devastating second wave of the COVID pandemic that left the World crippled in its wake. The ISCCM day celebrations, therefore, had a special connotation this year owing to the havoc wrecked on the fraternity by COVID. The theme in keeping with the devastation of the COVID 19 pandemic on the medical fraternity was The ISCCM leads the fight against COVID.

The ISCCM day program covered a host of other exciting activities – Drawing / Photography / E-Poster / Extempore elocution competition which were conducted in the weeks leading up to the main event. Our members showed a lot of enthusiasm by participating in the various events. One day before the ISCCM, on 8th October, a very interesting 3-hour long quiz was organized, where 5- teams participated, and the award-winning e-posters, photographs and drawings were also displayed.

Next day, on 9th October, the program festivities brought together around 130 members including past presidents, past vice-chancellors, and other eminent members of the society. After a long time, people emerged out of their virtual screens to appear real-time and were quite happy to meet each other on a bright and cheerful day.

A press conference was organized to highlight the contribution of ISCCM in the fight against COVID. The members of the press were informed about the academic activities that were carried out by ISCCM to spread awareness on the advances in the management of COVID by involving national and international experts. The press was informed about the various COVID related guidelines that were published in the society's journal and were also explained about the Research Conclave and its objective of identifying ICU based research needs of a country like India and fast tracking it. Dr. Deepak Govil, Dr. Arindam Kar, Dr. Rajesh Mishra and Dr. Rajesh Pande represented ISCCM.

Post lunch, the ISCCM day started with an interfaith prayer, followed by lamp-lighting and the inaugural address by the President Dr. Deepak Govil. A 1-minute silence was maintained in the memory of members who lost their lives fighting COVID. This year, the ISCCM DAY was celebrated on a somber note and the Memorial service, in the memory of ISCCM members who lost their lives while fighting COVID, was the highlight of the ceremony. The ISCCM fraternity chose the occasion to pay homage to the brave soldiers whose lives were unfairly cut short. The fraternity stood by their bereaved families and pledged to support them through their loss. Dr. Rajesh Pande- General Secretary Elect presented a brief about our fallen heroes to the audience, and their family members were honoured with a certificate, silver plaque, and financial assistance, as a mark of our gratitude. This may not be enough to compensate for the unsurmountable loss the families have had to suffer but it will surely go some way in mitigating the pain and making them feel honored to have a hero in the family.

The winners of the various events were announced, their work including e posters, photographs and drawings were displayed. The winners were awarded cash prized by the society. and were offered cash prizes.

The President released a video with messages by the past presidents and the current office bearers highlighting the ISCCM members resolve and commitment in fighting the COVID menace. Dr. Rajesh Mishra, the President elect, presented an overview of various COVID and non-COVID related academic events organized by ISCCM during the pandemic.

ISCCM President Dr. Deepak Govil, and the General Secretary Dr. Arindam Kar ISCCM inaugurated the ISCCM Telegram Channel as well as the ISCCM Connect. Dr. Arindam Kar gave a live demonstration of ISCCM Connect, which would automatically pickup participation by members in any ISCCM event and would serve as a great communication source between members of the society.

President elect- Dr. Rajesh Mishra also presented a Curtain Raiser to Criticon 2022- Ahmedabad, informing the august gathering about the venue, workshops and other scientific activities planned. There will be more than 300 lectures across 20 formats and 14 work-shops/ skill stations. Criticon 2022 will see more interactive sessions as opposed to monologue type lectures. A robust response from our members and full participation is expected. He hoped that COVID 19 will beat a hasty retreat by then and the conference will be a resounding success. The inaugural session of the program ended by a vote of thanks by Dr. Rajesh Pande and Dr. Arindam Kar.

After a short break, the Research Conclave started with the President Dr. Deepak Govil, Dr. Dhruva Chaudhary Immediate Past President, Dr. Rajesh Mishra- President Elect and Dr. Arindam Kar, the General Secretary ISCCM. The meeting was chaired by chairman Scientific Committee, Dr. JV Peter.

Dr. Deepak Govil explained that the research conclave has been organized with a view to increase research collaborations and research output that is relevant to India in the field of critical care. The idea behind the Conclave was to brainstorm on the areas that could be identified eventually as the research priorities. Dr. JV Peter presented the work done by the Scientific committee and the research opportunities that has been created by ISCCM so far. He also presented the vision to expand research done by the society and taking it to the next level. On the first day of the Conclave the floor was open to all participants to present their views about the type of research the society should pursue and the anticipated bottlenecks. A frank discussion was held, and many ideas were presented.

On the second day, those opinions were collated and presented. The two-day Research Conclave thus created a good platform to launch new relevant research ideas and it is hoped that this initiative would gain momentum with further discussions at Criticare-2022 and beyond.

ISCCM DAY CELEBRATIONS 9TH OCTOBER 2021

Competition Poster

Click Here

Competition Winners

Click Here

ISCCM Day Photo

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Press Conference

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ISCCM DAY CELEBRATION BY CITY BRANCHES

Bhubaneswar Branch

Guwahati Branch

Lucknow Branch

Ludhiana Branch

Madurai Branch

Nagpur Branch

ISCCM DAY CELEBRATION BY CITY BRANCHES

Nellore Branch

Vadodara Branch

Visakhapatnam Branch

1ST ISCCM RESEARCH CONCLAVE

Dr. J V Peter
MD, DNB, FAMS, FRACP, FJFICM, FCICM, FICCM, FRCP, FRCP (Edin), M. Phil,
Professor
Medical Intensive Care Unit, Christian Medical College, Vellore

The first Indian Society of Critical Care Medicine (ISCCM) Research Conclave was held in New Delhi on 9th and 10th October 2021. This was organized with a view to increase research collaborations and research output that is relevant to India in the field of critical care. The meeting was coordinated by Dr. Deepak Govil, President ISCCM, Dr. Rajesh Mishra, President elect ISCCM and Dr. Arindam Kar, General Secretary ISCCM.

The meeting commenced with an overview of the opportunities created by the ISCCM in launching research to the next level. This was in terms of presentation of the a) vision statement of the research committee (RC) of ISCCM, b) the mode of conduct of research committee meetings, c) the types of studies that are supported by the ISCCM (ISCCM initiated studies, ISCCM endorsed studies, ISCCM funded studies), d) the standard operating procedures (SOPs) for the submission of research proposals, e) evaluation of research proposals and f) the mechanism of approval of studies as well as identifying research priorities for India. The President also informed that apart from ISCCM funded studies for proposals for its full members of the society has created funding opportunities for in-training research (available for trainees in critical care) and mid-career training in research methodology (available for full members); details available on the ISCCM website. The President also informed that an Independent Ethics Committee (IEC) was being created so that it could review multicentre trials, ISCCM initiated trials, investigator initiated studies where funding is sought through ISCCM and investigator initiated studies where there is no local institutional ethics committee.

One of the key reasons for holding the conclave was to brainstorm areas that could be identified as research priorities. Towards this, a Google form was sent to some members of the ISCCM who have been doing substantial research work, prior to the conclave, in order to identify these areas. On the first day of the Conclave, the floor was open to all participants to present their views on the issues that need to be addressed as well as give themes and topics that can be converted to research projects. A total of 59 members presented their views and options. On the second day, these were collated and presented.

In summary, the areas of research that were identified were categorized as a) emerging themes for research (e.g. antibiotics, tropical infections, and toxicology), b) emerging questions (e.g. antimicrobial prescription patterns, dengue), c) multiplier questions where the question could not be adequately answered in smaller good studies (e.g. DAMA and LAMA) and d) qualitative research (e.g. quality indicators in ICU). For each of the identified topics, it was decided that standing committees would be created, considering expertise in the field and regional representation. The individual committees would be encouraged to submit their research proposal to RC at the earliest.

It was also decided that the RC and the Executive Committee (EC) of the ISCCM would look into the concerns raised by the members and would come up with SOPs. The society would also look at the feasibility of creating a central registry. The members exhorted the society to ensure that there is greater ownership for research with the provision of authorship, involvement of younger members in research, ensuring data fidelity and providing help for the conduct of studies. Two Contract Research Organizations (CROs) also made presentations on how they could support research of ISCCM.

The two day Research Conclave thus created a good platform to launch research and it is hoped that this initiative would gain momentum with further discussions at Criticare 2022 and beyond. The society is keen that more members should be actively engaged with the ISCCM to bring in practice changing research to India.

A SELECTIVE HISTORY OF PANDEMICS- AND THE LESSONS LEARNT?!

Dr Sumit Ray
Head of Department, Critical Care Medicine &
Medical Director
Holy Family Hospital, Delhi

"At the root of every pandemic is an encounter between a disease-causing microorganism and a human being", emphasizes Laura Spinney in her book, "Pale Rider: The Spanish Flu of 1918 and how it changed the world"(1) , adding that pandemics are "shaped by numerous other events taking place at the same time - the weather, the price of bread, ideas about germs, white men and jinns." A pandemic is as much a social phenomenon as it is a biological one. It cannot be separated from its historical, geographic, economic and socio-cultural context. History offers a mirror that helps discern patterns in biological behavior, societal priorities and responses to these outbreaks. In a long succession throughout history, pandemic outbreaks have decimated societies, determined outcomes of wars, wiped out entire populations, but also, paradoxically, cleared the way for innovations and advances in sciences (including medicine and public health), economy, and political systems. (2)

Pandemics and epidemics became part of the human condition after the domestication of animals, agriculture and urbanization. The triad of humans, animals and infective microorganisms living in close proximity, where they can jump from one species to another due to multiple reasons is a recipe for new epidemics and pandemics. These are thus called "crowd" diseases. Among pandemics caused by such cross species jump of a virus or bacteria the two biggest killer pandemics were plague and the "Spanish" flu (a misnomer as it did not originate in Spain). It is interesting to look at how pandemics behave and how we behave in pandemics , especially when looking at the two biggest killer pandemics and the latest one Covid-19.

If there is any one word in history which encapsulates the terror of a pandemic, it is 'Plague'. Stemming from the Greek word plaga (strike, blow),it has been used interchangeably to describe either the particularly virulent contagious febrile illness caused by Yersinia pestis or as a general term for any epidemic disease causing a high mortality, or more broadly , as a metaphor for any sudden outbreak of a disastrous affliction. (3)

The first well documented "plague" was the Antonine Plague, which erupted in 165 CE, at the height of Roman power throughout the Mediterranean world during the reign of Marcus Aurelius Antoninus (161-180 CE). The epidemic most likely emerged in China shortly before 166 CE spreading westward along the Silk Road and by trading ships headed for Rome. Sometime between late 165 to early 166 CE, the Roman military came into contact with the disease during the siege of Seleucia (a major city on the Tigris River) and spread the disease northward to Gaul and among troops stationed along the Rhine River. Though it is called "plague", but, from the symptoms described by the well known physician Galen, it seems to fit a small pox pandemic. It has been suggested that a quarter to a third of the entire population perished, estimated at 60-70 million throughout the empire. Lucius Verus, co-emperor with Marcus Aurelius, died from the illness in 169 CE and Marcus Aurelius 11 years later. (4) The horrific death toll reduced the number of taxpayers, recruits for the army, candidates for public office and farmers. The economic effects of the disease was on agriculture, crafts and trade.

The medically specific term 'Plague', as we know, is transmitted from rats to humans by the rat flea, Xenopsylla cheopis. The classic bubonic plague is a severe disease, characteristically producing enlarged lymph nodes ("buboes") and leading to extreme suffering, prostration and death. Along with bubonic plague was a variant, the pneumonic plague, transmitted through respiratory secretions between humans, that had predominantly respiratory symptoms like severe pneumonia and acute respiratory distress syndrome (ARDS).

In the absence of antibiotics 50-80% of those who contracted this infection died from it. Compare that to a case fatality rate of 3-8% for the Spanish flu and an estimated 1% for Covid-19. There were multiple waves of the plague pandemic. The first recorded being the Justinian, from the 6th century to the 8th century, to the "Black Death" between the 14th and 17th century and the modern plague pandemic, between the 1870's and the early years of the 20th century.

Over centuries all pandemics have spread through paths for human trade, commerce and travel, with ports becoming primary points of entry. The Justinian Plague originated in mid-6th century AD possibly in Ethiopia, moving through Egypt, or in the Central Asian steppes, where it then traveled along the caravan trading routes. From one of these two locations, the pestilence quickly spread throughout the Roman world and beyond. Like most pandemics, the Justinian plague generally followed trading routes providing an "exchange of infections as well as of goods," and therefore, was especially brutal to coastal cities. Military movement at the time also contributed to spreading the disease from Asia Minor to Africa and Italy, and further to Western Europe.

Procopius, in his Secret History, describes victims as suffering from "delusions, nightmares, fevers and swellings in the groin, armpits, and behind their ears. He recounts, while some sufferers lapsed into comas, others became highly delusional….seized by madness,". Many victims suffered for days before death, while others died almost immediately after the onset of symptoms. (4, 5). Many people died painfully when their buboes gangrened; others died vomiting blood. However, there were cases in which the buboes grew to great size, and then ruptured and suppurated. In such cases, the patient would usually recover, having to live with withered legs and tongues – the classic stigmata of plague. The Roman Emperor Justinian, after whom this plague has been named, contracted the plague himself, but did not succumb to it. (unlike Marcus Aurelius to the small pox pandemic)

Procopius further describes, "streets were deserted, and all trade was abandoned. Staple foods became scarce and people died of starvation as well as of the disease itself."(5,6). The Byzantine Empire was an advanced sophisticated society of its times. The plague affected many of these advanced public institutions and policies. As the tax base shrank and economic output declined, the Empire forced the survivors to shoulder higher tax burdens (7) After the initial outbreak in 541 CE , repetitions of the plague established permanent cycles of infection. By 600 CE, it is possible that the 20-40% of the inhabitants of Constantinople would eventually perish from the disease. Throughout the rest of the empire, nearly 25% of the population died with estimates ranging from 25-50 million people in total. (4)). The Byzantine army was particular affected as it was unable to fill its ranks and carry out military campaigns, and ultimately failing to retake Rome for the Empire. The Byzantine Empire, like its predecessor , the Roman empire (during the Antonine "plague") experienced major challenges and weakening of its physical, economic, and cultural infrastructure during this outbreak, which took time to rebuild.

The plague of the middle ages (Black Death) probably started somewhere in Central Asia, in the early 14th century and by 1347 CE moved to Europe, where it caused catastrophic devastation. It is estimated to have killed nearly 75-200 million people across Europe, Asia Minor and North Africa and decimated anywhere between a third and half of the population of Europe. It entered Europe via merchant ships carrying grain, spices and textiles, but also rats, which had the rat flea carrying plague bacteria. The ports of entry were the great centers of early mercantile capitalism - the Italian city states of Genoa, Venice and Naples. There is another probable later overland route of transmission from the Silk route into Crimea and Constantinople. In the 1870s too, the seaports of Bombay (Mumbai) and Calcutta (Kolkata) were the entry points for plague. These two cities, particularly Mumbai, suffered huge casualties, before the pandemic crept into the hinterland. The Spanish flu also entered India through Bombay in 1918, inadvertently carried by Indian soldiers returning from European battlefields in World War I. The Covid-19 pandemic too, entered India through ports - now airports.

At the time of the "Black Death", authorities were at a loss regarding the cause of the affliction. The first official report blamed an alignment of three planets from 1345 for causing a "great pestilence in the air" (8). It was followed by a more generally accepted miasma or bad air theory. Entire neighborhoods or entire towns, were wiped out or settlements abandoned. Crops could not be harvested, traveling and trade became curtailed, and food and manufactured goods became short. There was a shortage of labor, which possibly in the long run encouraged innovation of labor-saving technologies. (9).

Pandemics can have some interesting positive effects in the long run. The first public health interventions like quarantine were started during the Plague. The word comes from the Italian "quaranta" meaning forty. That was the period of days of isolation of ships and individuals coming into ports and cities. It did not have much scientific basis, but was based on the importance of 40 days in multiple Biblical events. It partly worked, as those afflicted on the ships would either die or recover by that time, so that the disease would not be carried into town. Other pandemics and epidemics led to the beginning of sanitation (Cholera epidemic, London), the germ theory, which was a major step forward in the understanding of disease and development of antibiotics and vaccines. In India, it will hopefully be a wake-up call for better public health investment and sanitation.

Talking about sanitation, we must remember that the Indian subcontinent has been the source of multiple cholera pandemics. Cholera was endemic in Asia until 1817, when the first pandemic spread from the Indian subcontinent to several other regions of the world (10). This pandemic emerged during a period of increasing globalization resulting from technological progress in transportation. The advent of steamships and railways allowed a significant decrease in travel time and dramatic increase in trade. The preventive strategies used were essentially the same than those implemented during the Black Death, i.e. travelers from places which had cholera and those who had contacts with infected persons were quarantined.

Thereafter, five additional major pandemics of cholera, caused by the Classical biotype originated from the Indian subcontinent and spread to other continents during the 19th and 20th centuries. In 1854, during the outbreak in Soho, London (part of the 2nd Pandemic),the physician John Snow used for the first time epidemiological methods to trace the source of the outbreak. He identified the public pumps used for water supply in these areas was the source of the contamination. The bacillus of cholera was isolated during the fifth pandemic by Robert Koch (1884) who also understood the importance of clean water in preventing its transmission. The seventh cholera pandemic, which began in Indonesia in 1961, was caused by the El Tor variant and is the most extensive in terms of geographic spread and duration. It seems to have become endemic in many regions of the world.

Coming to the misnamed "Spanish" flu, (which was caused by the H1N1 strain of the influenza virus) it did not start in Spain. The two competing theories are that it either started in a camp hospital in Étaples, France in 1917 or at Camp Funston, Kansas and spread from there to Europe due to US troop mobilization during the first World War. It is estimated to have killed nearly 50 million people across the world. It laid low nearly half of the allied troops and a third of German troops. India was hit hard too, losing 12-18 million people by different estimates. After entering India through Mumbai, it spread to the North, South and East of the country, in two waves, a milder summer wave in July and the second more virulent wave from late September, taking its maximum toll in November and December. It seems to have lost some of its virulence moving eastwards towards Bengal, supposedly due to a heavy monsoon in that region.

Since the "Spanish" flu pandemic of early 20th century, there have been anywhere between three to five respiratory viral pandemics, depending on how we count them. The Asian flu between 1957-59, caused by the Influenza A (H2N2), the Hong Kong Flu caused by H3N2 variant of the Influenza A virus between 1968-70 and the Swine Flu (H1N1) between 2009-10. Then there have been the SARS (2002-3) & MERS (2015-ongoing) caused by the coronavirus. We will focus now on the Spanish flu as it was the most severe in multiple ways.

Of the millions who died during the Spanish flu, a particularly large percentage were young. However, there was an interesting observation in both, the Spanish flu pandemic and the influenza epidemics. Significantly lower number of women died of these infections. This appears to be replicated in the current Covid outbreak. Women's mortality is anywhere between a third to a quarter of that of men. This mortality among the young and predominantly men was attributed to the "cytokine storm". However, in India, during Spanish flu many more women died than men. This has been attributed to the poorer nutritional status of women in India at the time and thus an inability to mount an adequate immune challenge. A balanced immune response, is of essence in any infection. Both an overreaction ("cytokine storm") or an inadequate immune response can be dangerous, as we know. In India, women tended to eat only after the men and children had eaten and thus possibly got even less nutrition, and thus, couldn't mount an adequate immune response. India's deeply patriarchal society and its inherent gender biases may have inverted the usual mortality trends of the Spanish flu.

Malnourishment which compromises the body's ability to mount adequate immune response is a well-known cause of higher mortality during pandemics. The Black Death in Europe was preceded a few years earlier by the Great Famine. The 1870s plague pandemic and the Spanish flu were preceded by famines in India. Of the many reasons for the poor and the marginalized suffering significantly worse outcomes in most pandemics, the most compelling one is poor nutrition. Another reason why the poor suffer more in pandemics is overcrowding. Tight urban spaces with over half a dozen people sharing one room cannot be conducive to physical distancing. Though pandemics cause deaths across social classes, the poor are hit the worst, due to a combination of poor nutrition, overcrowding and lack of access to health care. During the Black Death, poor people suspected to have contracted the plague were forced inside their tight living or working spaces with others, the doors locked and marked. Very few escaped those chambers of death. If we remind ourselves, something very similar happened in the initial phase of the pandemic in large urban centers in India. The lived realities of the vast multitude of people in India and across the world is that they live in extremely tight urban spaces, with no possibility of physical distancing. When people in these spaces came out for a breather, the police beat them back into those crowded spaces. It seems we tend to repeat some of the tragedies of history even in the 21st century!

Though separated by centuries, some of the responses to these measures seem to remain similar. During the Black Death in Europe and modern plague and Spanish flu in India, draconian laws and enforcement led people to flee urban spaces to their rural homes. We saw the same during the first few months of the pandemic in India. Millions fled to their villages when forced to stay in crowded urban spaces, without the permission to step out, without adequate food and social security. Many of them, tragically, were not allowed back inside their villages out of fear, when they reach there, like in previous pandemics.

Stigmatization, social ostracizing and public shaming of those with or suspected of the disease has also been a common thread during all pandemics. This ends up being counter-productive, as those infected try to hide the fact and tend not to access healthcare facilities, leading to worse outcomes for the individual and further spread of the disease in society.

A related phenomenon is scapegoating. When war-like rhetoric is used by governments to contain the pandemic, in the setting of irrational fear of an invisible and possibly incurable "enemy", it leads to vigilantism and urge to find a "visible enemy". "There is a long history of such stigmatisation and violence against the very vulnerable, from smallpox outbreaks in slave ships, to systematic murder of Jewish populations in Europe during plague outbreaks, to rampant systematic discrimination against Italian and German immigrants in America during the yellow fever and influenza epidemics and so on. The Covid-19 outbreak has unleashed hostilities against Southeast Asians, South Asians, Blacks and Hispanics in the US and Europe. Stigmatisation makes people fearful and they shrink into the shadows, leading to concealment of cases and delays in detection. Fearful people are less likely to seek medical attention, more likely to suffer from the serious consequences of their ailments and contribute to the spread of disease. This further aggravates marginalisation of these communities, makes them distrustful about the motives of healthcare professionals and less likely to comply with medical advice." , as we wrote in an editorial piece in the Times of India. (11) In India, it was being directed predominantly at a minority community and early in the first phase, it was called the "Tablighi" phase and a whole community vilified. Of course, it was proven to be untrue! Higher courts in the country later came down heavily on this type of vilification and scapegoating.

To effectively contain and mitigate a pandemic, one should use rational thinking, accurate science, have compassion and earn people's trust and not use militaristic posturing. Places where it was perceived that the state machinery was unbiased and there was a transparency in the functioning of the state, it led to all social and religious groups acceding to testing and quarantine if necessary and vaccination, without any attacks on healthcare workers. The battle against obscurantism and bigotry has been as important a battle against pandemics through history as has been the medical battle.

During the 1870s plague pandemic in India, the British colonial government brought in the draconian Epidemic Act in 1897(which is the one we are still using), without taking the people into confidence. This involved mass sanitation, measures to stop social and religious gatherings, social distancing, invasion of private property to search for plague suspects etc. These measures may seem well-intentioned, but they reveal a sheer contempt for people and a naked paternalism, blissfully blind to the plight of people. As historian David Arnold (Colonizing the Body: State Medicine and Epidemic Disease in Nineteenth-Century India)(12) says, "Never before had the state in India intervened so directly and forcefully in the lives of the Indian people. This produced a massive backlash from Indians of all classes, who deeply resented the physical inspections and the invasion of their homes, including riots and attacks on Europeans and health workers."

When it came to the Spanish Flu, the British did little, except advice social distancing. They did nothing to improve the health infrastructure. They left people to their own means. Even the Mahatma and many of his colleagues were infected. He managed to recover, but millions didn't. While the British government stood by, multiple voluntary and charitable groups set up dispensaries and hospitals, provided food and medicines, removed dead bodies and cremated/buried them. These organizations became the building blocks of the anti-colonial movement. Both David Arnold and Laura Spinney, believe that, these two epidemics strengthened the Indian freedom movement.

During past pandemics, the response to the uncertainty of life was either an increase in religiosity or a decrease in faith. Increased religiosity was driven by the idea that pandemics are divine retribution and faith in God and religion could save you. During the Covid-19 pandemic, this hasn't been a major movement. Even during medieval times, there was a surge of rationalist ideas during pandemics, to understand the death and devastation, as divine retribution of an all-loving God couldn't explain the suffering of so many, particularly children. This rationality led to scientific thought, which went on later to the germ theory of disease.

In these modern times, seduced by technology and science, there are interesting responses from people, scientists and leaders. There are those who believe that science and technology will "win" this "battle". This has brought in a new "irrationality" of science. We have had scientists announcing "magic bullets" from the pulpits of science - the medical journals -- and on social media and television. "Studies" that would not have made it to even the lowest grade of peer reviewed journals are being published in the most hallowed journals and then brought down hastily once there is enough of a clamour among the real scientists who haven't given in to irrationality and realise that there will be no "magic bullet". Nearly all severe viral respiratory illnesses as we know, have no "cure". Good quality supportive management is what saves patients. We lose more than half a million people every year to influenza for decades and haven't found a "cure". But we have been able to save millions from severe influenza by supportive care. Rather than trying to understanding the pathophysiology of Covid-19, and providing high quality supportive care that can save lives, there have been these desperate attempts to find quick- fix "cures". The panic-stricken discussions in physician webinars and Whatsapp groups carried the stench of fear and irrationality. To add to that, there are unethical pharmaceutical companies and their crony scientists and physicians fishing in troubled waters, because of our unscientific and irrational behaviour. And then there are the technology geeks, who think everything can be solved either by an app or AI. The apps till now only seem to have worsened our Orwellian 1984-style surveillance nightmares. It is only in the last few months, that a degree of rationality seems to have returned to the larger medical fraternity.

Past pandemics have lessons for us embedded in their stories. It is up to us to listen carefully, analyze past mistakes and adopt measures that could work to our advantage, without causing severe distress to large sections of society. Pandemics have taught us, that they are fought with not only better medical care, but, with more equitable social and economic justice and political will. The present pandemic hopefully will make all of us rethink our way of life and focus on reducing consumption leading to lesser carbon emissions and hopeful stop climate change in the long run. The stories pandemics should inform us on the trajectory which development and governance should take for a better future. The important question is, will we learn from the past or repeat our mistakes?

(A shorter version of this article appeared as, Parallels Between Pandemics: Plague, "Spanish" flu and COVID-19. Dr Sumit Ray & Dr Sandeep Kumar, in the Quint, on 03 May 2020. Reproduced with permission)

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WHAT WE COMPROMISE DURING PANDEMIC

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INTRODUCTION

The emergence of the Coronavirus disease (COVID-19) pandemic has resulted in disruption of life and made quarantine, isolation, masking and social distancing as the new norm. Over the last 18 months, over 230 million people have been infected globally and 4.8 million people have died (1). Although the disease is now better understood and more therapeutic options are available, resurgence has occurred due to the development of Variants Of Concern (VOC). These VOC have greater transmissibility and probably present with more severe illness. It was hoped that vaccination would reduce the intensity of the pandemic. Despite the time required to develop vaccines and the need to generate evidence of benefit, the first vaccine rollout occurred within a year of onset of the pandemic, an incredible achievement by the scientific community.

There have been criticisms in almost every country on how the pandemic was handled. Several decisions and compromises had to be made by several countries with a resultant trade-off on other domains. This article attempts to provide an overview of what are likely to be compromised in the setting of a pandemic.

KEEPING THINGS IN PERSPECTIVE

"In hindsight everything is much clearer" – Bart Cummings

It must be remembered that everything is much clearer in hindsight and it is easier to criticize approaches to a pandemic. Each country approached the pandemic in different ways and only time will tell which worked and which did not work. This is because this was a new disease and the approach at the beginning was based more on intuition, with some logic and almost no knowledge on the subject. Certain policies helped countries in the short term, but in the long term created other challenges. For example an extremely efficient system of identifying infection, testing, quarantine and treatment resulted in relatively smaller first waves but larger second waves with the newer mutants, particularly in the unvaccinated groups. Further some responded by hitting the panic button. This was probably due to the fact that the generation that was born in the latter half of the 20th century did not face any major global disasters and calamities in contrast to the ones born in the first half of the 20th century that faced several major disasters.

WHAT CAN BE COMPROMISED IN A PANDEMIC?

This can be addressed in several domains – ethics, science, policy and people's behaviour.

Ethical considerations during pandemics

There are several ethical considerations that need to be kept in mind in the setting of a pandemic. There is a danger that some of the core principles of ethics may be compromised. These principles are elegantly described in an ethical framework article (2). The key elements include a) minimizing harm (includes physical, psychological, social, economic), b) proportionality (which requires that restrictions to individual liberty and measures taken to protect the public from serious harm should not exceed what is necessary), c) solidarity (which requires working together), d) fairness (which requires that resource allocation is done in a fair manner and not arbitrarily), e) duty to provide care, f) reciprocity (requires that society supports those who face a disproportionate burden in protecting the public good, e.g. healthcare workers, and takes steps to minimize risks as much as possible) and g) privacy.

In pandemics, the fairness of resource allocation assumes importance. In this context the principles of utility and equity are widely discussed. It is generally agreed that equity implies equality. From an individual's perspective the expectations are the maximum life expectancy with the best quality of life and with the best chance to achieve it. Although this is ideally pursued in any healthcare setup, this may not be possible during pandemics since resources. Often the utilitarian principle may need to be applied. The utilitarian principle attempts to maximize good to the maximum number of people. The definition of this "good" is also challenging since it may range from probability of survival to length of life or quality of life. The utility principle will maximize the number of lives saved, but may not provide an equal chance to everyone, nor will it maximize the good of the outcome in terms of years of life saved, adjusted for their quality (3).

The science domain

From a scientific perspective, at the start of the pandemic, a segment of the scientific community was lost and probably even confused. Evidence based medicine appeared to take backstage and replaced by eminence or eloquence based medicine. Although it is important that new therapies or repurposed drugs should be tried, this should be done within the confines of some scientific rigor.

Treatments: Broadly, treatments can be categorized as a) recommended for routine use based on scientific evidence, b) rescue therapy for patients with severe illness and low probability of survival where the evidence may be minimal or equivocal and c) research drugs where newer therapies or repurposed drugs or those with no evidence are tried only on a research mode. Unfortunately many new therapies were promoted without evidence. In one report, over 52,000 patients had received convalescent plasma in the US and these were given outside clinical trial settings. Subsequent evidence did not demonstrate a benefit of plasma therapy on outcomes in COVID. The same was true for treatments such as Hydroxychloroquin and Remdesivir. On the other hand, good quality clinical trials demonstrated the benefit of low dose corticosteroids in COVID and this impacted outcomes.

Vaccination: Another dimension was the approach to vaccination. There was an urgency to develop vaccines (which was very important given the public health impact) and this led to some compromise in generating evidence for benefit. Once vaccines became available, the initial shortages in supply resulted in the ethical dilemma on whom to vaccinate first? The question as to whom among the population should be prioritized for vaccination and who should be compromised when there is only limited supply of vaccine (at the start of the vaccination campaign) are difficult questions in the setting of a pandemic. It was broadly stated that the ones to be vaccinated first should be the ones that are most vulnerable. The question of who was more vulnerable was also challenging to define – was it the frontline worker (healthcare, police, sanitary workers) or the elderly patients with comorbidities?

Policy

This is an important domain. Policies are often based on ethical principles and scientific knowledge. Several policy decisions can potentially be affected during pandemics. These include policies on lockdown, testing and treatment and economic. Questions on the timing (early vs. delayed) of lockdown, the duration (short vs. long) of lockdown, extent (regional vs. national) and the intensity (complete vs. partial) of lockdown are areas that have been criticized by the public. Over the last 18 months, it was evident that intense and complete lockdown would slow down disease transmission and buy time for the population to be vaccinated; however this was associated with a lot of hardship. Unaffected areas were equally locked down as affected areas and this led to compromise in livelihoods. It is now apparent that a system of dynamic lock-unlock may be better suited and based on the number of positive cases in regions or zones, rather than at a district, state or national level.

The initial restrictive testing policies due to lack of kits and infrastructure posed considerable challenges. However it is important to note that the Government of India ensured the expansion of testing so that patients can be detected early and the chain of transmission can be broken. The treatment policies were initially centralized resulting in some compromises on the way the guidelines were structured, some of which were not based on scientific data. However this is no longer an issue.

Balancing economy and health has been a major problem for every country. There is a clear relationship between health and socioeconomic status. There are reports that economies have been hit hard and it is not clear at this stage if this had a direct impact on health. The cost of lockdown and economic recession on the health of the population is not quantified. There is some evidence that the number of road traffic accidents reduced during the lockdown period. However it is also evident that patients with cancer did not seek care and have now presented with advanced illness and those with other medical problems such as diabetes have had poorer control.

People

During the initial phase of the pandemic, there was fear and panic, resulting in isolation and stigmatization. The pendulum then swung the other way with people throwing caution to the winds and not adhering to infection prevention control measures which contributed to the second wave. It was sometimes difficult to get people to adhere to protocols and policies due to pandemic fatigue and this led to compromise in the approach to mitigation of the spread of the pandemic.

CONCLUSION

Pandemics are trying times for the world. It is important that ethical principles of management are followed so that the compromises that are needed to be taken are kept to the minimum.

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HOW SHOULD WE PREPARE, SURVEY AND PREDICT

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PANDEMIC:

A pandemic is defined as "an epidemic occurring worldwide, or over a very wide area, crossing international boundaries and usually affecting a large number of people".[1] Pandemics can cause sudden, widespread morbidity and mortality as well as social, political, and economic disruption.[2]

If we sneak into the history, we can see various pandemic diseases have ravaged humanity, and at times, signalling the end of entire civilizations. A few examples are: the Black Death: 1346-1353 (by Yersinia pestis), Russian plague: 1770-1772, Philadelphia yellow fever epidemic: 1793, Flu pandemic: 1889-1890, American polio epidemic: 1916, Spanish Flu: 1918-1920, Asian Flu: 1957-1958, AIDS pandemic and epidemic: 1981-present day, H1N1 Swine Flu pandemic: 2009-2010, West African Ebola epidemic: 2014-2016, Zika Virus epidemic: 2015. [3]

At present we are in the midst of another pandemic: "Coronavirus disease 2019 (COVID-19)". It started with cluster of cases of pneumonia reported from Wuhan City, Hubei Province of China on 31st Dec 2019. On 1st January 2020, the US Centers for Disease Control and Prevention identified a seafood market in Wuhan as the suspected hub. On 7th January, Chinese authorities confirmed that they had identified a new virus. Followed by this, cases were confirmed in Thailand, Japan, South Korea, USA and Singapore. On January 31, WHO Issues Global Health Emergency and the worldwide death toll of more than 200 and an exponential jump to more than 9800 cases, the WHO finally declares a public health emergency (PHEIC). Finally on 11th March 2020 — WHO Declares COVID-19, a Pandemic.

Coronavirus belongs to the family Coronaviridae, which is responsible for mild respiratory diseases in humans. In recent times, three major coronaviruses have led to disease outbreaks:

- The severe acute respiratory syndrome coronavirus (SARS–CoV) in 2002,
- Middle East respiratory syndrome coronavirus (MERS–CoV) in 2012, &
- The severe acute respiratory syndrome coronavirus 2 (SARS–CoV2)-COVID-19

DISEASE UPDATE:

Global: [4]
Globally, as of 8 October 2021, there have been 236,599,025 confirmed cases of COVID-19, including 4,831,486 deaths, reported to WHO. As of 9 October 2021, a total of 6,364,021,792 vaccine doses have been administered.
India: [5]
As of 11th Oct 2021, total cases 3,39,71,296 (+ 19,020), active cases 2,21,502, recovered 3,32,85,885 (+ 21,583), deceased 4,50,814(+ 193)

THE IMPACT OF COVID-19:
Globally COVID-19 caused at least 3 million excess deaths in 2020 [6]. It is responsible for increased deaths from other causes as well because of the disruption to health service delivery systems and routine immunizations, fewer people seeking care, and shortages of funding for non-COVID-19 services. COVID-19 has exposed persistent inequalities by income, age, race, sex and geographic location. It has also revealed significant gaps in countries' health information systems.

Along with loss of human lives, COVID-19 has also led to unprecedented challenge to public health, food systems & work and jobs. The economic and social disruption caused by the pandemic is devastating: tens of millions of people are at risk of falling into extreme poverty, while the number of undernourished people, currently estimated at nearly 690 million, could increase by 132 million.[7]

COVID has brought human, economic and social crisis. It has affected the all segments of the population and is particularly detrimental to members of those social groups in the most vulnerable situations, including people living in poverty situations, older persons, persons with disabilities, youth, and children.

LESSONS LEARNT:

We have witnessed that over the past few decades, Emerging Infectious Diseases (EID) and spreading of diseases, and vulnerability to pandemics and disease outbreaks have been increasing locally and globally. With increasing in EIDs like Ebola, Sika, Swine flu, SARS, MERS and currently COVID 19 as a large-scale outbreaks or global pandemics, we are at greater risk of having deaths of thousands or millions of humans and of having huge socio-economic losses. Even the consequences of Spanish Flu 1918 were devastating leading to political, social, economic and emotional losses.

Early response, effective command, government involvement with strong political leadership and commitment and focused and coordinated actions are key to control & contain the pandemic.

The most vulnerable healthcare and frontline workers should be protected at the outset. Public engagement and responsible role of mainstream and social media is crucial.

Both in 1918, as well in 2020, it has been proved that travel swiftly spreads the virus. In 1918, the U.S. soldiers traveling to the East Coast and on to European battlefields carried the virus along with them. Hence isolation and quarantine are crucial to prevent further spread of the disease.

Stigmatization and discrimination should be responded through information and communication campaigns and support from public health systems, & communities.

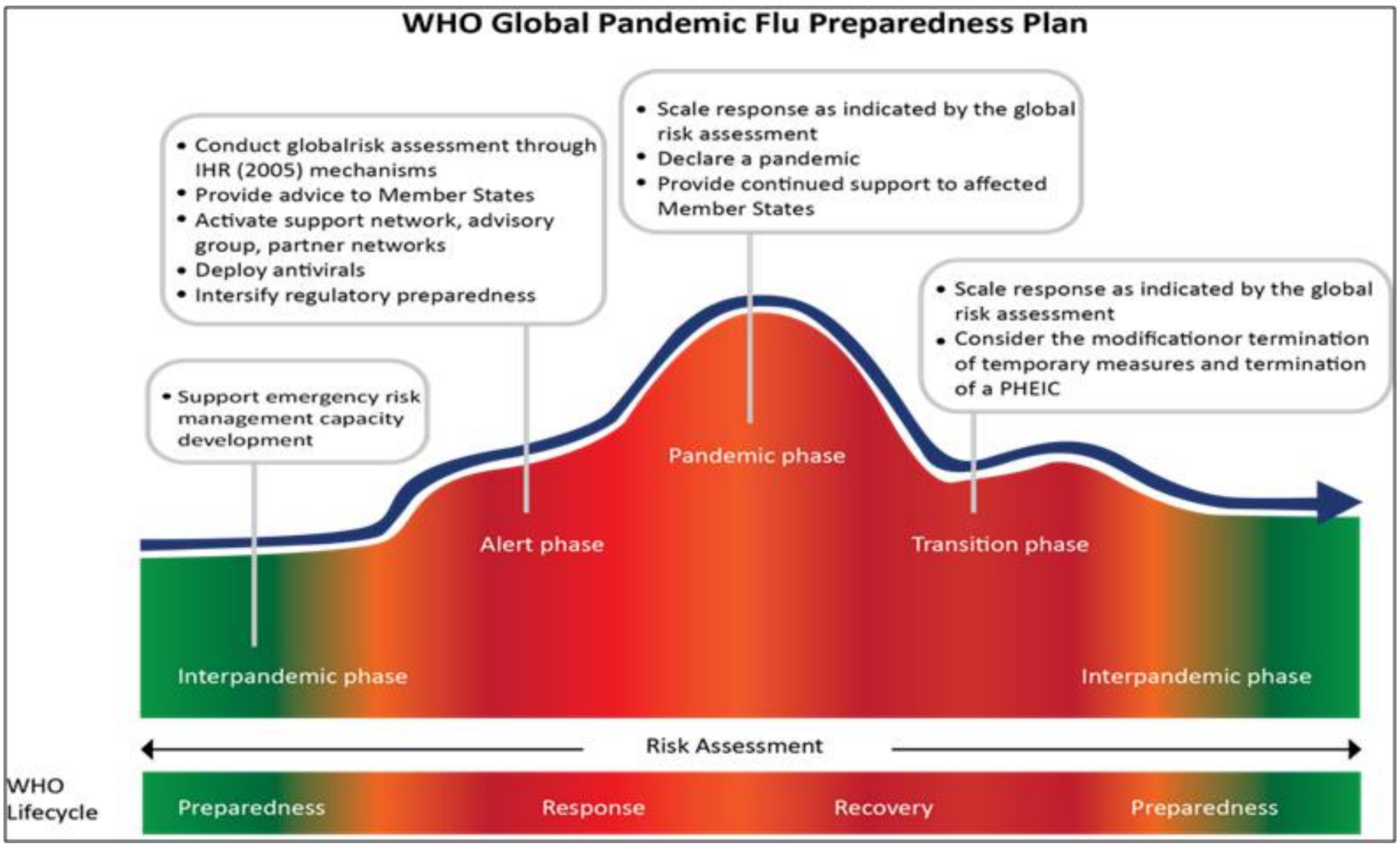
Another important learning is to strengthen the R&D at national level and participate in global research activities. Also harnessing all national resources is a swift and cost-effective approach. And most vital is public engagement which the key to contain COVID-19 pandemic

MITIGATION & PREPAREDNESS:

COVID-19 pandemic has proved the world how ill-prepared we were to combat a 100-year pandemic. The lessons we learnt from past as well as from this current pandemic should draw attention for preparedness and global coordination for next pandemic.

WHO PANDEMIC PHASES [8]

The WHO has come up with a global influenza preparedness plan, which defines the stages of a pandemic. It also outlines the WHO's role and makes recommendations for national measures to be taken before and during a pandemic.



From left to right, the curve shows the increase and decrease of the global average of pandemic cases across four phases of the pandemic continuum. The four phases include “interpandemic,” “alert,” “pandemic,” and “transition.” The phases in the continuum also overlap with the stages of the pandemic risk assessment. From left to right, the three stages of the risk assessment include “preparedness,” “response,” and “recovery.”

In order to accomplish the public health goals for each phase, the specific objectives and actions to be taken by WHO, and those recommended for national authorities, are divided into five categories: [9]

(1) planning and coordination;
(2) situation monitoring and assessment;
(3) prevention and containment;
(4) health system response; and
(5) communications.

Planning and coordination aim to provide leadership and coordination across sectors. The pandemic preparedness should be integrated into national emergency preparedness frameworks.
Next important step is situation monitoring and assessment. The goal is to collect, interpret, and disseminate information on the risk of a pandemic before it occurs and also to monitor pandemic activity and characteristics.

Reducing the spread of disease will depend significantly upon increasing the “social distance” between people. Measures such as individual/household level measures, societal-level measures and international travel measures, and the use of antivirals, other pharmaceuticals, and vaccines will be important.

The health systems response is crucial to determine the extent to which the existing health system can expand to handle the increasing patients load. It is important to maintain adequate triage and infection control measures to protect health-care workers, patients, and visitors.

Lastly communication plays a vital role in the management of pandemics. It is important to provide and exchange relevant information with the public, partners, and stakeholders so that well informed decisions can be taken to protect health and safety of all. Communications should be based on the five principles as described by WHO: planning; trust; transparency; announcing early; and listening [10]

HEALTHCARE COALITION CHECKLIST FOR PANDEMIC PLANNING [11]

1. Healthcare System Preparedness: Healthcare system preparedness is the ability of a community's healthcare system to prepare, respond, and recover from incidents that have a public health and medical impact in the short and long term through a continuous cycle of planning, organizing and equipping, training, exercises, evaluations and corrective actions.

2. Healthcare System Recovery: It involves the collaboration with Emergency Management and other community partners, (e.g., public health, business, and education) to develop efficient processes and advocate for the rebuilding of public health, medical, and mental/behavioral health systems to at least a level of functioning comparable to pre-incident levels and improved levels where possible focusing on effective and efficient return to normalcy or a new standard of normalcy for the provision of healthcare delivery to the community.

3. Emergency Operations Coordination: It is regarding healthcare is the ability for healthcare organizations to engage with incident management at the Emergency Operations Center or with on-scene incident management during an incident to coordinate information and resource allocation for affected healthcare organizations. This enables healthcare organizations to coordinate their response with that of the community response.

4. Fatality Management: Fatality management is the ability to coordinate with organizations (e.g., law enforcement, healthcare, emergency management, and medical examiner/coroner) to ensure the proper recovery, handling, identification, transportation, tracking, storage, and disposal of human remains and personal effects; certify cause of death; and facilitate access to mental/behavioral health services for family members, responders, and survivors of an incident.

5. Information Sharing: Information sharing is the ability to conduct multijurisdictional, multidisciplinary exchange of public health and medical related information and situational awareness between the healthcare system and local, State, Federal, tribal, and territorial levels of government and the private sector.

6. Medical Surge: The ability to provide adequate medical evaluation and care during incidents that exceed the limits of the normal medical infrastructure within the community. This encompasses the ability of healthcare organizations to survive an all-hazards incident, and maintain or rapidly recover operations that were compromised.

7. Responder Safety and Health: It is the ability of healthcare organizations to protect the safety and health of healthcare workers from a variety of hazards during emergencies and disasters. This includes processes to equip, train, and provide other resources needed to ensure healthcare workers at the highest risk for adverse exposure, illness, and injury are adequately protected from all hazards during response and recovery operations.

8. Volunteer Management: Volunteer management is the ability to coordinate the identification, recruitment, registration, credential verification, training, engagement, and retention of volunteers to support healthcare organizations with the medical preparedness and response to incidents and events.

CONCLUSION:

We have witnessed that despite the persistence of disease and pandemics throughout history, humanity has always continued to move forward. Understanding the factors that nurture pandemics and improvements in healthcare have been powerful tools in mitigating their impact.

The COVID-19 pandemic is one of the biggest challenge the humanity is facing currently. However, continuous efforts and various measures adopted have enabled the pandemic to be better contained. The modern generation is experiencing the challenges of a pandemic first-hand and learning the importance of strict social distancing and prevention measures. Contact tracing, personal protective equipment, and testing have proven pivotal in the face of all pandemics. By implementing preparations for these events far earlier in the process, pandemics can be ended more quickly and met with better success, limiting disruption to life.[12]

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PUBLIC RESPONSE AND BEHAVIOUR IN A PANDEMIC

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Introduction:

Covid-19 pandemic brought an immeasurable threat (real and assumed) to normal life that impacted human cognition in complicated ways and resulted in changes to our daily life that are far from normal. Since we are moving into post peak phase of the pandemic, normalisation daily life is what is expected. But given the burden of illness is not completely resolved, WHO has released "new normal guidance" before completion of a year of the pandemic. (1) Such observations suggest living with physical distancing measures over prolonged periods of time. They failed to note the psychological flexibility as a basic requirement to achieve new normal which is variable amongst population.

There has been great amount of money, resources, effort and publicity expended to look for pharmacological measure to control of the illness. But the efforts to see how individuals and societies cope with various phases of the pandemic and also the public health measures undertaken has been less than optimal.

Public response and compliance:

Suppression and mitigation as non pharmacological strategies in the initial phases of pandemic had diverse uptake but a positive one in general (good compliance). (2) Literature on this aspect of the pandemic is predominantly derived from behavioural sciences research during the first wave and to some extent in the second wave. Three public health advises that are part of transition strategies (post-peak period: use of masks, undertaking social distancing and vaccine uptake) will allow us to move from abnormal to new normal and have strong evidence base. Compliance for the above when we are transitioning from peaks of infection to low level of infections (after at least two peaks) has been good but still not optimal. Evolving research from around the world about post peak phase compliance measures might not be applicable to geographically, culturally, politically diverse country like India but there might be some take home messages from these studies (eg. studies from USA).

When compliance with public health guidance is to be understood, we need to review the literature available from current and past pandemic experiences. For ease of understanding, I have discussed it under two parts: First being the individual or collective experiencing external world (threat and changes to daily life) and the second being how we processed external stimuli through our internal processes and responded by changing behaviour. (3) (Fig 1)

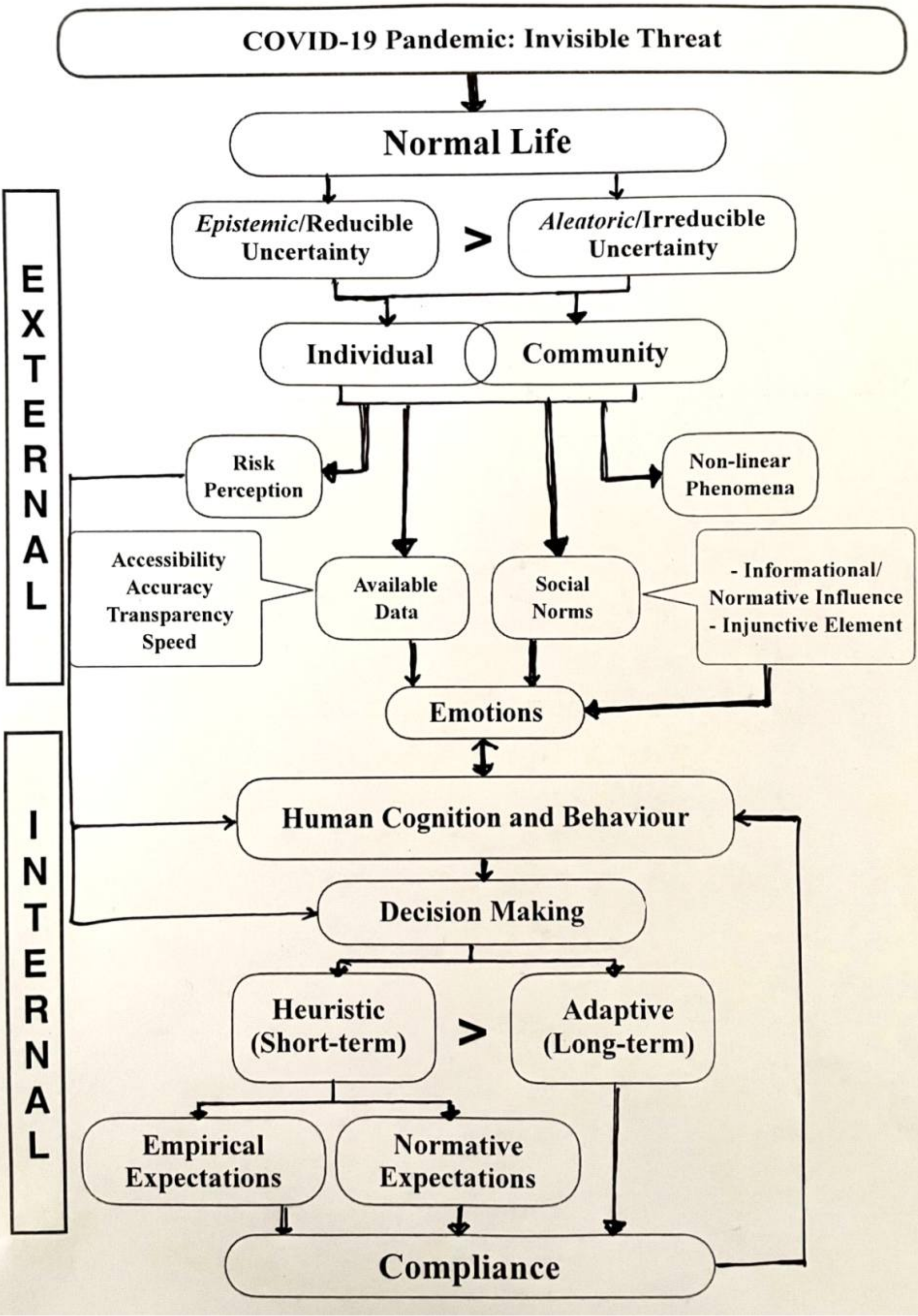
COVID-19 Pandemic: Invisible Threat
Normal Life
Epistemic/Reducible Uncertainty
>
Aleatoric/Irreducible Uncertainty
Individual
Community
Risk Perception
Non-linear Phenomena
Accessibility
Accuracy
Transparency
Speed
Available Data
Social Norms
- Informational/ Normative Influence
- Injunctive Element
Emotions
Human Cognition and Behaviour
Decision Making
Heuristic (Short-term)
>
Adaptive (Long-term)
Empirical Expectations
Normative Expectations
Compliance
EXTERNAL
INTERNAL

Figure: 1

External Stimuli:

When Covid-19 started to spread through the world and more specifically in India, we took public health measures as a collective. The respective government, with in-put from experts created an action plan to contain spread of the disease by limiting the movement of the citizens (Lock-down: a suppression strategy). This was based on the premise of needing to improve knowledge about illness amongst general population and in part to gain time to upgrade facilities should the surge happen. Following first peak, a mitigation strategy and upon onset of second peak, a re-institution of suppression strategy were undertaken. These decisions though were taken at state or national level, the impact was on every single individual and their acceptance of the above depended on few factors. (Fig 2)

Fig 2

Factors contributing to risk perception:
1. Threat of the illness
2. Non-zero sum nature of illness
3. Trust

Factors that influence available information:
1. Political structure
2. Information and mis-information (including conspiracy theories)
3. Persuasive advise towards behaviour change from respective advisory bodies: Collective benefits vs individual benefits (changes over the course of pandemic)

Social norms:
1. Non-linear processes
2. Culture
3. Inequalities, Prejudices and discrimination

An individuals risk perception changes with time and as they impart more accurate information along with personal experiences of the illness they understand that the illness is one of non-zero sum nature with some zero sum elements. This will also change ones trust in nation and public health advisory. Political structure and the cultural context play a vital role in publics acceptance of the health measures. The rigid a political system is, the less mis-information, trust in the state or organisation and more likely that the advise is complied with. (3)

In India, during the pre-first peak and during first peak, there has been a significant expression of prejudices based on religious and social class that lead to social inequalities. This is not specific to India but seen in various higher income countries too. But these failed to create further in roads into the collectives thought as the crisis deepened and were insignificant factors by the time we reached second peak and after.

Internal Processes:

Emotion or the affect derived from above mentioned external stimuli is processed through ones or collectives (social) cognition. This will lead to a behaviour that balances ones and collectives positive goal (affect-cognition-behaviour).

During Covid-19 pandemic, suppression or mitigation strategies varied world wide based on individual state or region preference mainly due to lack of clarity or best available research. (4) Mathematical modelling showed time frame and alternative suppression and mitigation strategies and their interplay for non pharmaceutical control of the pandemic. (5)

Theory of planned behaviour and dual-process theories of thinking and decision-making are well researched models that best explain the public health and Covid-19 related behaviours. Internal processes that respond to affect created by external processes go through varied decision-making and depending upon changes in cognition (specifically and not limited to reasoning, memory and attention), the resultant behaviour changes as well. (6-8). These changes are less likely due to "behavioural fatigue" but more likely due to re-calibration of internal processes to external stimuli over time. (9)

Both real and perceived external threat as well as the persuasive changes used to control spread of infection change as one goes through various phases of pandemic. (10,11) In the initial phases of the pandemic, collective empathy shares the risk leading to a collective action but as the time goes by, and the isolation and distancing that fundamentally erodes the human connection (social dilemma), there is erosion to the collective action as well. Economic strain compounds the social disruption and influences compliance with public health guidance. (6,12-14) Collective (society, state or nation) benefit and individual benefit and how they change over time also depends on the size, political structure of the society based on the available research. The smaller the population and rigid the political structure, the higher is the achievement of collective goal. (15)

Coping is a strategy where an individual or a group undertakes conscious or unconscious strategy to relieve unpleasant experience of illness or isolation. These could be cognitions or behaviours and relate both to the stressor (Covid-19) as well as the circumstances (suppression and mitigation strategies causing negative emotional or financial burden). (16)

Phases of pandemic, calibration of risk perception and adaptive coping strategies drive an individuals decision-making. These decisions are predominantly gut-felling like responses but over time are more reflective. These decisions along with belief of others behaviours will decide how one complies with the required public health advisory. Hence further research into various permutation and combinations of scenarios will better inform the persuasive strategies that need to be employed.

Clinician compliance:

As much as we discuss public compliance, it is of vital importance that we have an introspection into our own clinical practice. Rational use of medications (RUM) as described by WHO deemed to have been breached consistently during this pandemic predominantly due to the mis-information, information overload, rapidly changing guidelines and altered social norms amongst clinicians. This resulted in increased and irrational use of pharmaceutical agents based on rationale but not limited to compassionate and off-label benefits. (17-20) DCGI guidance in India continued to allow many ineffective medications as treatment guidance long after most countries following evidence review stopped recommending and even auditing further usage. Prior research informs various other factors influencing such prescription practices. They are patient-related, prescriber-related, work place related and industry influence.

One important external factor that influences the above in Indian context is fear of discrimination by colleagues and patients alike for practicing what is RUM as less is considered ineffective or poor effort. This along with sense of vulnerability to physical and emotional harm whilst undertaking clinical duties during most stressful circumstances and with much higher mortality rates push clinicians to do more rather than appropriate. Ethical issues that should have arisen amongst individuals or in respective societies, have not been able to reduce this practice.

Social norms amongst clinicians, poor understanding of non-linear nature of illness and heightened risk perception (as seen with general population) are likely to be the main cause of inappropriate prescription practices which are deemed prevalent in care of Covid-19. Accepting that there could be a problem and auditing of the prescription practices will be a step in right direction and this needs political will of an organisation and the state.

Conclusion:

Measures to normalise life or achieve “new normal” during transition phase (post-peak) of pandemic needs continued emotional and physical effort from individuals as well as society. These efforts are both inherent (self-driven) and to a majority are persuasions from the state or an appropriate body based on best available research. Achieving compliance with such measures is a complex task as this involves multiple aspects (internal and external processes). These changing processes lead to change in individual or collective decisions and is very difficult to study as a whole or in continuum during a pandemic.

Studies suggest making clear and precise information available along with due importance to social norms will lead to one and all to assess risk appropriately. This will lead to a more stable response based on affect-cognition-behaviour cycle by changing attitudes overtime. Mask-distance-vaccine strategy during this phase of epidemic in India needs increased persuasive effort as well as changes to attitudes and behaviours that will help community to reach new normal.

Clinicians too with appropriate information (regarding both pharmaceutical and non-pharmaceutical methods of controlling pandemic) and addressing social norms amongst them will show increased behaviours that comply with standard of care prescribed by the state rather than undertake high risk and emotionally charged decisions that contradict standard of care.

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THE ECONOMIC AND FINANCIAL IMPACT OF SARS - COV - 2 PANDEMIC

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Introduction

The world is on the verge of an unprecedented pandemic disease, as many cities across the globe go on lockdown in response to the spread of novel coronavirus, the so-called COVID-19.

The consensus among economists about the global economic shutdown due to disease pandemic is believed to be the primary determinant of stock market volatility that could lead to the biggest stock market crash in the 21st century the SARS - COV- 2 pandemic is a sign of how vulnerable and fragile our world is.

The social and economic crisis precipitated by COVID-19 is affecting families, communities and nations across the globe. The impact of the pandemic is massive:

US$ 10 trillion of output is expected to be lost by the end of 2021, and US$ 22 trillion in the period 2020–2025 — the deepest shock to the global economy since the Second World War and the largest simultaneous contraction of national economies since the Great Depression of 1930–32; 115–125 million people have been pushed into extreme poverty.

National pandemic preparedness has been vastly underfunded, despite the clear evidence that its cost is a fraction of the cost of responses and losses incurred when an epidemic occurs.

The total cost of the economic losses due to SARS was estimated at US$ 60 billion. The 2015 MERS outbreak in just one country, the Republic of Korea, with 185 cases and 38 deaths, cost US$ 2.6 billion in lost tourism revenue and US$1 billion in response costs. The 2016 Commission on a Global Health

Risk Framework for the Future argued that its proposed preparedness spending boost of US$ 4.5 billion annually was a small investment compared with a scenario of the potential global cost of pandemics over the whole of the 21st century, which they assessed as being“in excess of $6 trillion”

Table 1. Historical MSCI World Index and S&P Performance Under Epidemic Risk.

Epidemic	Month End	6 - month % Change of S&P	12 - month % Change of S&P
HIV/AIDS	6/1/1981	-0.3	-16.5
Pneumonic plague	9/1/1994	8.2	26.3
SARS	4/1/2003	14.59	20.76
Avian flu	6/1/2006	11.66	18.36
Dengue fever	9/1/2006	6.36	14.29
Cholera	11/1/2010	13.95	5.63
MERS	5/1/2013	10.74	17.96
Ebola	3/1/2014	5.34	10.44
Measles/Rubeola	12/1/2014	0.2	-0.73
Zika	1/1/2016	12.03	17.45
Measles/Rubeola	6/1/2019	9.82	N/A

Europe, there have been rapidly growing numbers of severe and fatal cases in many EU/EEA countries, and several countries in Europe have already reported nationwide community transmission. Italy, Spain, France, and the Netherlands have already registered healthcare system saturation due to very high patient loads requiring intensive care. Stock markets have plummeted: France, -17.21 percent; Germany,-16.44 percent; the United Kingdom, -13.74 percent and; Italy, -22.85 percent. The European Central Bank announced to inject 780 billion euros into financial markets and refinancing options for the private sector of 3 trillion euros. In the United Kingdom, the Bank of England proceeded to interest rate cuts, whereas the government announced expansionary measures of 30 billion pounds.

Germany will launch a stimulus package of 750 billion euros to support the local economy. Economic contraction is already on its way with irreversible repercussions to the economy. In previous recessions, trade protectionism policies, along with export subsidies, enabled businesses to recover in the medium term. However, the current pandemic constitutes the traditional policy response irrelevant. Each government has to preserve the country's productive capacity restoring consumer spending, business investment, and market expectations. Further and coordinated action is required from all governments to support economic activity directly.

Actions required:

Raise new international financing for the global public goods of pandemic preparedness and response. The facility should have the capacity to mobilize long- term (10-15 year) contributions of approximately US$5-10 billion per annum to finance ongoing preparedness functions.

It will have the ability to disburse up to US$50-100 billion at short notice by front loading future commitments in the event of a pandemic declaration. The resources should fill gaps in funding for global public goods at national, regional and global level in order to ensure comprehensive pandemic preparedness and response .

The Global Health Threats Council will have the task of allocating and monitoring funding from this instrument to existing institutions, which can support development of pandemic preparedness and response capacities. COVID-19 is not only a global pandemic and public health crisis; it has also severely affected the global economy and financial markets. Significant reductions in income, a rise in unemployment, and disruptions in the transportation, service, and manufacturing industries are among the consequences of the disease mitigation measures that have been implemented in many countries. It has become clear that most governments in the world underestimated the risks of rapid COVID-19 spread and were mostly reactive in their crisis response. As disease outbreaks are not likely to disappear in the near future, proactive international actions are required to not only save lives but also protect economic prosperity. The COVID-19 pandemic has caused direct impacts on income due to premature deaths, workplace absenteeism, and reduction in productivity and has created a negative supply shock, with manufacturing productive activity slowing down due to global supply chain disruptions and closures of factories. For example, in China, the production index in February declined by more than 54% from the preceding month's value . In addition to the impact on productive economic activities, consumers typically changed their spending behavior, mainly due to decreased income and household finances, as well as the fear and panic that accompany the epidemic. Service industries such as tourism, hospitality, and transportation have suffered significant losses due to reduction in travel. The International Air Transport Association projects a loss in airline revenue solely from passenger carriage of up to $314 billion.

Restaurants and bars, travel and transportation, entertainment, and sensitive manufacturing are among the sectors in the U.S. that are the worst affected by the COVID-19 quarantine measures . The advance seasonally adjusted insured unemployment rate in the U.S. has already reached a record level of 11% for the week ending April 11, 2020. Global financial markets have been heavily impacted by the effects of COVID-19 spread. As the numbers of cases started to increase globally, mainly through the US, Italy, Spain, Germany, France, Iran, and South Korea, the world financial and oil markets significantly declined. Since the start of the year, leading U.S. and European stock market indices (the S&P 500, FTSE 100, CAC 40, and DAX) have lost a quarter of their value, with oil prices declining by more than 65% as of April 24, 2020. Daily data on stock market volatility and price movements are good indicators of consumer and business confidence in the economy.

Conclusion

As the spread of the virus is likely to continue disrupting economic activity and negatively impact manufacturing and service industries, especially in developed countries, we expect that financial markets will continue to be volatile. There is still a question as to whether this unfolding crisis will have a lasting structural impact on the global economy or largely short- term financial and economic consequences. In either case, it is evident that communicable diseases such as COVID-19 have the potential to inflict severe economic and financial costs on regional and global economies.

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PREPAREDNESS FOR PANDEMIC WAR LIKE COVID 19

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Introduction

Existing health systems had intrinsic flaws that may be fatal when stressed, as the SARS-CoV-2 pandemic has ruthlessly demonstrated. The current SARS-CoV-2 outbreak has starkly demonstrated society's vulnerability to pandemics, especially ones that have been long expected and predicted. Most healthcare systems have not evolved to be resilient in the face of disasters or to respond quickly to pandemics.

When the COVID-19 pandemic is gone, the key questions will be what we have learned and how to improve our system.
Inequalities in health have existed for decades, and while everyone was affected by the COVID-19 pandemic, vulnerable communities were disproportionately afflicted. The pandemic has intensified child poverty, food insecurity, and homelessness. Furthermore, school closures, job losses, and furloughs have all had substantial societal consequences.

Are We Prepared for Future Catastrophes? It's either now or never to act.

There can be little doubt that in dealing with the COVID crisis, there have been errors, failures,
insufficient planning or foresight, and poor management at many levels across the country. Someone must be held accountable if oxygen, hospital beds, or immunisations areinsufficient. Something is wrong if lifesaving equipment such as ventilators is either non-functional or underutilised.

"Never let a good crisis go to waste," Winston Churchill famously stated.
Because everyone's existence is at stake, a national agreement is more important than political brinkmanship. The ability of COVID-19 to level the playing field has already been established. It does not differentiate between the rich and the poor, rural and urban locations, caste or religion. As a result, we must join forces and hands to fight it.
Be ready for a change in a volatile and dynamic environment. Rather than opposing it out of fear of failing, see it as an opportunity to grow (Connor, Jerry) In a volatile and dynamic world where anything may happen anytime, it is vital to be prepared for change. Rather than resisting change because we are afraid of failing, we see it as an opportunity to learn and improve. Instead of being stuck in linear thinking, which may be constrictive, try various approaches to the same topic while battling uncertainty.

It will present us with challenges that are orders of magnitude higher than we are used to. To deal with them, we need to create an operating model that accommodates us at a high level of unpredictability.

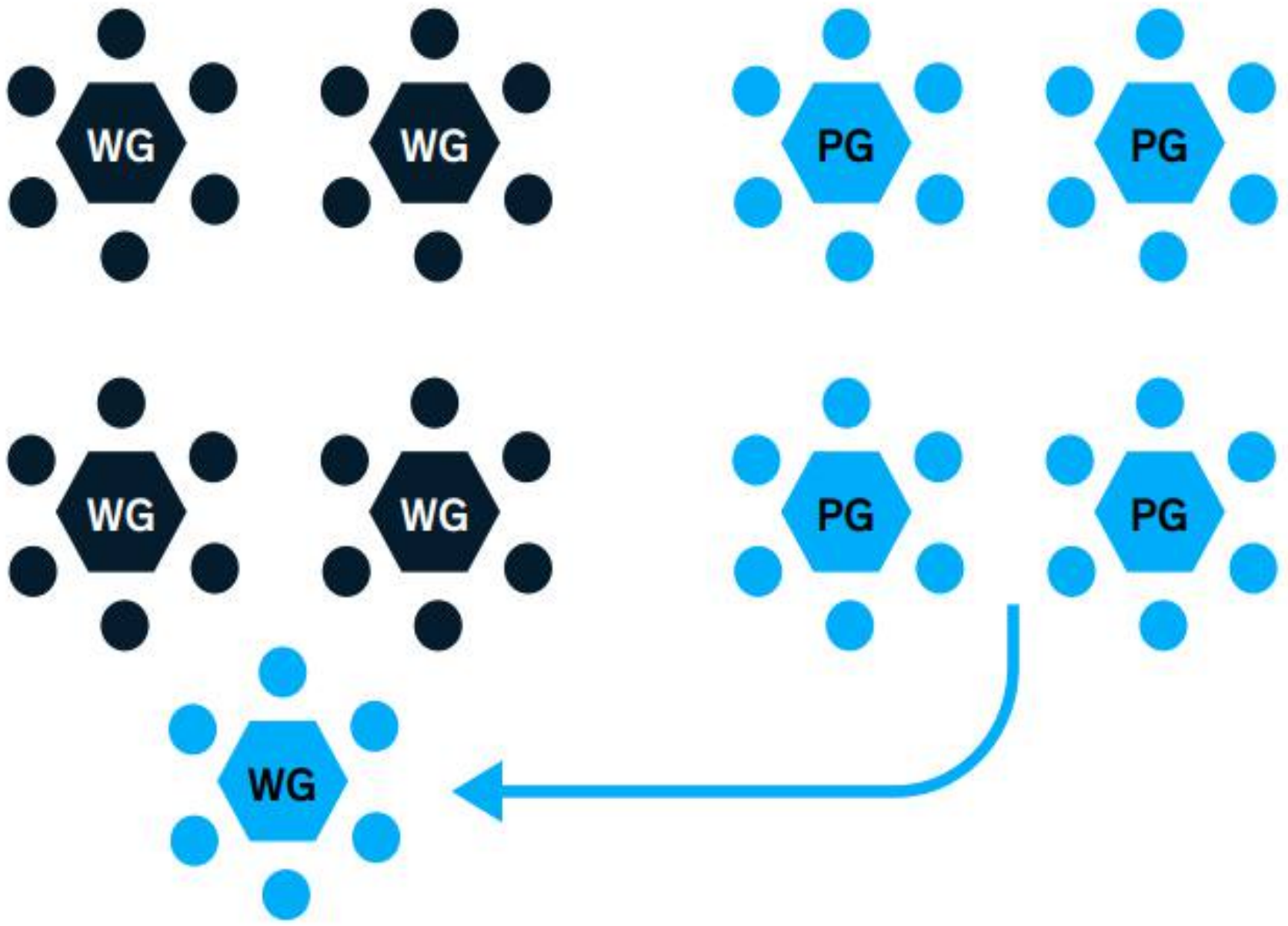
Form a team that thinks ahead.

Gathering forward-looking intelligence, developing scenarios, and identifying tactical and strategic alternatives and actions should be the responsibility of the plan-ahead team. Unlike a traditional strategy team, it will need to plan across all time horizons, may be within Hours, Days, Weeks, Months, Years, and to the next normal, to keep up with rising difficulties and the decisions that must be made in this time of high uncertainty.

The Organisation's management team is presented with scenarios, action recommendations, and trigger points by a Plan-ahead team, which allows them to determine the optimal course of action.

The decisions are communicated to the crisis team or other Organisational elements for implementation. If more data is required, the Plan-ahead team will do a second shift, acquiring further data to reduce uncertainty. The Organisation of the Plan-ahead team is modular, with separate cells focusing on specific difficulties over many time horizons. When new issues arise or periods lengthen, we may need to add more cells. Depending on the intensity of the crisis, the team will be able to scale up or down. Today, planning necessitates a full-time senior executive. There is no scope for waiting for perfect solutions It can be unproductive when dealing with uncertainty. Thus, the Plan ahead team will need to update and enhance plans regularly by incorporating new intelligence as it becomes available.

A plan-ahead team is divided into cells, each of which focuses on a different issue throughout time.



WG - Working Group, PG – Planning Group

The Plan-ahead team must complete the following five frames:

1. Get a realistic picture of where we are beginning .

2. Create scenarios for a variety of future scenarios.

3. Establish our stance and broad trip direction.

4. Determine robust actions and strategic manoeuvres that can be used in a variety of contexts.

5. Create trigger points that motivate us to act at the appropriate time.

Even as we evaluate the optimal course of action, avoid doing what we see all too often in typical strategic planning processes: avoiding uncertainty altogether or relegating it to a risk analysis at the end of the presentation deck.

As the crisis progresses, we can utilise a strategic crisisaction plan to lead our reaction through the following stages. We cannot emphasise this point enough: time is of importance.
Our Plan ahead team must move quickly, provide us with a day one solution the next day, and iterate at a high rate.

We add modules for our Plan-ahead team whenever new difficulties or opportunities arise do not slow down.

Make a realistic assessment of your starting point.
Consider it a "system restore" to get things back to normal. You do not have time to start from scratch; instead, use your current Plan as a springboard for thoroughly examining what has changed. Financial assumptions, ongoing activities, and significant strategic decisions should all be reviewed by the Plan-ahead team.

Referring to a three-year plan and cataloguing the planning assumptions made in that document might assist in determining what drives the Organisational financial success.

Those elements should be divided into three categories: those that appear to be roughly correct, those that appear to be incorrect, and those about which you are doubtful.

If possible, perform a fast sensitivity analysis to determine which assumptions are most important.

The next step is to list all the significant ongoing initiatives, starting with the capital expenditure list's significant projects, and group them into the same bucket categories.

The next stage is to list the major strategic decisions that drive our model, such as maintaining a pricing premium, investing in a physical network, and investing quicker than the competitors. Sort them into one of the three containers as well. We now clarify the overall picture and highlight the most essential points.

Create scenarios for various future imaginations.

Too often, the traditional approach to strategic planning assumes a head-in-the-sand attitude. We cannot get rid of ambiguity; we must face it now more than ever. Building scenarios is a great approach to do this.
We merged the two most significant uncertainties connected with the crisis—virus propagation (and the resulting health reaction) and economic knock-on consequences (together with the resulting public-policy response)—into plausible macroeconomic outcomes. The goal is not to argue about which scenarios are more likely but to see what is possible and be prepared for anything that appears realistic.

Scenario studies frequently fail when "the tails" are cut off to eliminate the most extreme possibilities leaving just variants of a base case. While some eventualities may appear to be too horrific to consider, that does not mean they should be ignored.

The Plan ahead team should develop at least four scenarios. If you just have three, it is too easy to fall back on the middle option as the default. Creating scenarios yields quick results. It enables us to categorise uncertainty into manageable and measurable buckets, eliminating confusion and separating what is unknown from what is truly important.It is critical that a planahead team examines numerous possibilities as input and transforms them into actionable ideas. However, it is also critical that the team has a set of planning assumptions to work with.

Take a wide stance and decide on a Broad direction of travel.
The COVID19 crisis is famous for its abrupt move to distance business structures. People substantially increased their usage of technology that enables remote learning, working, services, and consumption in a couple of days. Will post-crisis adoption decline, or will we transition to a new status quo? Should we, as a result, increase our expenditures in a digital business strategy now?
Is it necessary to reduce our capital expenditure? Rather than expanding our physical footprint, how about securing bandwidth to virtualised business? we can't put all our eggs in one basket or hope, given the level of uncertainty.

Before establishing any activities, the critical output of this frame is to establish confidence on future themes.

Determine robust actions and strategic manoeuvres that can be used in a variety of contexts.

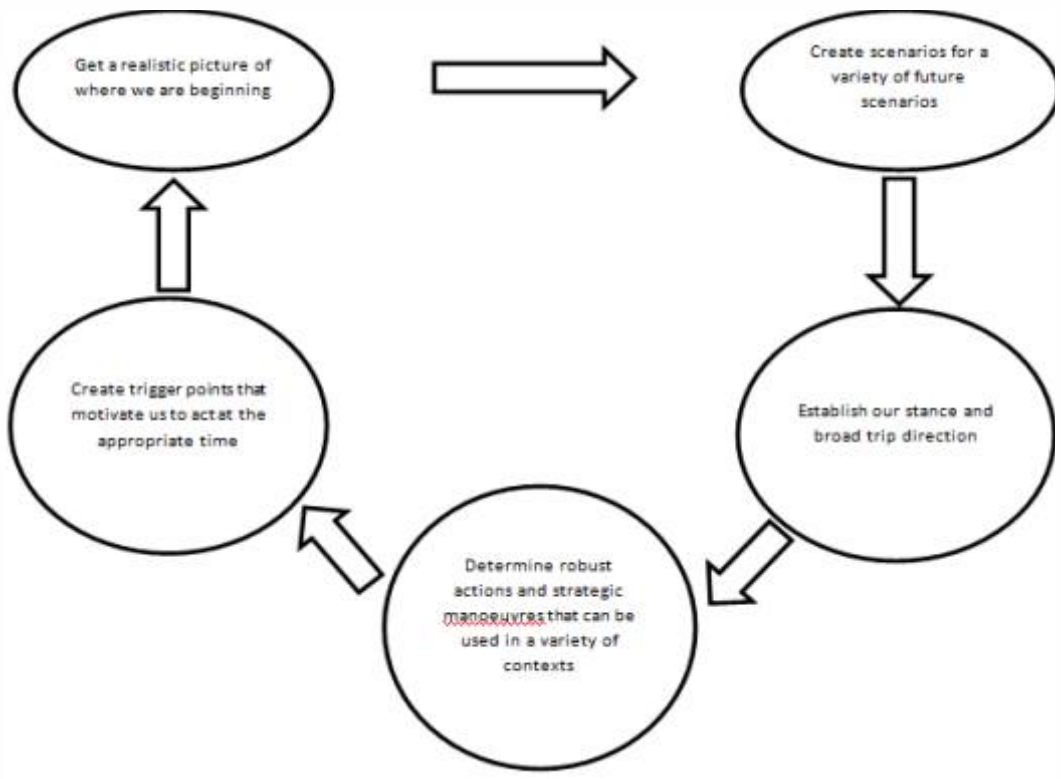
A rigid, deterministic plan will not last long in a world of great uncertainty. However, making everything adjustable might be a costly road to nowhere.Instead, think about putting together a portfolio of strategic movements that will perform well as a whole across all possible circumstances, even if none of them are winners on their own.

There should be a portfolio of several dozen strategic movements, ranging from no-regret moves to ones that can irreparably affect the organisational future.

Ensure that significant decisionmakers and stakeholders, both inside and outside the Organisation, are well-informed about each sequential development.

Establish trigger points that will prompt our Organisation to act at the appropriate time.
In an uncertain environment like the one created by COVID19, a rigorous strategy will quickly become obsolete. The world is changing at a breakneck pace. We have no idea what scenario we are approaching. However, we must strive to be the best learner (the first to see where the world is headed) and the best adapter (the one who makes the most exemplary changes, decision-making and Plan iteration). It is not about that starting with the ideal strategy: it is all about staying on track. The most rapid rate of improvement in a fast-paced environment, that is what will mean the most in the world, as even the best plan will fail. As previously said, most of the manoeuvres we describe will only make sense in a specific set of circumstances. It will vary with context. To ensure that each action is accompanied by a clear explanation, a well-defined set of triggers for when the Organisation should start planning in depth. In collaboration with the plan-ahead team, a critical responsibility of the Head of Organisation is to determine when trigger points have been reached—and when thorough planning and execution should begin.

In the fight against time, stay ahead of the competition.
In times like these, being on the quickest track is more important than having a great plan because plans do not always work out.
Making the next moves against the clock -
— Convert our activities and move portfolio Ideally into a strategic crisis-action planthrough a syndicated and "decision primed "Simulation on a tabletop.
– Put all the plan's initiatives on hold for the time being. Objectives and decision-making points This will provide us with more visibility to be able to steer the action in the right direction in real-time— Assemble a collection of indications into a report. The control office functions as an early-warning system. A mechanism to indicate which scenario is generating.
It's not our duty to figure out the unknowable, but it is our responsibility to figure out how to figure out the first to know and the first to act, we must be the first to know and the first to act. It necessitates the presence of a sentinel capable of detecting the signals first, paired with a flexible and adaptable plan i.e. Take action in response to the trigger points. We do not have the time or resources to do it on our own. That is why, even when our crisis management team is hard at work, we should have our modular model if we want to keep our firm afloat. A scalable plan-ahead team at our disposal to assist us. Throughout the crisis, our iterative planning cycle must continue regardless of how overwhelming the problems appear to be.



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COMMUNITY INVOLVEMENT IN THIRD WAVE PANDEMIC PREPAREDNESS

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Introduction

Many epidemiologist have been repeatedly warning of another disastorous wave of COVID 19 in India. It is expected to affect the paediatric population although there is no sufficient data to back up this widespread fear of the third wave of the pandemic. However, as the COVID virus continues to evolve, protecting the children will be a big challenge due to no vaccines for them currently. Usually children infected with COVID are asymptomatic or develop mild symptoms only. But it is worrisome in children with comorbidites and other special needs. According to the Ministry of Health and Family Welfare, 60-70% of children hospitalised due to COVID had other comorbidities. COVID in children very often tends to develop MIS-C (Multi- system Inflammatory Syndrome) which is extremely serious condition prolonging hospital stay, causing morbidity during post COVID recovery.

The current pandemic needs a special intervention in the field of medicine and critical care which is much talked about at present among the medical community. In this article we try to share and bring light upon the social and community needs of the population as a whole and individual groups of women and children which has been largely ignored during the pandemic, in order to ensure the physical and mental wellbeing of the population. Hence, we would like to make recommendations taking this issue into account and to attempt to adopt a more comprehensive and sensitive approach which will be able to create availability, accessibility and affordability of all resources to these groups.

India's second wave of COVID-19 had been catastrophic, causing a havoc in the country and burden over the medical healthcare system. The COVID-19 pandemic in India is part of the worldwide pandemic of coronavirus disease 2019 (COVID-19) caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2).

The deadly second wave which began in March 2021 was much larger than the first and more catastrophic. It was one of the largest humanitarian crisis of the country which caused massive shortages of hospital beds, oxygen cylinders and therapeutic drugs and vaccines in the country. Not only were the medical supplies short but basic needs like food and shelter were not available to a large population of the lower socio economic group. Multiple factors had potentially contributed to the sudden spike in COVID cases which included the highly-infectious variants of concern such as Lineage B.1.617. 2 (Delta variant), huge lack of preparedness as temporary hospitals and care centres had been dismantled after cases had started to decline, and no new facilities were built. Health and safety precautions (mask wearing, social distancing, avoiding crowds) that have time and again been stressed upon globally and nationally by epidemiology and health experts were being poorly followed, implemented or enforced across the country, especially during weddings, festivals, sporting events leading to overcrowding in public places[1]

The second wave placed an unprecedented strain on the healthcare system with shortage of basic medical oxygen due to unanticipated demand, lack of cryogenic tankers, delay in transport of oxygen, lack of availability of life saving drugs with overburdening of the healthcare workers working continuously in difficult working conditions without breaks for hours together, lack of availability of life saving drugs because of which families and relatives of COVID patients had to run post to pillars trying to search for supplies to save their loved ones.[2]

Third wave in India: the ticking timebomb

Experts have warned multiple times of an imminent third COVID-19 wave. In the first week of May 2021, K Vijay Raghvan, Principal Scientific Advisor to PM, called the third wave of COVID inevitable and that it could cross age groups and may put children at similar risk as adults.[3,4] IIT Kanpur has predicted three likely scenarios for the third wave based on the level of unlocking: [5]

Scenario	Situation	Third wave peak	Severity
1	Back to normal	October	Lower peak than second wave (3.2 lakh per day)
2	Emergence of new and more virulent variants	September	Higher than second wave (5 lakh per day)
3	Strict interventions	Late October	Lower than second surge (>2 lakh per day)

*Does not take impact of vaccination into account

According to Prof Shahid Jameel, an expert virologist, there is no definitive answer to when and if a third wave would hit the country as all would depend on how the population follows COVID appropriate behavior as the country unlocks and the speed of the vaccination drive depending on how quickly vaccine doses are administered ,and whether a far more infectious variant emerges as a driver.[6]

Delta-Plus Variant: Driver of the third wave?
The Delta-Plus variant formed due to the mutation in the B.1.617.2 (Delta variant) was the one that drove the fatal second surge in India. The new variant of concern is a sub-lineage of the Delta variant that has acquired a spike protein mutation 'K417N' .

Delta Plus variant has the following characteristics causing concern:
- increased transmissibility
- stronger binding in receptors of lung cells
- potential reduction in monoclonal antibody response

Third wave and Children

This is a cause for worry according to many public health experts, since children below 18 years remain unvaccinated in India. Adding to this the existing pediatric health care facilities which not robust enough to treat children on a large scale if a third wave occurs.

School reopening and third wave
The WHO proposed the use of following four categorisation of districts depending on local level and pattern of transmission.[7]

Category	Transmission level and pattern in district	Strategy for decision making at district level
1 and 2	No cases or Sporadic cases	Keep all schools open and implement COVID control measures
3	Cluster Transmission present	Keep most schools open and consider closing schools in the areas witnessing increase in clusters that includes schools
4	Community Transmission (with increasing trends of COVID-19 cases, hospitalizations and deaths)	Require school closure

Early statistical indicators of third wave in India

1) Slowdown in rate of decrease in COVID infections

There is a significant slowdown in the downward fall of daily COVID infections with a slight increase in the positivity rate instead, as per the Ministry of Health and Family Welfare (MoHFW). The problem is that new infections are not rising but also not decreasing as expected . Secondly, there is reversal of falling trajectory of positivity rate.[8]

2) Increasing R-value

The R-value, that is reproduction rate of Covid-19 in India has increased from 0.96 to 1 in July and is flagged as matter of concern by AIIMS.[9] R-value measures the number of people that are being infected by one COVID-positive person on an average. The numbers of infections increase exponentially if the R-value is more than 1. When the R value decreases, the infection stops spreading because it will break the chain of new case outbreak. All this indicates that a third wave is on the horizon in India.

Third wave preparedness: An immediate priority

A) COVID-19 Third Wave in India: Children's Vulnerability and Preparedness

-Awareness programmes to educate the population that COVID in children is different from adults and hence also their treatment . Parents, guardians and teachers should be trained about management of a COVID infected child.

-Vaccination for young children and children with comorbidities should be an immediate priority with caution.

-Identification of need for long and short term rehabilitation of COVID affected children.

-Comprehensive child care models in hospitals and community.

-Protocols for children with comorbidities, malnutrition, disabilities and special needs to be developed and facilities to correct the same.

B) COVID- 19 Third Wave in India: Impact on women-children

1. Mother and Child care:

-Preventing neonatal mortality due to separation from COVID suspect/positive mother.

-Provision of special medical equipment for new-born and child health such as paediatrics ventilators, alongwith maternal and reproductive health services.

-Pregnant women should be treated as a priority group and ante-natal, perinatal, postnatal and mental health care services should be ensured to all women through ASHA workers, ANMs, tertiary and referral services during the pandemics without any lacunas.

-Pregnant women should also be vaccinated for covid on priority basis, as they are vulnerable if they get infected , also risking the health and life of the fetus and later the neonate.

2. Sexual and Reproductive Health and Rights (SRHR)

-Menstruation, contraception, safe termination of unwanted pregnancy, pregnancy and delivery services, medical facilities for sexually Transmitted Diseases (STDs) and Reproductive Tract Infections (RTIs) should be continued during the pandemic with proper COVID appropriate behaviour.

3. Protection of women and girl child from domestic violence and abuse at homes.

4. Livelihood rehabilitation and support

India has one of the largest groups of lower socoi economic groups of labourers and workers who lost their jobs during the pandemic with no basic facilities like food, money and shelter causing their migration in large numbers further leading to spread of COVID infection to rural India.

5. Explicit attention to the mental health and health facilities for frontline workers- doctors, nurses, ASHAs, ANMs, Aanganwadis, Safai Karamcharis etc.

6. Information and Communication
-Public health messaging and communication to spread awareness about COVID Appropriate Behaviour (CAB) and vaccination, based on community engagement.
-Risk communication should aim to create awareness among general population by reasonably explaining the reasons for the do's and dont's during the pandemic so that people can follow them by logical reasoning rather than blindly following directives and guidelines.

-Having good app for smartphones like the ArogyaSetu. As many households in India do not have smartphones or internet, awareness and communication should be made via SMS, television and radio.
-Short cartoon based films to sensitize children- for COVID Appropriate Behaviour (CAB) like hand washing, wearing face mask, maintaining social distancing etc.
-Common Service Centres (CSCs) and Anganwadis should sensitize children, women and immediate caretakers about proper health tips, red flag signs, CAB etc.

-Community as a whole should be engaged for following COVID precautions (do's and don't's), reporting symptoms to local health workers at the earliest, COVID home care tips and removing vaccine hesitancy by proper councelling.
-Capacity and skill building of doctors, nurses, community health workers like Anganwadis, ASHA, ANMs etc. to manage COVID patients who are asymptomatic or mildly symptomatic at home.
-Facilities and applications for online consultations and telemedication for patients and doctors with online facilities for delivery of drugs and other amenities.

7. Awareness programmes regarding COVID and vaccination for rural India
-Special vaccination awareness team to educate people about benefits of vaccination and to alleviate their fears and apprehensions about the same by using innovative and specialised tools and techniques.

-Creating a web of COVID isolation and COVID care centres in rural areas as like the urban centres of COVID care facilities, to prevent crowding at urban centres and also localise the spread of COVID.

8. Transportation
-Transportation is one of the major concerns in India during the pandemic. From dearth of ambulances to poor interstate connectivity , which needs correction before the possible third wave.

-Rural India needs more, well equipped ambulances with trained paramedic personnel to impart first aid and transfer the patient safely to a secondary or tertiary care hospital.

9. Training and capacity building:

-Professional training should be conducted for COVID case management according to latest treatment guidlines while cases are low so as to be ready for the next wave.
-Upskilling of the student nurses and nurses shall be updated with new COVID treatment guidelines to aid doctors when the case load increases.
-Abridged programmes for training doctors and nurses to fill the lack of healthcare workers.

10. Effective and efficient Data Management
-Proper scientific collection, organisation, analysis and presentation of data related to
serological surveillance, case fatality, immunisation which can be used to forecast future requirements of hospital beds, oxygen, drugs etc, alongwith effective preparedness strategies and planning.

11. Need to ramp up health facilities
Rural areas, tier-I and tier-II cities need urgent revamping of health facilities and precautionary measures with stringent surveillance in order to contain the further spread of COVID. This can be done through:

-Effective implementation of public health principle of test, isolate and treat starting down from the taluka, village level to towns to metropolitan cities.

-Strengthening the CHC/ PHC with oxygen supplies, better quality of bed, water, food, toilets etc. With easy availability of life saving drugs like steroids , anticoagulants, nebulisers etc so as to manage mild to moderate cases reducing burden over tertiary care hospitals.
-Making testing facilities available at all levels.

12. COVID guidelines to integrate COVID care in the regular health programs
This is to ensure that patients with severe and chronic diseases do not suffer. During COVID, most hospital facilities were focued only on COVID; significantly hampering other health facilities and rest of the health programs. This created other health problems like pregnant women delivering at home, patients with non communicable diseases like diabetes, hypertension, cancers etc. losing follow up and discontinuation of medicines. Similarly, malnourished children, young adolescents and geriatric population's health needs have been ignored. Thus, all these health facilities should be integrated with covid 19 care in the regular health services provisions.

-Structured coordination of the overall response according to technical pillars:-
(i)Case management; Diagnostics & Research; Infection Prevention & Control; Risk Communication & Community Engagement; Vaccination.
(ii)Developing plans for isolation centers at community level.
(iii)Step up community medicine physicians to manage mild cases across the spectrum.

13. COVID 19 vaccination
The emergence of a third wave would be significantly challenged by increasing vaccination in India.

Conclusion

India has just stepped out of a fatal catastrophe of the second surge that has alarmed everyone at global and national level alike, with many countries gearing up to prepare for subsequent waves after witnessing the COVID aftermath in India. But, India has again thrown caution to the wind with markets buzzing with crowds, zero social distancing, opening of offices, schools and abandoning of masks. As the saying goes, ‘Those who do not learn from history are doomed to repeat it’ , can be very well seen by the lackadaisical attitude of Indians. Therefore, the situation is dire and will worsen due to lack of adherence to COVID Appropriate Behaviour (CAB), insufficient medical facilities and lagging vaccination.

Therefore, we strongly recommend home care models, ramping up of vaccination, medical facilities for all especially children, guarantee food security especially for the vulnerable , strengthen the community level engagement and risk awareness and communication, zero tolerance towards sexual abuse of children and domestic violence against women and exponentially increasing the awareness through massive public outreach campaign

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SURVEILLANCE DURING A PANDEMIC

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What do we mean by disease surveillance

Disease surveillance is an epidemiological tool aimed at monitoring about a particular disease in terms of its incidence and spread. It helps to gather information so as to enable the epidemiologist to observe the nature of disease progression amongst population and help predict a model for future progress. Ultimately, this leads to better preventative effort with timely and appropriate allocation of available resources, minimizing the harm caused by outbreak, epidemic or a pandemic. So, a key strategy in disease surveillance is collecting and collating disease case reporting. Now, with the advent of internet connectivity and the digital era this process has become quite efficient and robust as compared to what it used to be.

The World Health Organization (WHO) is the key organization which coordinates, collects and publishes such data on major communicable disease outbreaks of significance specially a pandemic.(1)

What are the goals of surveillance

The major goals of disease surveillance can be elucidated as follows :

A) Early detection and warning – it helps in quick and timely implementation of action plan

B) Predict the spread of disease – taking into account previous such occurrence and behavior

C) To collect key information on the virulent strain, its prevalence, diagnostic modalities, susceptibility to drugs and mutation if any

D) Identifying or indicating where preventative action at what level is necessary. Advising and liaison with local governments and guide to carry out coordinated action plan against the spread of disease

E) Help provide information on selecting the strain for vaccine production

F) Evaluation of epidemiological and medical intervention and publish data.(2)

Types of surveillance

Active surveillance: A system which employs people who actively contact healthcare providers and the population to collect data about health condition. It is most accurate but logistically intensive and expensive.

Passive surveillance: This is based on reports collected from hospitals, clinic, public health unit and other sources. It is less expensive and can reach a wider population but data reliability and timely submission is an issue. Routine health information and management system is a passive system of surveillance.

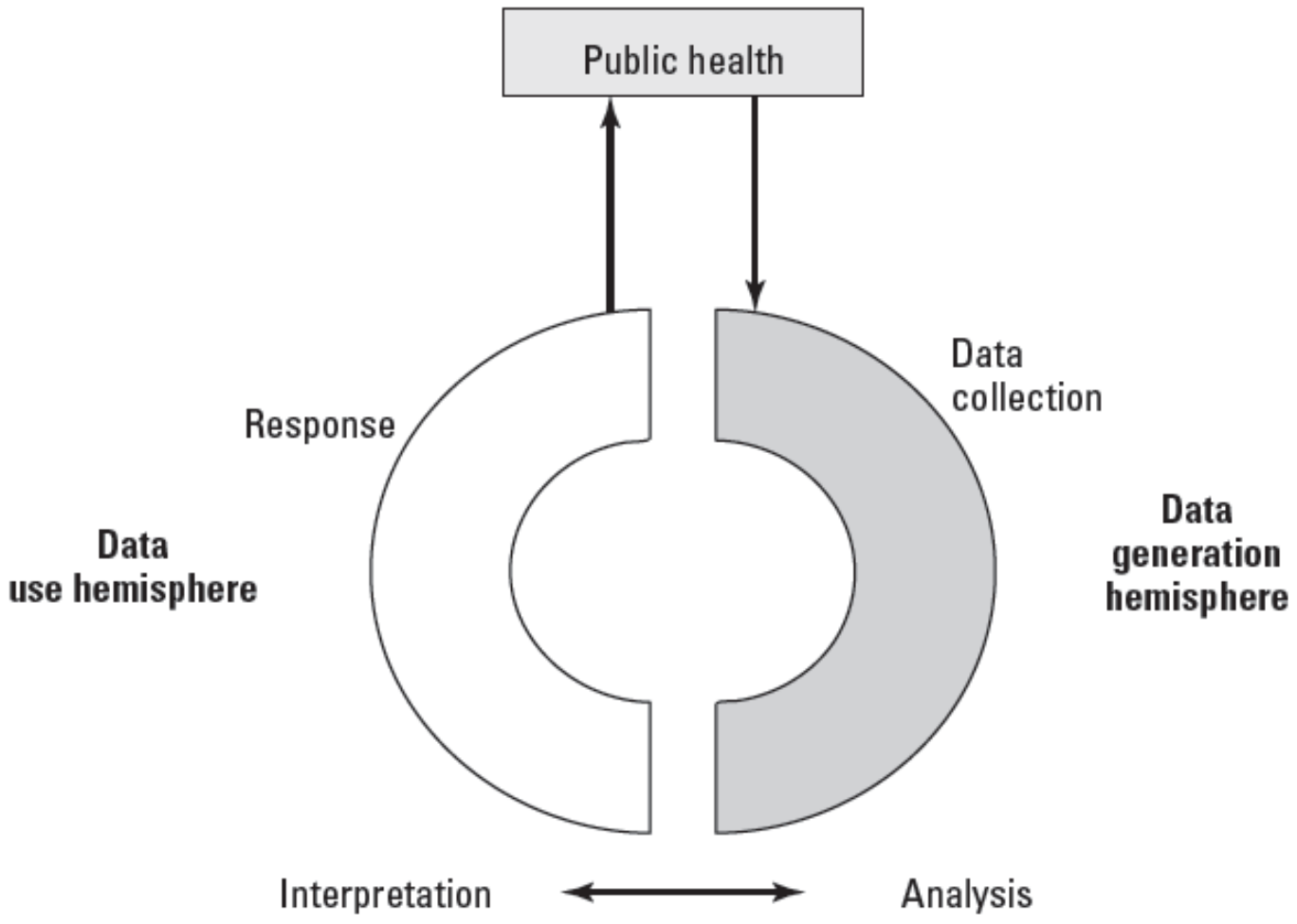
Sentinel surveillance: Instead of collecting data from all healthcare workers, a sentinel surveillance selects a small group of workers randomly or intentionally, from whom to gather data. This leads to more intensive data collection and focused analysis. For example, collection of nasopharyngeal swabs from all people in a closed group of people to identify the prevalence and strain of influenza virus. Collection of such data from all healthcare workers would not be possible. (3)

Apart from these there are other types of surveillance like syndromic or clinical, virological or serological, virological sentinel, population serological, event based or hospital based surveillance, so on and so forth. (4)

What is a pandemic

Commonly used terminologies.
Outbreak : An outbreak is when a disease happens in unexpected high numbers. It can last for days to years.
Epidemic : An epidemic is when an infectious disease spreads to more people than would be expected. It usually involves a larger area than an outbreak.

Pandemic : Pandemic is a disease outbreak that spreads across countries or continents. It affects more people and takes more lives than an epidemic. WHO declared covid a pandemic on 11th march 2020, when it became clear that it was severe illness and spreading over a wide area.



Surveillance during Covid pandemic

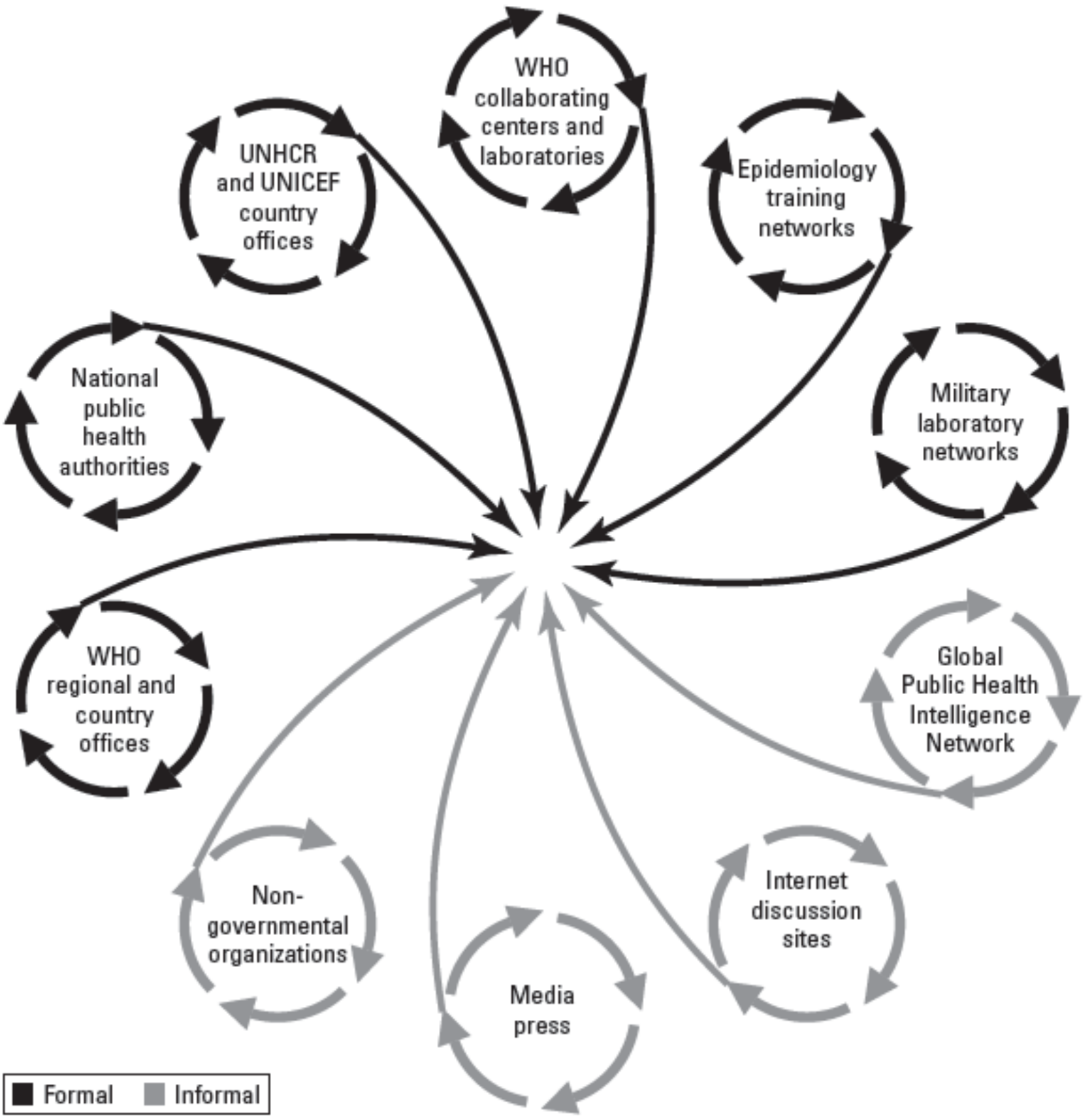
Different populations have taken up emergency measures to deal with the ongoing pandemic with use of newer technologies of surveillance. But, on the flip side, it is thought that, many of these "new" ways of surveillance have long lasting consequences.

Most important of these are the new technologies involving machine learning and automated decision making to monitor into people's digital footprints, identify those who are potentially infected, their contacts and enforce quarantine or social distancing.

In Izrael an anti-terror limited use phone tracking system has been used to monitor location of whole population and the Govt has released and app based system for people to detect whether they have come close to an infected person and need to self-isolate.(5) Similarly, in China, two mobile payment agencies, WeChat and Alipay, has released app to combine user's location, health and financial data to identify a potential infection risk. The Govt and businesses are using these to decide whether to allow someone to shop, transport or public places.(6) Throughout the world increasingly these systems have been used to monitor and contain the pandemic.

One problem of these “newer systems” is that the data generated may be biased, non reliable and non transparent. Another is, the “surveillance creep”, the ways implemented during a pandemic as, exceptional means for exceptional times, are kept on for longer duration and ever more pervasive and stringent monitoring encroaching upon privacy and civil rights. Not only that it has psychological implications for the people also, as it may feel like a sense of being controlled and compromised autonomy, with negative effects on motivation and well-being. In such circumstances, people may even try to avoid surveillance and reassert their autonomy. In South Korea, for example, apps to publicize movement of people with covid 19 raised fear that it might encourage avoidance being tested.(7)

How to use the new technologies during a pandemic for valuable, realistic generation of surveillance data, yet not to compromise civil rights and violate sense of well-being for people, the concept of “protected well-being”, remains to be solved.



Global Infectious Disease Surveillance Frameworks

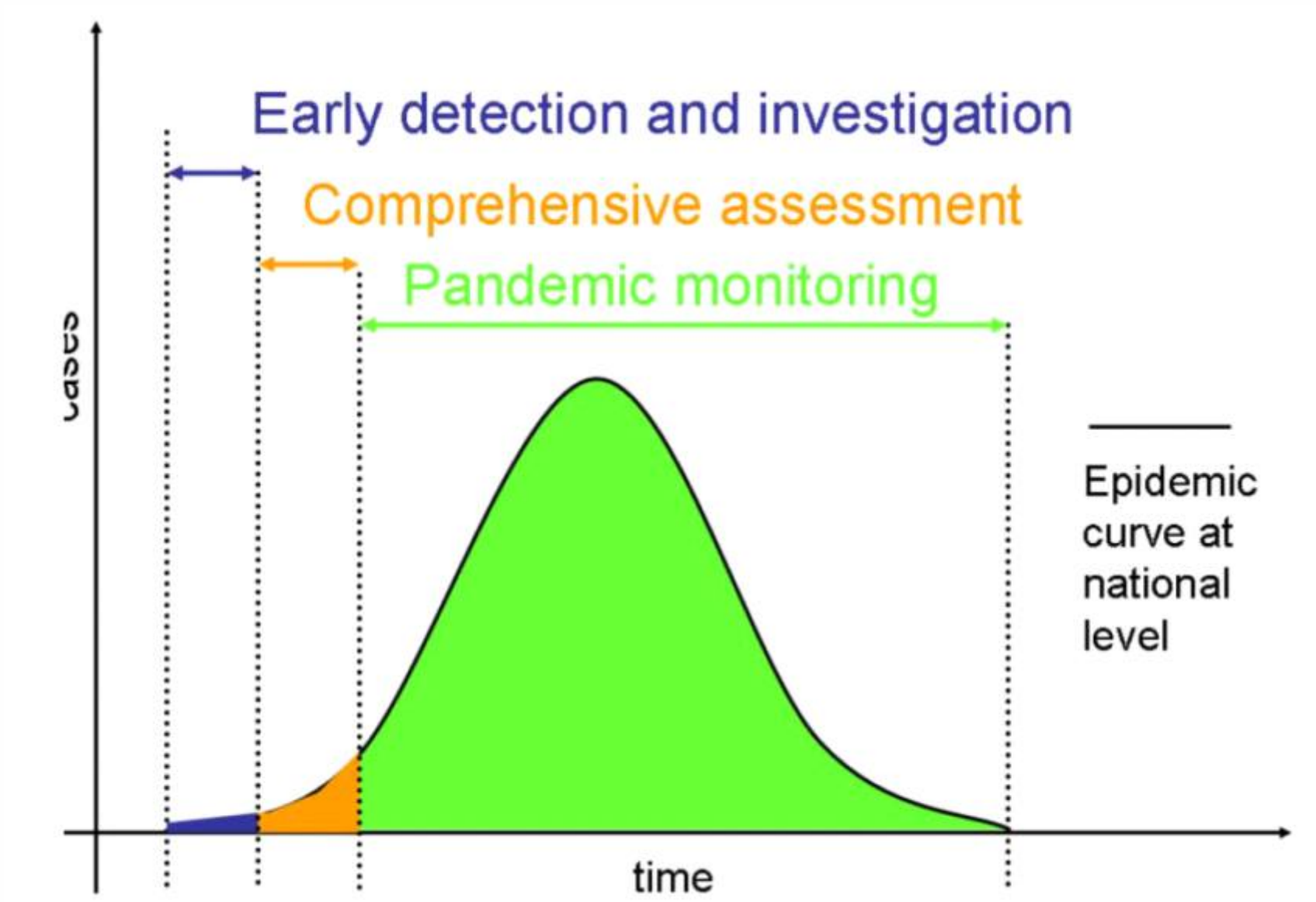
Challenges faced in surveillance during a pandemic

As pandemic occurs only once in a while and severe pandemic once in every 100 years approximately, the expertise, experience and logistics to work under such public health emergency situations become much more difficult and arduous task Pandemics (specially the ongoing one on covid 19) occur at an enormous scale across national and continental boundaries, and hence coordinating, conducting and publishing surveillance data assumes epic proportions putting all existing modalities under huge stress and demand, which can easily become overwhelming at times. At the same time, expectations can run ahead of what can be delivered specially from politicians or decision makers. People who are responsible for surveillance activities may be pushed for data that they are not accustomed to deal with, and reports are expected to be more precise, frequent and timely than what was the usual routine practice.
Even after accepting the nature of a pandemic disease catastrophe and the urgent need for vital surveillance information and clue to mount an appropriate and timely intervention, it is prudent to be realistic and not to expect beyond what can be done.

In this situation, the existing routine surveillance may take a hit and get compromised. Once saturation limits are breached, there can be either an inability to capture relevant data where it is not done automatically, or the inability of the primary or secondary care facilities to care for all cases who seek treatment, the so called “ceiling effect”. During the SARS pandemic in Far East and Toronto it was seen that even with few cases the surveillance almost stopped for a while with service public health staff being too busy in managing the situation and doing contact tracing. Also, disbursal of local data to the WHO was delayed and disrupted in some instances. Hence, it is important to have dedicated teams for priority surveillance data and situation reports. The role of WHO in getting the member countries to tow the guided line is also very important.

One of the key challenge of putting up a robust surveillance apparatus is to reinforce important systems ahead of time, find out which systems are likely to fail under stress and how to mitigate the problems of “ceiling effect”.(8)

Local, National and International collaboration
Surveillance during a pandemic is a continuous process involving collaboration and seamless collation of data at local, national and international level. This is of paramount importance but unfortunately is hard to come by, leading to undue confusion and less trust-worthiness of published data leading to possibility of improper allocation of available resources and difficulty in implementing effective containment strategy.



Overview of the three (3) surveillance components at national level

Future directions

1. Periodic meeting and coordination and multiple levels starting from grass-root workers and data collectors to international cooperation orchestrated at world forums such as the WHO and the UNO
2. Seamless and uninterrupted data transfer in both vertical as well as lateral directions so as to get the true picture of the problem at hand.
3. Implement the principle of shared protocols and agreements to share critical information and outcome of interventions
4. To put forward a mechanism to detect vaccine effectiveness and formulate a comprehensive guideline as per universal consensus.
5. Further use of modern day technologies (Artificial intelligence and satellite based fast internet systems) to reach out to the remotest of corners with maximum efficiency and speed. This can reduce a lot of manpower related deficiencies as well as reduce human errors considerably.(9)

Conclusion

Surveillance during a pandemic is a key epidemiological tool which helps to better understanding about the disease as well as build effective counter measures to contain the spread and manage the public health emergency. There are many types of surveillance which can be used during a pandemic. Missed cases can lead to new chains of transmission, which can be more difficult to contain, hence, the importance of surveillance.
There are many challenges faced for surveillance during a pandemic and lessons learnt during the recent covid pandemic, are mainly related to cost, training and sustainability. Judicious use of new age technologies can help in more accurate and speedy reporting of data. Overall, surveillance during a pandemic has improved over recent years and although the current standards are far from ideal but, the future seems to be promising.

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PREPARING FOR THE THIRD WAVE
HOW TO TRAIN THE STAFF?

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The COVID-19 pandemic has created a havoc all across the world and has caused an unprecedented level of devastation, leaving no aspects of human lives untouched by its dreaded consequences. The second wave in India went through inconceivable levels of suffering and grief, started from severe COVID-19 transmission through highly transmissible delta variant to various post COVID complications to long COVID sequel. In India, there have been 30,752,950 confirmed cases of COVID-19 with 393,310 deaths from 3 January 2020 to 9 July 2021 (WHO, 2021). Good and resilient health infrastructure is a must to fight any future waves of covid.

The possible third wave threats are already looming large and its disproportionate impact on vulnerable groups like children are already being discussed. Hence, before the third wave, the country needs to be prepared for minimizing the impact of pandemic among our future generations. Many healthcare experts had initially expressed their apprehensions about the possibility of a third wave affecting children more detrimentally than adults. However, recent scientific data suggests otherwise. The Indian Academy of Paediatrics and the Lancet COVID-19 Commission India Task Force have concluded that there is no biological evidence that the current and new Delta Plus variant will affect children more disproportionately than adults and its going to target children specifically.

The Delta-Plus variant was formed due to the mutation in the B.1.617.2 (Delta variant) that drove the fatal second surge in India.

The typical features were
» increased transmissibility
» stronger binding in receptors of lung cells
» potential reduction in monoclonal antibody response

The ongoing COVID-19 pandemic has swept all over the world, posing a great pressure at the same time different challenges on critical care resources due to large number of patients needing critical care. Streamlining of protocols for rapid diagnosis and isolation, clinical management and infection prevention are going to be very important not only to patients of COVID-19 but also to all healthcare professionals and other patients who are at risk from nosocomial transmission. Appropriate management of acute respiratory failure and haemodynamics are the cornerstone.

Training should be done under the following heads ;

1. Infection Prevention/Occupational safety and health
2. COVID Triaging
3. Precautions of artificial airway establishments
4. Oxygen therapy and airway support
5. Prone position ventilation
6. Timing of ECMO
7. Haemodynamic management
8. Fluid management
9. Transportation of COVID-19 patients
10. Miscellaneous

1. Infection Prevention/ Occupational safety and health

Tertiary class protection should be made available to healthcare staff working in the ICU which includes quality N95 masks, PPE kits, medical uniforms, disposable gloves, full face-shields and goggles. Healthcare Professionals should be trained to use reusable respirators with filters and cartridges which can be replaced on a schedule or as needed. Adequate stock should be kept ready by the hospitals and the supply chain be so arranged that increasing demand can be easily fulfilled.

2. Covid triaging

Just like we have triage in emergency room, there should be covid triage protocol implemented in the emergency as well as OPD in which suspected case of covid are immediately isolated and a confirmed diagnosis is achieved as early as possible so that spread among other patients and relatives is reduced. All the healthcare workers should be given mock drill of doing triaging frequently.

3. Precautions of aritifical airway establishment & bronchoscopy

Since covid is spready through droplets it is imperative to develop more negative pressure rooms or to do procedures related to airway like intubation or bronchoscopy in negative pressure to avoid infection to healthcare personnel. Portable airpurifiing respiratory with level III biosafety should be made available to the person doing the procedures as many healthcare workers contracted the disease while doing airway procedures.

4. Oxygen Therapy and Airway Support

Oxygen Therapy and Airway Support are the mainstay of the treatment for COVID-19 induced ARDS, positive pressure ventilation is vital to restore the collapsed airways and improve gas exchanges. However, high end inspiratory pressures increases the strain and eventually increases the risk of lung injury and barotrauma that must be kept in mind. Proper training and awareness of various oxygen delivery methods and its equipments are going to be the key in managing patients of acute respiratory failure. Noninvasive ventilation support (NIV) and HFNC are important modalities of oxygen therapies for SARS nCoV2 induced mild to moderate ARDS. The mechanisms of these oxygen delivery methods are positive end-expiratory pressures, decreased respiratory workload, decreased incidences of intubation, ease of use and higher comfort. In certain trials, it has been observed that it can be associated with an improvement in oxygenation; however, it was not associated with a reduced need of intubation or with improved outcomes especially in patients with $PaO_2/FiO_2 < 150mmHg$ or in case of severe form of ARDS. For COVID-19, there is no sufficient evidence to prove that HFNC is superior than BiPAP. Delayed intubation increases ARDS mortality therefore early recognition of the need of invasive ventilation is the key. ROX index can be used to predict HFNC failure and need of intubation in case of respiratory failure. If it is >4.88 it suggests high chance of success and if it is <3.85 it suggests high chance of failure. If it is between 3.85 to 4.88, suggests that patients supposed to be monitored very closely and further delay in intubation to be avoided. Lung protective strategy to be used in COVID-19 ARDS; low tidal volume, limited plateau pressure and driving pressure could decrease ARDS mortality. PEEP setting should be based on various factors like haemodynamics, gas exchange, lung recruitibility and driving pressure as because of loss of elasticity such lungs can have high chances of VILI. Increased use of videolaryngoscopes allow healthcare professionals to intubate the patient with minimal assistance, can reduce failures and also increase the distance from patient's airway. Preferably RSI techniques to avoid manual ventilation of patient's lungs and potential aerosolization of virus from the airways. Limit the number of health care providers in the room where the patient is to be intubated. In the end, judicious use of oxygen is going to the cornerstone as in second wave all across there was severe scarcity of oxygen supply. To assure smooth continuity of oxygen supply, need to have liquid oxygen/plant and at the same time target SpO_2 should be lowered between 90 to 93% instead of above 94% to make sure that oxygen can be delivered to those patients who are actually in need.

5. Prone position ventilation

Prone position has been in practice for refractory hypoxia in severe ARDS, but with covid pandemic it was given even in non intubated patients. Healthcare personnel should be taught to be more proactive in doing PINI (Proning in non intubated) patients. Proning causes improvement in lung recruitment and decreases the ventilation perfusion mismatch with reduction in the alveolar shunt. It should be done in moderate to severe ARDS (PaO2/Fio2 < 150 mm Hg). The minimum duration should be atleast 12 hours and should be extended further depending upon the improvement in the oxygenation. Proning of ventilated patients is tedious process and the healthcare team should be trained to do it so that for any future pandemic all can do it easily and safely. ICU team to be trained in such a way to minimize the complications related to proning like accidental removal of invasive lines or endotracheal tube, pressure ulcers etc.

6. Timing of ECMO

ECMO should be initiated early for those patients who are having refractory hypoxia and hypercapnia despite optimum ventilatory settings and proning. If the patients has PaO2/FiO2<50 for over 3 h; PaO2/ FiO2<80 for over 6 h; Irreversible pH<7.2 for over 6 h, he/she fits in to the criteria for initiation of ECMO. Since ECMO machinery and the personnel are scarce in our country, those patients which are young and without comorbities should be given priority. This will help in better utilisation of the resources. Also the healthcare personnel should be trained to use the ECMO machines and made familiar with the cannulation techniques.

7. Haemodynamic management

Critically ill patients of covid will be having unstable haemodynamics and the healthcare staff should be able to put invasive lines in PPE kits easily. Bedside echocardiography should be used to guide the fluids as well as administration of vasoactive agents. Even the nursing staff should be trained on putting invasive arterial lines. The requirement of the drugs and lines will be increased during a sudden surge so the hospital pharmacies should stock adequate quantities and the supply chain primed for any anticipated increase in the demand. CRRT if available should be used and the healthcare personnel should be trained on operating the machines.

8. Fluid managment

Dynamic assessment of fuid responsiveness could improve the clinically relevant outcomes in ICU, such as mortality reduction, reduced duration of ICU length of stay, and mechanical ventilation. Passive leg raising (PLR), lactate clearance, pulse pressure variation (PPV), and inferior vena cava (IVC) collapsibility or distensibility are simple tools which can be used in resource limited settings. Conservative fluid strategy with crystalloids should probably be considered for COVID-19 patients with ARDS while ensuring tissue perfusion.

9. Transportation of Covid patients

Patients will be required to be transferred from home to hospitals and from non covid to covid designated hospitals. During the previous waves there was a shortage of the ambulances and due to prolonged waiting or time taken to accept a patient at the hospital, turnaround of the ambulances was very slow. The government can create a pool of private ambulance service providers on a common platform and the vehicles be made to get mandatorily fitted with GPS devices to track their location and availability. Since not all ambulances have ventilators or having ACLS facilities, more nursing staff should be trained for transporting covid patients. There required shifting of patients from ward to ICU and vice versa and for this designated transport teams comprising of an attendant, nursing staff and doctor should be identified for smooth movement of the patients. If the turnaround time of ICU bed after the patient is decided to be shifted out decreased, more lives could be saved. The transport staff should be trained to decontaminate themselves after transporting to prevent infection to themselves.

10. Miscellaneous: Other important areas to look after are

» Fire safety awareness : It is the need of time as it can take place due to three major reasons which are electrical short circuit, gas cylinder bursts and human negligence. With surge of patients and continuous usage of electric equipments chances of fire hazards are going to be high so frequent mock drill training of all healthcare professionals is going to be the key regarding fire safety equipments, extinguishment, emergency response, detection of alarm, compartmentation and escape.
» Judicious usage of medicines and beds: Second wave has witnessed all sorts of scarcity like hospital beds, oxygen and at the same time shortage of key medicines like antivirals, immunomodulators etc. So judicious use of all these molecules is going to very crucial at the time of crisis.
» Mental wellbeing of staff: Alongwith all sorts of struggle during of COVID-19 tsunami, one of the most important thing to address is the manpower management because they are going to be the worst affected with direct transmission of infection, mental fatigue and physical exhaustion because of long hours of duties, continuous apprehensions of cross transmission of infection to the beloved family members at home etc so challenges are plenty against all healthcare professionals. To tide over these major issues, meditation in form of Yoga, Music Therapy should be considered.

Conclusion

Last but not the least, educating the layman to follow COVID Appropriate Behaviour(CAB) and focus on mass vaccination drive are the cornerstone for prevention of the third wave. The first two waves saw a significant mortality because we did not have adequate infrastructure and expertise, but now we are much prepared and have experience in handling covid. Trained staff and a geared up healthcare setting will play a significant role in decreasing mortality for a possible third wave.

THE INDEX CASE IN PANDEMIC AND RED ALERT SIGNS TO NOTIFY THE WORLD

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The new millennium has seen emerging and reemerging pathogens like severe acute respiratory syndrome (SARS), Ebola and Zika that have posed global challenge for public health.1 Delayed recognition and response to these emerging diseases has, time and again, resulted in adverse consequences in terms of illness and death, spread to other countries, and disruption of trade and travel.2 The story of SARS-Corona virus-19 has been no different. In late December 2019, several local hospitals used a surveillance mechanism, established in the wake of the 2003 severe acute respiratory syndrome (SARS) outbreak, to report "pneumonia of unknown etiology", which were later identified as a novel coronavirus (nCoV) by the Chinese Center for Disease Control and Prevention (China CDC).3,4 This finding was also verified by several other independent laboratories.5,6 After the initial cohort, infections were also reported in medical workers and family clusters, and human-to-human transmission was later confirmed.6

The World Health Organization declared the novel coronavirus (COVID-19) outbreak, a Public Health Emergency of International Concern (PHEIC) on January 30, 20207 and by the time the WHO had declared it a global pandemic, on March 11, 2020, there were 118,000 cases reported globally in 114 countries.8 The diligence shown by the clinicians in Wuhan in noticing clusters of unusual pneumonia, sending samples for screening where commercially available next-generation sequencing detected signs indicative of a new SARS-like coronavirus and escalating their concerns about this cluster of unexplained disease to local health authorities, helped WHO in the early dissemination of the outbreak alert to countries around the world.9

The sequence of events highlights the importance of the index case, following which, a series of papers detailing the epidemiology of the disease was released that lead to the closure of the Huanan market, to prevent any further zoonotic transmission. This was in contrast to the SARS outbreak in 2002, where it took 4 months to notify the WHO and identify the civet as a reservoir for the disease due to which, civet was continued to be sold on food markets thus perpetuating the outbreak.10 Similarly, the post-outbreak analyses of the 2013–2016 Ebola epidemic in West Africa also pointed the relevance of index case, in which a 3-month delay between the index case and the identification of the causative agent resulted in the loss of thousands of lives and billions of dollars in the cost of response.11

Despite the early identification of SARS Covid-19 in China and the alert issued by WHO, the study of index cases and clusters of cases of Covid-19 in Europe revealed delays in identifying the index cases of the two clusters in France and Germany resulted in a long time to detect and isolate the locally acquired cases.12 Study of first 12 COVID-19 patients identified in the United States shows the viable virus can be cultured readily from upper respiratory tract specimens soon after illness onset with the highest viral RNA levels identified in the first week of illness.13

To address the problem of early identification and timely action to contain new outbreaks of an infection, the World Health Assembly adopted the International Health Regulations (IHR 2005) as an international treaty on May 23, 2005, to ensure that countries can detect and notify health events.14

The IHR requires that, when disease or deaths above expected levels are detected, essential information is reported immediately to subnational or national levels and if urgent events, defined as having “serious public health impact and/or unusual or unexpected nature with high potential for spread” are detected, they must be reported immediately to the national level and assessed within 48 hours. Similarly, events assessed to warrant a “potential public health emergency of international concern” defined as "an extraordinary event which is determined [by the WHO Director-General] to constitute a public health risk to other States through the international spread of disease and to potentially require a coordinated international response" must be reported to WHO within 24 hours of assessment, via the IHR national focal point.14

To warrant an event as PHEIC, at least two of four conditions must be met, namely: (1) have serious public health impact; (2) be an unusual or unexpected event; (3) have a significant risk of international spread; and (4) carry a significant risk of travel or trade restrictions. A "decision instrument" that helps state parties identify whether a health-related event may constitute a PHEIC and therefore require formal notification to WHO has been shown in Figure 1, simplified from annex 2 of IHR by Baker et al.15

Figure 1: International Health Regulations (IHR) 2005 decision instrument (simplified from annex 2 of IHR)

Numerous researchers have been working on different models to predict the pandemic potential of a health event and predict the spread at a global level. Some have utilized Artificial Intelligence (AI) to predict the pandemic spread at the global level. One such model that successfully predicted the pandemic spread of infection has reported the following findings: the basic reproduction number R0, 4.4; a latent non-infectious period of 1.1 days followed by 4.6 days of the pre-symptomatic infectious period; the probability of developing severe symptoms, 0.01; the probability of being diagnosed when presenting severe symptoms of 0.6; the probability of diagnosis for cases with mild symptoms or asymptomatic, 0.001 as predictors of a potential pandemic.16

Another group of researchers used a coalescent framework to combine retrospective molecular clock inference with forwarding epidemiological simulations to determine how long SARS-CoV-2 could have circulated before the pandemic was established.17

They found that the first case of SARS-CoV-2 probably emerged in Hubei province, China between mid-October and mid-November, 2019 and that in the early days, more than two-thirds of simulated epidemics quickly went extinct and that the virus was repeatedly introduced but had died out and by the time the COVID-19 was first identified, the virus had firmly established itself in Wuhan. This highlighted the difficulty in surveillance for novel zoonotic pathogens with high transmissibility and moderate mortality rates such as SARS CoV-2 using the current IHR surveillance system. The independent panel for pandemic preparedness and response implicated the slow and deliberate pace with which information was treated under the IHR (2005), with their step-by-step confidentiality and verification requirements and threshold criteria for the declaration of a PHEIC, with greater emphasis on action that should not be taken, rather than on action that should, was one of the factors responsible for the current Covid-19 pandemic.9

Conclusion:

In today's world of information and technology, free flow of information and data-sharing can serve as one of the cornerstones for preventing another pandemic. Surveillance and alert systems at national, regional and global levels need to be redesigned to bring together the detection of index cases of a pandemic, pick up signals of potential outbreaks and ensure that signals are verified and acted upon. The IHR 2005 decision instrument presented in Figure 1 can serve as the model for early identification and notification of a potential PHEIC to the WHO and the world. Similarly, AI can be used to construct the epidemiological model and predict whether a health event will go on to become a potential PHEIC and used as an adjunct to notify the world.

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USE OF LEAK PORT IN NON-VENTED MASKS IN COVID 19- LESSONS LEARNT

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A year and a half back when the world was struggling with the resourse and infrastructure management with sudden rise in COVID -19 cases, many ideas for optimum recourse utilization were published. One such idea was conversion of non-invasive ventilators to invasive ventilators. Tusman et al in August 2020 suggested 3 models for this conversion. [1]Simplest among the models was the use of leak port with non-vented masks. Non -vented masks are readily available in wards, High Dependency Unit (HDU's) and Intensive Care Unit (ICU). Good amount of gas flow should be present for flushing of CO2 in this model. Further improvisation of this model was done with the use of Anti Asphyxia valve (AAV) by Resmed and was found clinically safer and reduced the risk of rebreathing even in the event of device failure as shown in Fig 1. [2]

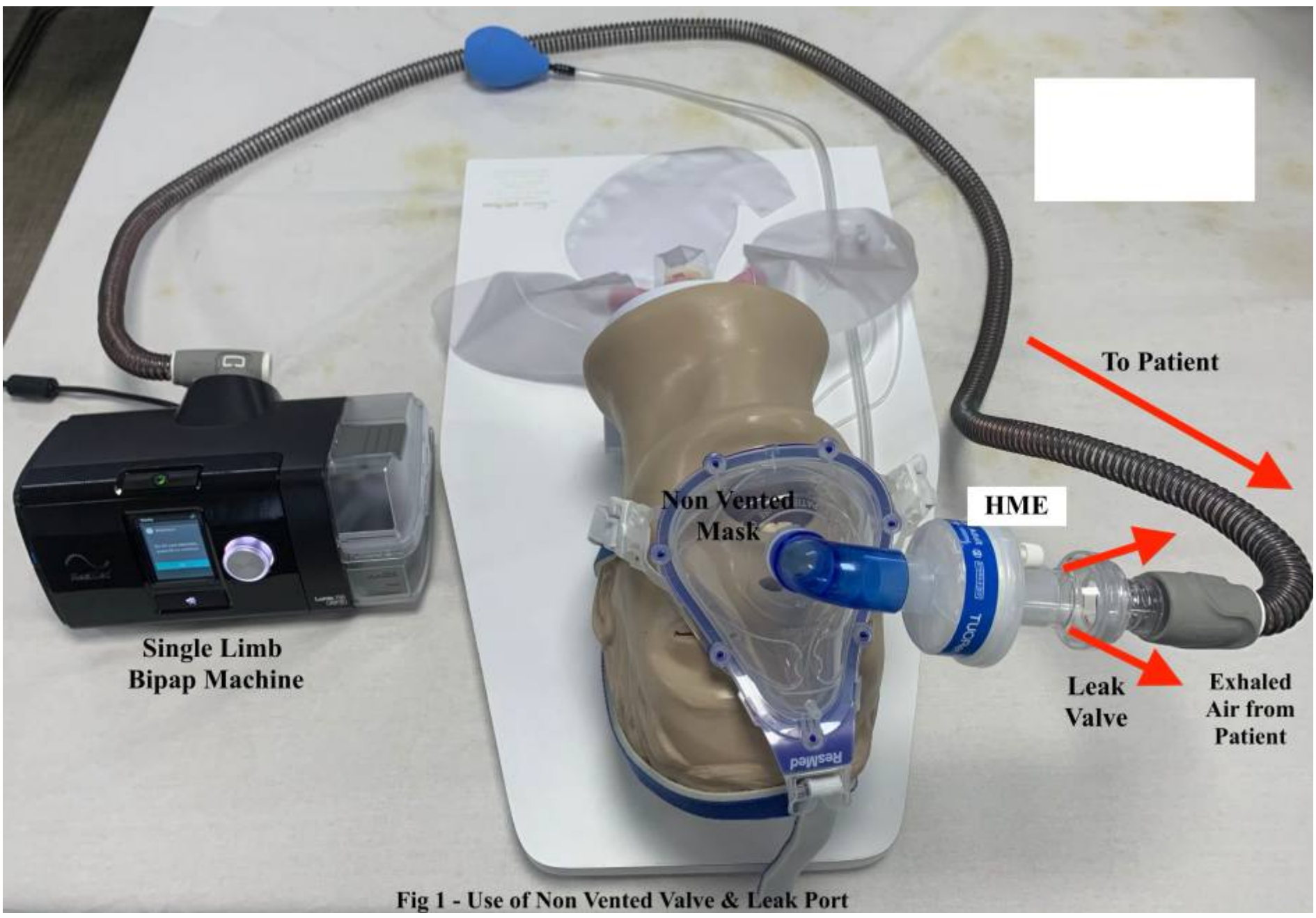

Fig 1 - Use of Non Vented Valve & Leak Port

The model initially did not gain popularity even though it was a very simple modification. Possibly due to concerns of use of non - vented mask and potential aerosolozation of SARS COV-2 virus. However use of filters both at inspiratory and expiatory end can reduce the risk but not fully eliminate. [3]

Instead of denying admission to our ICU due to lack of ventilators, we used this model of conversion of a noninvasive ventilator to invasive ventilator as a bridge therapy. We found the following problems and utility.

Pros-

1. Simple and easy to adopt
2. Abundance of NIV ventilators in wards, High Dependency units (HDU)
3. Resource utilization with minimum cost
4. Individual parts were reusable and could be sterilized frequently

Cons-

1. Poor titration of Fractional oxygen (FiO2)
2. Poor monitoring
3. Alarms are not sensitive as in ventilators

In our country few regions are not as blessed as others in terms of recourses. These ICU hacks helped us overcome the need of respiratory support during sudden resurgence of Covid -19 patient during the second wave. They acted as a bridge to definitive therapy. This may not appeal to the stalwarts of Critical Care Society but may prove promising for smaller centers. Preparedness in terms of procurement of optimum number of mechanical ventilators and proper training of medical staffs and doctors are key to fight Covid-19 pandemic. Acting proactively, we have started training sessions on life supporting skills, how to convert a non-invasive ventilator to a safer mode of ventilation as discussed. (Fig 2)

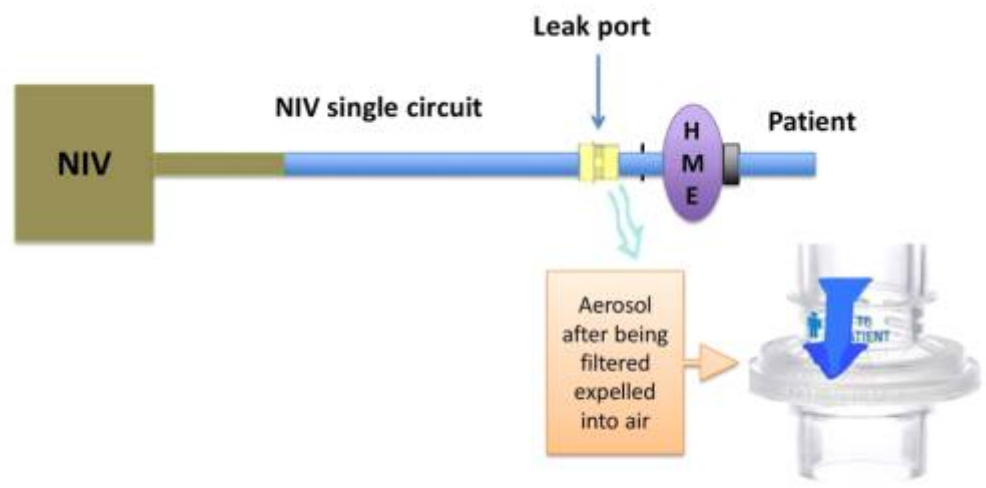

Fig 2- Circuit Diagram Showing Position of HME Filter & Leak Port

We sincerely hope that 3rd wave will not be as overwhelming as the second one. But the lessons learnt from them will be remembered and passed on to others for awareness about the methods of optimal utilization of recourses .

Fig 3 – Teaching of Doctors, Students & Staff

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VIRAL ZOONOSES

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BACKGROUND

According to the World Health Organization (WHO), zoonosis is defined as any disease or infection that is naturally transmissible from vertebrate animals to humans and there are more than 200 known zoonotic diseases as of the time of writing. It's a known fact that 75 percent of all emerging infectious diseases are zoonotic.

A disease is considered zoonotic when the pathogen (bacteria, parasite or virus) "jumps" from infecting one species to another. Zoonotic viral infections are grouped based on the type of infection they produce in natural host. Some are associated with encephalitis/hemorrhages and others may cause only local lesions like rashes and arthralgia. Transmission of these viruses usually involves arthropod vectors, which sometime act either as mechanical and/or biological vectors. 1 Transmission of zoonotic viruses may occur by a variety of routes. They include: "direct" (e.g., rabies virus) or "indirect" (e.g., hantavirus) contact; "nosocomial" (e.g., Ebola virus); "aerosol transmission" (SARS coronavirus); "vertical" (in utero) (Zika virus); and "vector- or arthropod-borne" (e.g., yellow fever virus and West Nile virus). 2 While some zoonotic diseases like HIV begin as zoonotic, they end up mutating to become "human only" diseases; whereas others like Ebola remain zoonotic with occasional human outbreaks.

The WHO, United Nations and other international organizations including the World Organization for Animal Health have accorded priority attention to zoonotic diseases as it's of global concern. These agencies address both human and animal health in an integrated manner through the "one health" approach wherein responsibility for multi-sectorial action is shared. 3

The recent few decades have witnessed an emergence of newer viral zoonosis including Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome-Corona Virus (MERS Co-V), Nipah, Ebola, Avian Influenza (H7N9, H5N1), Crimean Congo Hemorrhagic Fever (CCHF), Zika, Kyasanur Forest Disease (KFD), Japanese Encephalitis (JE), and probably SARS-CoV2 (Coronavirus disease 2019) etc. These viruses have caused tremendous socio-economic disruptions and posed formidable challenges to the public health systems at large. Catastrophe can result as a consequence to continued microbe evolution and adaptation due to the increasing global trade and the burgeoning human population, travel and movement. The RNA viruses in particular can quickly adapt and mutate owing to increased error rates in their polymerases. One of the most recent examples is the ongoing COVID-19 pandemic. 4,5 As we continue to grapple with the latter, it becomes imperative to review and understand viral zoonotic infections, especially those encountered in Asia that may be of relevance and interest to an intensive care physician.

MANIFESTATIONS OF VIRAL ZOONOSES

- Encephalitis
- Hemorrhagic Fevers
- Emerging and Reemerging Zoonoses
- Rare Viral Zoonoses
- Other Zoonosis
- Prevention, Control Measures and Perspectives

Encephalitis - Most of the encephalitis associated viral zoonoses are transmitted through tick or mosquito bites i.e arthropod borne with the exception of rabies (through bite of an infected host). Five viral families (Rhabdoviridae, Flaviviridae, Togaviridae, Bunyaviridae and Reoviridae) account for the vast majority of these infections. While rabies may be distributed worldwide, some of these infections are confined to a particular geographical area (Colorado tick fever in the North America) and cause symptoms like vomiting, fever, headache, neurological disorder and encephalitis.2

Japanese encephalitis (JE) – is endemic in India with the first outbreak occurring in 1973 in West Bengal. JE virus accounts for a vast majority of the human clinical cases, with the predominant affected population being children. Being a member of four related flaviviruses, the virus is transmitted by Culex spp. mosquitoes. Initial symptoms often include fever, headache and vomiting. Movement disorders, mental status changes and neurologic symptoms may develop subsequently. Children, especially, may present with seizures. 6,7 JE is now endemic in Gorakhpur region of Uttar Pradesh and has been accorded a high priority by the Government of India. 7

Hemorrhagic Fevers-

Viral hemorrhagic fever (VHF) is caused by a diverse group of viruses belonging to the families Arenaviridae, Bunyaviridae, Filoviridae, and Flaviviridae. All VHFs have a similar clinical picture, with mortality rates of 15%–30%; in the case of VHF due to Ebola virus, this rate is as high as 80%.8

Most of these infections are vector borne (eg. through mosquito and tick bites) and associated with extensive bleeding in humans. The viruses under this category include Crimean-Congo hemorrhagic fever (CCHF), dengue fever, yellow fever, Kyasanur forest disease (KFD), Ebola and Marburg etc. Out of these, In India, KFD and CCHF are notifiable diseases associated with high mortality. KFD in India was first identified in 1957 in Karnataka with recent outbreaks in 2012-2013 to previously unaffected areas including Kerala and Tamil Nadu. CCHF came into existence in India's Gujarat state where it was identified for the first time.9

Most of these viral infections can be diagnosed through serology (ELISA) or molecular methods (RT-PCR). Vector control remains the mainstay containment measure and vaccines are not available for majority of these diseases.7

Emerging and Re-emerging Zoonoses –

Emerging viral infectious diseases (EID) include those whose incidence has been predicted to increase in near future or those that have increased in incidence in the past decades. The majority of these originate from animals, of which wildlife is the most important source of outbreaks in humans. Spillovers can occur directly or through vectors including ticks, mosquitoes etc. Examples of EID's include SARS, MERS, Avian Influenza, Ebola, Zika and COVID-19 (SARS-CoV2). The RNA viruses are the most emerging pathogens as mutations are more common in these as compared to the DNA viruses.10

The loss of habitat of bats/flying fox by human activity has been implicated for emergence/re-emergence of Nipah virus (NiV). The most recent outbreak of NIV was reported in the state of Kerala on September 2021 wherein 20 people contracted infection including the healthcare workers. The clinical manifestations include atypical pneumonia and severe respiratory problems. In severe cases, patients with encephalitis and seizures can progress into coma. The case fatality rates are estimated at between 40 per cent and 75 per cent as per WHO. Nipah now erupts annually in Bangladesh and also emerges periodically in eastern India. After COVID-19, NIV could pose a next pandemic threat.11

There were only 14 documented human clinical cases of Zika virus until 2007 in the world and no outbreaks. However, in recent years, more than 84 countries have experienced and reported re-emergence of Zika virus outbreaks. This viral infection manifests with fever, rash and joint pains in humans. An increased incidence of microcephaly and congenital malformations, known as congenital Zika syndrome has been been reported in infants born to pregnant women infected with this virus. The course of this illness can be complicated by enhanced risk of neurologic complications including Guillain-Barre' syndrome, neuropathy and myelitis.12-13

Rare Viral Zoonoses

Hantaviruses are transmitted from rodents to humans via direct contact with infected rodents, rodent droppings, or nests, or through inhalation of dried rodent feces, urine, or saliva. Infection has also been transmitted via a rodent bite, work with infected laboratory rats, and handling of rat plasmocytoma cells in the laboratory. Even though hantaviruses include more than 12 viruses capable of causing human infection, human-to-human transmission has been documented only for Andes virus. Hantavirus infection in humans can be categorized into 2 major syndromes: one characterized by hemorrhage and renal failure, and another characterized by respiratory distress.14

Cercopithecine herpesvirus 1 (Herpesvirus simiae or B virus) is a member of the herpes group of viruses indigenous only to Asian monkeys of the genus Macaca 15. More than 25 cases of B virus infection in humans have been described. B virus infections in humans usually result from macaque bites or monkey scratches. A seroprevalence survey of primate handlers detected no evidence of asymptomatic B virus infection. 16

In humans, B virus infection most commonly presents as rapidly ascending encephalomyelitis. The incubation period in humans has been reported to be as short as 2 days, but it most commonly lasts 2–5 weeks. The case-fatality rate has historically been ~70%, but this rate appears to have declined recently. 17

Monkeypox, which is caused by a member of the genus Orthopoxvirus, is enzootic in squirrels and monkeys in the rain forests of western and central Africa. Clinical signs of monkeypox include a centrifugally distributed vesiculopustular rash, respiratory distress, and, frequently, lymphadenopathy (this aids in its differentiation from smallpox and varicella). Monkeypox has occurred sporadically in humans in Africa. Person-to-person transmission is well described, with a secondary attack rate of ~10%. Multiple generations (up to 5) of person-to-person transmitted disease have been reported. 18

Other Zoonoses

Prions are misfolded proteins (PrP) with the ability to transmit their misfolded shape onto normal variants of the same protein. Some of the animal prion diseases include Scrapie in sheep and goat, Mad Cow Disease in cattle, Transmissible mink encephalopathy in mink and Feline spongiform encephalopathy in cats. In humans they cause diseases like Creutzfeldt–Jakob disease and Fatal familial insomnia. Human prion diseases can be classified as sporadic, hereditary or acquired. 18

Prevention, Control Measures and Perspectives

Effective prevention and control can be achieved through proper diagnostics and prophylactic measures to curtail further spread in most of the zoonotic viral diseases. A clear understanding of epidemiology of the diseases with wild life reservoirs namely their virulence and transmissibility (e.g. human monkey pox) will help in understanding the severity and thereby to take appropriate measures in eradication of such dreadful diseases. Improved sanitary conditions, treatment and disposal of human waste, higher standards for public water supplies, improved personal hygiene procedures and sanitary food preparation are essential to strengthen the control strategies.

A better understanding of avian migration patterns and their infectious diseases would be useful to forecast disease outbreaks due to emerging zoonotic infections like avian influenza. Control and prevention strategies need to be designed based on the viral transmission pattern and characteristics, involvement of vectors, environment and epidemiology of the disease. 19

It is essential to counter viral zoonoses with a combined effort of veterinary and public health specialists. Decisions at policy level need to form a robust system like the European Union's Med-Vet- Net network that pools the skills of medical practitioners and veterinary experts in better understanding, predicting and preventing viral zoonoses.

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ROLE OF WORLD HEALTH ORGANISATION (WHO) IN A PANDEMIC

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Emerging and reemerging diseases such as COVID-19, Ebola, Dengue, etc. continue to pose threat to global health security with some diseases having the potential to develop into pandemic i.e., being able to cross national and international borders and affecting people across all over the globe.

World Health Organization (WHO) is a specialized United Nations (UN) agency that is concerned with providing technical as well as financial assistance to its members for improving the health status of people across the world. The objective of WHO is "the attainment by all people of the world a level of health that will permit them to lead a socially and economically productive life".[1]

The control of pandemics is impossible without international cooperation, due to their transboundary nature. Intergovernmental organizations are to play an important role in pandemic preparedness and response. The World Health Organization (WHO) is the source of legally binding international regulations for the pandemic response, provider of technical assistance and standard guidelines to the states.[2]

The main instrument used by the WHO for pandemic response includes the International Health Regulations (IHR), the Global Outbreak Alert and Response Network (GOARN), Contingency Fund for Emergencies, Pandemic Influenza Preparedness (PIP) Framework and the Public Health Emergency Operations Centre Network (EOC-NET). The International Health Regulations (IHR) were first developed in 1969 in response to deadly epidemics that once overran Europe.[3]

The purpose and scope of IHR 2005 (Third edition) are "to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade." IHR has grown from focusing on only three diseases (plague, cholera, and polio) to have provisions to let WHO declare public health emergency of international concern (PHEIC) in 2005.[4]

WHO's Global Outbreak Alert and Response Network (GOARN) support the countries with the right technical expertise and skills. GOARN provides rapid access to resources and expertise for effective response to public health emergencies. It links over 200 institutions and 600 partners around the world.[5]

WHO established Emergency Operations Centre Network (EOC-NET) in 2012 to identify and disseminate best practices and standards for Emergency Operations Centres and capacity building in the Member States. WHO in cooperation with EOC-NET partners, works to develop evidence-based guidance for establishing, operating, and improving public health EOCs.[6]

Contingency Fund for Emergencies (CFE) was established by the World Health Assembly in 2015 considering the criticism of the WHO in terms of slow response to emergencies and lack of resources. The characteristic feature of this fund is that it can be mobilized within 24 hrs and it provides WHO the resources to respond rapidly to disease outbreaks and health emergencies. It also allows WHO the flexibility to scale up operations in response to an escalation in health emergency and provide funding.[7]

The Pandemic Influenza Preparedness (PIP) Framework was adopted by World Health Assembly in 2011 to improve global pandemic influenza preparedness and response. It includes a PIP Benefit Sharing System which will ensure the immediate availability of necessary products such as vaccines and other pandemic-related supplies during an influenza pandemic.[8]

WHO supports the member states in managing and containing any pandemic by providing technical support, augmenting evidence-based policies, setting health research agendas, and monitoring the health trends. The five reasons why the world needs WHO during a pandemic are 1) to help the countries to prepare and to respond 2) to provide accurate information for dangerous myths busting 3) to ensure the vital supplies reach front line workers 4) training and mobilization of health care workers 5) strengthen biosafety and biosecurity and 6) research and development of vaccines.[9]

During the COVID-19 pandemic, WHO has issued a COVID-19 Strategic Preparedness and Response Plan, which identified the major actions countries should take, and the resources needed to carry them out. The six regional offices and 150 country offices of WHO along with the various governments around the world work in an integrated manner to prepare and to respond effectively when cases arrive and begin to rise.9 The COVID-19 Solidarity Response Fund by WHO ensured the optimum patient care and adequate supply of essentials for the frontline workers and accelerated the research and development of a vaccine.[10]

WHO plays an essential role in providing accurate information amid an “infodemic”. This includes around 50 pieces of technical advice for the public and health workers with evidence-based guidance. WHO provides comprehensive, authoritative information with the help of the expertise of a global network of health professionals, epidemiologists, scientists, and virologists. WHO team gives accurate and easy-to-understand advice from trusted sources and helps to bust dangerous myths during a pandemic. Daily situation reports and press briefings keep the world informed. Various social media platforms including Instagram, Linkedin, and chatbots on Whatsapp along with tech companies are working closely with WHO to aid the flow of reliable information.[9]

One such platform is Information Network for Epidemics (EPI-WIN) is a part of WHO’s Health Emergency Programme’s risk communication efforts and was established following coronavirus disease (COVID-19) pandemic. Through this WHO identifies the trusted sources and engage them as amplifiers of accurate, tailored and timely information. It acts as a two- way communication to address the key need of information while providing scientific evidence for the same.

WHO ensures the vital supplies to reach the front-line workers during a pandemic. This includes an adequate supply of personal protective equipment, diagnostic tests, and essential medical supplies. During the COVID-19 pandemic, WHO launched a “UN COVID-19 Supply Chain Task Force” to dramatically increase the supply of essential protective equipment based on the needs of countries.

WHO helped to train millions of health workers through OpenWHO platform. Life-saving knowledge was circulated to frontline personnel and its key partners. This global platform ensured a social learning network based on interactive, online courses and materials covering a variety of subjects. This also served as a forum for the rapid sharing of public health expertise, and in-depth discussion on key issues. This network has been involved in 135 field missions deploying 2900 professionals to the field in 90 countries till now. Highly trained, self-sufficient Emergency Medical Teams, which are a part of this global network are also sent to places of the confirmed outbreak.

WHO also helps in the research and development of appropriate treatment and control measures. During the COVID-19 pandemic, the agency launched a “Solidarity Trial”, an international clinical trial, involving 90 countries, to help find an effective treatment to rapidly discover whether any existing drugs can slow the progression or improve survival. WHO ensures equitable access to safe and effective vaccines across the world to end the pandemic. For COVID-19 vaccines, there is a WHOlandscape of covid-19 vaccine candidates, for the latest information on vaccines in clinical and pre-clinical development, generally updated twice a week.[11]

Key partners to support the WHO implementation include the Food and Agriculture Organization, the UN Children's Fund, the World Organization for Animal Health, international aid agencies, the International Labour Organization, the European Union (EU), WHO collaborating canters, and non-governmental organizations and foundations.

WHO plays a critically important role in responding to pandemics. As per the legally binding IHR, countries have to report potential PHEICs within 24 hours following initial detection, and WHO supports member states to control it. With the recent COVID-19 pandemic although there were some institutional missteps but WHO contributed dynamically toward pandemic control and management. To date WHO has raised $256 230 578 through its Solidarity Response Fund to combat the COVID-19 crisis. WHO provided guidance documents on the pandemic and played a significant role in coordinating research for the treatment and vaccines. Recently WHO proved again that it plays a necessary and vital role in pandemic control.

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HOW TO PREPARE AND MANAGE A PANDEMIC

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Background:

Pandemics are large infectious disease outbreaks that affect several countries and pose major health, social and economic risks to a substantial number of individuals. Throughout human history, there have been a number of pandemics of diseases such as smallpox. The most fatal pandemic in recorded history was the Plague, which killed an estimated 75–200 million people in the 14th century.[1][2]. Recent pandemics include tuberculosis, Russian flu, Spanish flu, Asian flu, cholera, Hong Kong flu, HIV/AIDS, SARS and COVID-19.[3][4].

SARS-CoV-2, a new strain of coronavirus, was first detected in the city of Wuhan, Hubei Province, China, in late December 2019.[5] It has caused a cluster of cases of an acute respiratory disease, which is referred to as coronavirus disease 2019 (COVID-19). More than 200 countries and territories have been affected by COVID-19, with major outbreaks occurring in Brazil, Russia, India, Mexico, Peru, South Africa, Western Europe, and the United States.[6] On 11 March 2020, the World Health Organization characterized the spread of COVID-19 as a pandemic, marking the first global pandemic since the 2009 swine flu pandemic. As of 11 October 2021, the number of people infected with COVID-19 has reached 239,007,759 worldwide, of whom 4,871,841 have died.[5]. It is believed that these figures are understated as testing did not commence in the initial stages of the outbreak and many people infected by the virus have no or only mild symptoms and may not have been tested. The world is still in the midst of a pandemic that has spread wider and faster than any in human history. The COVID-19 crisis reminds us how underprepared the world was to detect and respond to emerging infectious diseases [7]. The COVID-19 pandemic is expected to have a profound negative impact on the global economy, potentially for years to come, with substantial drops in GDP accompanied by increases in unemployment noted around the world.[8]
The impact of a pandemic is highly variable but can be very widespread, affecting many areas of daily life. Because the human population has little or no immunity to the disease, it can spread rapidly across the globe and may result in high numbers of cases and deaths. The impact of a pandemic depends on how sick the pathogen makes people (clinical severity), the ability of the pathogen to spread between people (transmissibility), the capacity of the health system, the effectiveness of interventions and the vulnerability of the population.

Phases of a Pandemic:

- Preparedness: Planning and coordination efforts is to provide multisectoral coordination and leadership. One important aspect is to integrate pandemic preparedness into national emergency preparedness frameworks.
- Containment is undertaken in the early stages of the outbreak, including contact tracing and isolating and quarantining infected individuals to stop the disease from spreading to the rest of the population, other public health interventions on infection control, and therapeutic countermeasures such as vaccinations which may be effective if available.[9]
- Mitigation: When it becomes apparent that it is no longer possible to contain the spread of the disease, management will then move on to the mitigation stage, in which measures are taken to slow the spread of the disease and mitigate its effects on society and the healthcare system. Goals of mitigation include delaying and reducing peak burden on healthcare (flattening the curve) and lessening overall cases and health impact.[11] Moreover, progressively greater increases in healthcare capacity (raising the line) such as by increasing bed count, personnel, and equipment, helps to meet increased demand.[8] In reality, containment and mitigation measures may be undertaken simultaneously.[10]
- Suppression, defined as reducing and maintaining low levels of disease transmission through intermittent loosening and tightening of public health social measures, detection and isolation of cases, and contact tracing and quarantine.

• Recovery is focused on restoring quality of life and community services to pre-disaster levels.

Response to pandemic requires country-level coordination, planning and monitoring, risk communications, community engagement and infodemic management, screening at ports of entry, international travel and transport, and restrictions for mass gatherings, infection prevention and control, and protection of the health workforce, case management, clinical operations, and therapeutics, operational support, logistics, and supply chain management, maintaining essential health services and systems; and vaccination. Pandemic preparedness includes the ability to make a vaccine in a shortest possible time and make it available to other countries for specific protection.

Contact, droplet and airborne transmission:

It is clear from the literature that there are three transmission routes of concern for respiratory viruses: droplet, airborne, and contact (including fomites/surfaces). While respiratory viruses are a global health concern, significant gaps exist in our knowledge of how they are transmitted, including the portion of transmission that occurs via contact, droplet, and airborne routes for a given respiratory virus. Fundamental to stopping the spread is to understand "chain of infection". By understanding how the pathogen is spread, preventative measures can be proposed that would interrupt transmission. Exposure to respiratory droplets in close contact are believed to be the dominant mode of transmission and surface mediated transmission risk is low. Without pandemic containment measures—such as social distancing, vaccination, and use of face masks, performing hand hygiene, or disinfecting surfaces —pathogens can spread exponentially.[12] So preventing transmission of the pathogen by interrupting the chain of infection is very important.

Modes of Transmission:

The standard CDC reference document on pathogen transmission is the Siegel (2019) guidelines originally published by CDC in 2007, which lists these modes of transmission:

• Contact transmission refers to contact with bodily secretions through direct person-to-person contact and indirectly, through contact with contaminated objects such as hands, door handles and toys.

• Droplet transmission: occurs when contagious droplets produced by the infected host are propelled into the environment through coughing or sneezing. In this context a distance of 3-6 feet would be high risk with droplets >5 microns as likely to transmit infection.

• Airborne transmission: refers to the production of droplet nuclei <5 m in diameter, which can stay suspended in the air and be disseminated by air currents. These particles can infect a susceptible host through inhalation. The classic example of a pathogen transmitted by airborne droplet nuclei is the measles virus.

• Transmission from the environment includes microorganisms commonly found in soil and water. In this type of transmission, other people and intermediate vectors are not involved in the transmission and the pathogen is not transiently contaminating the reservoir but rather is found in the reservoir on an ongoing basis.

Reducing the spread of disease will depend significantly upon increasing the "physical distance" between people. Measures at individual and household levels, societal-level measures and international travel measures, and the use of antivirals, other pharmaceuticals, and vaccines will be important. Individual/household level measures include risk communication, individual hygiene and personal protection, and home care of the ill and quarantine of contacts. Societal-level measures require a behavioral change in the population. International travel restriction aims to delay the entry of pandemic disease into not-yet-affected countries and will have an impact on international traffic and trade. Countries should balance reducing the risks to public health and avoiding unnecessary interference with international traffic and trade.

How to investigate

Emerging infections continue to disrupt the health care system and are becoming increasingly complicated to detect and treat successfully. Thus, one of the essential public health services is the diagnosis and investigation of health hazards in the community. Health departments at the federal, state, and local levels, often with the aid of the academic community, can perform these functions if they have the appropriate level of resources, adequately trained personnel, and established systems of reporting and communication.

Most infectious disease outbreak investigations follow the same general approach: (1) identification of the circumstances that indicate the need for an investigation; (2) investigation; (3) determination of the cause of the circumstances (i.e., the reason that the excess cases of disease occurred); and (4) response, which usually includes the control of the outbreak, and recommendations and coordination of response—both public and private—for the prevention of further disease spread.

Possible outbreaks of disease come to the attention of public health officials in various ways. Often, an astute clinician, infection control nurse, or clinical laboratory worker first notices an unusual disease or an unusual number of cases of a disease and alerts public health officials. Review of routinely collected surveillance data can also detect outbreaks of known diseases. Sometimes public health officials learn about outbreaks of disease from the local newspaper or television news. Outbreak investigations provide epidemiologic training and foster cooperation between the clinical and public health communities. The tools available to recognize and respond to disease outbreaks have improved in recent years. There are now computerized databases which allow outbreaks to be more rapidly recognized, and electronic mail and the Internet allow information to be more rapidly shared.

The earliest possible recognition of a novel pathogen is critical to containing it. Rapid detection, and suppression of local (community and healthcare associated) outbreaks is important to prevent wider spread of infection. Enhancing testing capacity using multiple methods will be required like

• Rapid Antigen Test (RAT) it has a short turnaround time of 15-30 minutes and thus offers a huge advantage of quick detection of cases and opportunity to isolate and treat them early for curbing transmission.
• Molecular fingerprinting. This technology allows laboratories to subtype pathogens and electronically submit pattern analysis to a centralized database maintained by CDC. Real-time analysis of submitted data allows recognition of outbreaks when they are still small, and helps in recognizing outbreaks timely, which previously were unlikely to have been identified. Various open and closed RT-PCR platforms (Open systems RT-PCR machines, TrueNat and CBNAAT etc) are currently being used worldwide. All these platforms require specialized laboratory facilities in terms of equipment, biosafety & biosecurity. Minimum time taken for the test varies between different systems with a minimum of 2-5 hours including the time taken for sample transportation. Other methods and referral networks are critical for effective pandemic response. Mega-testing diagnostic platforms to test large population will be useful.
• Genomic sequencing and surveillance initiatives will be next frontiers in diagnostics. Coordination and data sharing between public, private, and academic sectors and geographic areas will be very helpful.
• Fund allocation Many countries in the world may need financing for routine and emergency response to investigate and treat a pandemic. Improved health facilities and laboratory capacity, laboratory networks and referral networks will be required to make health system more resilient.

Although each investigation is unique, most state-level investigations require basic components to ensure a timely and appropriate conclusion:

Epidemiological component: The determination of a cause of an outbreak usually requires the use of accurate epidemiological methods to ensure the collection of unbiased data, the use of appropriate statistical methods in the analysis of the data often with the use of computer software such as Epi-Info, and the correct interpretation of the analysis results.

Laboratory component: Proper collection of specimens, from patients, environment, food or water, or targeted specimens, is a critical component of the investigation. The ability to have these specimens appropriately analyzed is often critical, particularly if regulatory authority needs to be invoked, for example, to recall food products on the market.

Environmental component: The information provided by the environmental health engineer's investigation is instrumental for determining what environmental risks were present.

Effective communication: The results of the investigation must be communicated, and the appropriate individuals must be educated about the actions needed to reduce the risk of further illnesses.

Surveillance systems: must be in place for diseases of public health importance. There need to be adequate resources at the local, state, national, and, occasionally, international levels to respond to and investigate these outbreaks. Adequately trained personnel and resources such as computers, laboratory testing reagents, and environmental monitors must be in place.

Judicial usage: Indiscriminate use of social media can lead to uncontrolled spread of misinformation, panic, uncertainty, and mismanagement of the pandemic. Social media if used properly can help in promoting appropriate behaviors, timely accessing testing and treatment facilities, follow up care and practicing appropriate preventive measures at home and in community.

How to collect data and interpret

Strengthening surveillance activities during public health emergencies can help in preparedness and response. Routine disease surveillance (Peace time) has linkages with other core public health capacities including laboratory, workforce development, legal and regulatory, preparedness and communications. During the pandemic in addition heightened surveillance (war time) will be required for responding to an evolving or established public health emergency. It includes the following

- Surveillance for emerging respiratory infections through techniques such as SARI/ARI surveillance is of paramount importance to detect emerging infections and outbreaks at earlier stages.
- The surveillance activities can be integrated as part of routine facility level and field level investigations in the public and private health systems.
- Community level surveillance can be conducted through grass root level workers such as ANMs and ASHAs in India during house to house visits and other field level activities
- An integrated data compilation and monitoring system has to be ensured for recording and reporting of surveillance activities utilizing existing databases (e.g. Integrated Disease Surveillance Project in India), with regular review of the output of surveillance at national and sub national levels. Data triangulation using all sources of information should be used for decision making process almost on daily basis.
- It is important to ensure engagement of private health sector as it contributes to a significant proportion of the health care especially in the urban areas. One of the major challenges is unregulated private sector often do not share all data with public health authorities. Mechanisms need to be developed to ensure recording and reporting of surveillance activities and case notification from private health sector which can be integrated into the database of the public health sector to inform adequate pandemic response.
- Establishment of sentinel systems for data collection at facility level / Sentinel sites at identified health care facilities with high patient load, especially in the urban areas will be great help.

Strengthening Infectious Disease Surveillance systems will be important for pandemic preparedness. Using of spatial-epidemiology and GIS based approach (Cluster analysis, Risk mapping, etc.), use of big data modeling (regression, simulation, and decision etc.) and Digital surveillance using automation of outbreak detection (health map; GPHIN) by AI, machine learning etc. can provide valuable insights.

Digital technologies are being harnessed to support the public-health response to pandemics worldwide, including population surveillance, case identification, contact tracing and evaluation of interventions on the basis of mobility data and communication with the public. These rapid responses leverage billions of mobile phones, large online datasets, connected devices, relatively low-cost computing resources and advances in machine learning and natural language processing. [13] [14]

Ethical data collection

- Data and analytics leaders must apply data ethics to their decision-making process when collecting, using and sharing data. If not, there is risk of causing more harm than good.
- Avoid falling into the trap of being too single-minded or outcome-determinative in decision making around the collection, use and sharing of data.
- Share data, data insights and data talent across the public and private sectors
- Collaborate with others on the decision-making process to gain multiple perspectives
- Reevaluate temporary measures regularly and return to normal where possible.

How to train Junior staff

During a pandemic, health systems will need to provide health-care services while attending to the influx of patients with diseases causing the pandemic. The importance of upskilling and reskilling in the aftermath of a pandemic especially for junior staff is very important.

- Online workshops/live training : Virtual training using technology and online platforms like video conferencing, Cisco WebEx, Zoom, google meet etc. can help in orienting large number of Health Care/frontline workers located in different geolocations on programme guidelines, SOPs Infection Control Measures etc. Remotely training employee also saves cost of travel and valuable time during the pandemic response.
- Online courses: Online self-learning modules which staff can take at their own pace and time. This approach requires government and appropriate authorities/businesses to develop their own educational materials. Integrated Government Online training (iGOT) introduced by Government of India has enhanced the capacity building of millions of front-line workers to handle the COVID-19 pandemic efficiently.

• Mentorship and coaching: Essentially, a junior employee can shadow a senior team member as they tackle a specific problem in testing and diagnosis or manage a case
• Microlearning: Microlearning is the term applied to disseminating snippets of educational information, one small piece at a time.
• Self-directed learning: Employees can be allowed to select their own learning materials, based on their job needs, that can benefit the entire team. Online courses, videos, articles and books are all options for self-directed learning.
• Physical and on the job training for facility level health care staff by senior faculty will help in skill building of junior faculty and newly recruited staff on patient care (e.g. RT PCR testing, Ventilatory care, using new equipment for diagnosis and case management etc.). Special measures for Infection Prevention and Control, Physical distancing, universal masking, frequent hand sanitization etc., good ventilation etc. will be required.

Five shifts required in health care systems (Government and Private), that can reduce chance of future pandemics

• Pandemic preparedness: 'Always on' systems and that can scale up rapidly during epidemics. Pandemic response is most effective when it uses regularly applied mechanisms.

• Building Robust Diseases Surveillance System: Strengthened global, national and local surveillance mechanisms for detecting infectious diseases with effective detection capacity at all levels will help in early detection and early response

• Integrated epidemic prevention agenda: Multisectoral and targeted interventions can reduce pandemic risk. All health facilities both in public and private should have separate entry and exit, good ventilation and infrastructure to follow all Infection Prevention and Control measures. Ensuring safety and wellbeing of health care/frontline workers will require attention and planning epically when pandemic gets prolonged like COVID-19.

• Strengthening Health System: Systems ready to surge while maintaining essential services will help in effective epidemic management, diverting health care capacity quickly, without losing focus on essential services. Countries should develop capacities to get hold of the equipment, supplies, diagnostic tests, advice, funds and workforce they need to respond to the exponentially growing caseload as experienced during COVID-19. More investment into countries' healthcare systems required to build stronger and more resilient health care system.

• Renaissance in infectious disease Research & Development is required for moving against infectious disease with desired speed as seen in COVID-19 response. [7]

Effective and high-level coordinating bodies, strong multisectoral leadership are critical to effectively deal with the rapidly changing situation during the pandemics. In a press conference on 28 December 2020, Dr. Mike Ryan, head of the WHO Emergencies Program, and other officials said the current COVID-19 pandemic is "not necessarily the big one" and "the next pandemic may be more severe." They called for greater preparedness. [15] There is a greater need for system thinking for redesigning health system to make it much more resilient for future pandemics.

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NEWER CONCEPTS FOR WINNING THE PANDEMIC WAR

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Recurrent waves of COVID pandemic necessitate the need for parameters that can help us predict the course of the pandemic better as well as suggest means to prevent the recurrent waves. Besides the currently available epidemiological tools, newer tools are needed to serve this purpose. We describe three new concepts related to the ongoing COVID pandemic which may help us in better managing the remaining waves of this pandemic and maybe prevent the third wave altogether.

The first is the concept of Strolling Rate. This new concept has been researched and put forward by scientists working in the field of hight-energy particle physics and can be used as a new guiding principle to curb the pandemic and avoid recurrent waves. I Strolling Period is the name that has been given to the period of semi-linear growth between the two waves of the pandemic. (Fig. 1)

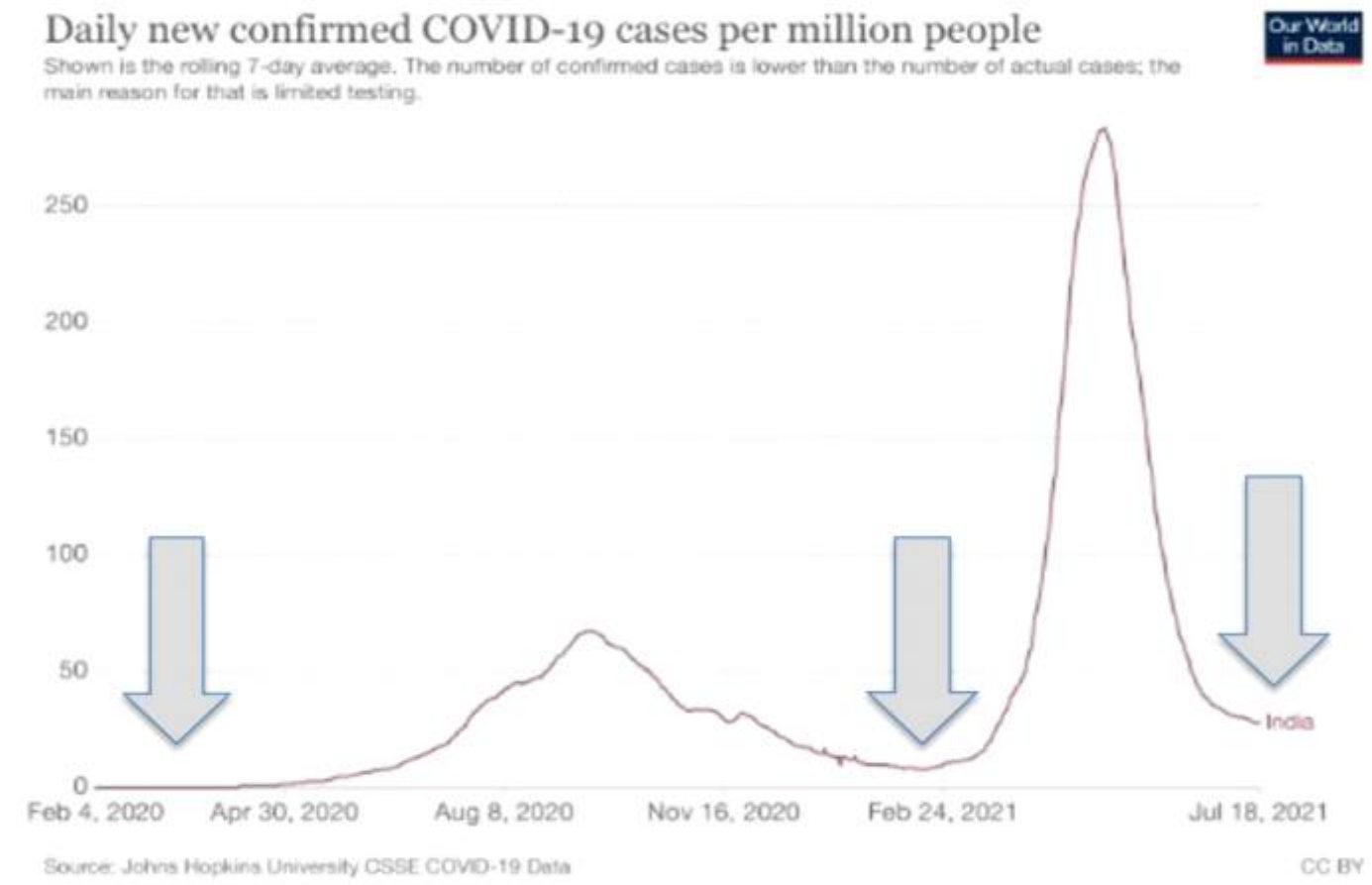

Figure 1: India's COVID-19 pandemic curve with the arrows pointing at the strolling periods

The rate of new infections per unit population has been called the Strolling Rate. It has been shown that keeping the strolling rate low by limiting the spread of the virus during the strolling period is the most effective way to prevent / delay the arrival of the next wave. Focussing on this measurable at local level during the inter-wave strolling period would help in decreasing complacency with the COVID appropriate behaviour and thus help in taming the pandemic. If we can keep the strolling rate to less than 10 new cases per day / million population (i.e. less than 1 new positive case per Lac population per day), we can probably delay the next peak by almost 40 weeks, thus earning ample time to enable the community to get vaccinated. This is a doable target, provided we do good contact tracing and adhere to the standard isolation and quarantine precautions while following the preventive principles of masking, social distancing and avoiding crowded places.

Second is the concept of Delta OC, standing for the interval (in days) between the onset of symptoms and confirmation of diagnosis. This therefore measures the time spent before the patient realises that the new symptoms may be because of COVID, gets the test for COVID done and gets the report of the test. Delay can happen at each of these three steps thereby contributing to increased Delta OC. This is the period when infectivity is at its peak and the isolation practices may be compromised since the patient has not yet been confirmed to be having COVID. Minimizing the duration of this period for each patient would help in the overall containment and management. Individual awareness, commitment and effort is needed for this. Just like we see people comparing their antibody levels and finding (dis)comfort in that, it would probably help more if they actually start comparing their Delta OCs with each other if and when they happen to test positive for COVID!

Third is the concept of The Golden Week. We have seen that with COVID, it is in the end of the first week / beginning of the second week of illness that patients with moderate / severe disease worsen. Thus, if the diagnosis, initial risk-stratification, optimal isolation along with contact tracing and quarantine can happen within this period, a lot of last moment crisis can be avoided. This is also the period within which the monoclonal antibody cocktail may be given if indicated. Thus, the Golden Week can be to COVID what the Golden Hour is to trauma.

These concepts, if embraced by the medical fraternity and communicated well to the community at large, can help us come out of this pandemic faster. While the Strolling Rate is what the media can focus on and report for each city, the concepts of Delta OC and Golden Week need to be embraced at the individual patient's level by both the patients and their treating doctors. This will help us to objectify the principle of early diagnosis. These three novel concepts can thus help flatten the curve and may be make it completely flat too by preventing the next wave.

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HOW TO INVESTIGATE, HOW TO COLLECT DATA AND INTERPRET IN A PANDEMIC

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Introduction

The COVID-19 global pandemic and the measures to control it through public health regulations, social distancing, lockdown/ quarantine measures, the data and assessment landscape is facing long-term serious consequences which could motivate all stakeholders providing international support to re-invent not only how to collect data in the prevailing situation but also to make use of other types of data which is readily available. The pandemic has provided opportunities to explore innovative approaches to react to its challenges and also to translate the acquired rich experience into current practices[1].

The pandemic has basically changed the way we live in this world. Many of us are now working from home, which creates challenges for researchers faced being unable to access the field physically. Hence, this pandemic has directed us to conduct research in different ways.
Finally, this will force us to get to the bottom of questions, which are based on both technical and policy level on how to be more effective and ethical with regards to data collection, analysis and interpretation [2,3].

The numerous challenges due to pandemic on accessing communities and gathering data will not only affect the public communities but the stakeholders who are relying on updated data for response and planning at different categories such as national governments, national and international organizations, as well as the other service providers such as leaders of the health and welfare organizations. However, the humanitarian community is uniquely placed, to bring in their experience in operating in situations with limited or no access at all [3,4,5].

The World Health Organization -WHO declared the global pandemic on 11th of March 2020, which is caused by the SARS Cov-2 novel corona virus, that has rapidly overwhelmed across the globe. As for the available data, the virus was first evolved in China in December 2019 and since then super fast transmission across the globe and that outbreak was declared a Public Health Emergency of International Concern, which later evolved into a lethal pandemic [1]. The WHO urged for immediate conduct of research including “immediately analyse available data to recommend what care approaches are the most effective” and “quick evaluation of effect of adjunctive and supportive therapies” [1]. There’s a huge challenge on many specialties such as researchers, clinicians, health-care workers, epidemiologists and decision-makers.

1. Challenges of analysing COVID-19 data related to statistics
Statistical models will play a capital role in “fighting panic with information” [2] to either avoid or at least minimize the risk of bias which is considered as a common threat in clinical and epidemiological researches. Upon experiencing this novel pandemic , there are most striking challenges, recognized by the statisticians and data analysts who want to provide support in this pandemic with their expert advice [1,2].

Obstacles of collecting accurate clinical data of active and closed COVID-19 cases

Following the outbreak in Wuhan, China [3], clinical data were prospectively collected in a cohort study. Handling data for merging and cleaning in large multi-centre hospitals was crucial and required sophisticated data management. Use of artificial intelligence along with deep learning algorithms were commonly used to tackle this challenge [3,4,5].

In non-pandemic situation, data security, patients consent, ethics statements are considered as essential facts, however those become bureaucratic barriers to approach for the easy access to clinical records. In pandemic situations, a very safe handling of these confidential facts, is highly required and it should be dealt in the appropriate manner at a national level. We have to distinguish these two types of COVID-19 cases; active (patients who are still hospitalized) and closed (discharged or dead patients). Case report forms (CRF) of patients with suspected or confirmed covid patients, are needed to collect and document data in a formal manner. There are two main bodies who are responsible for making protocols for the investigators, which are the 'International Severe Acute Respiratory and emerging Infection Consortium (ISARIC)' (isaric.tghn.org) and the 'Lean European Open Survey on SARS-CoV-2 Infected Patients (LEOSS)' (leoss.net). In these two initiatives, it is planned that only closed COVID-19, patients who are still hospitalized are stored [5,6,7,8]

Clinical endpoints

Endpoints in patients with severe pneumonia are challenging and results complexities in understanding target cases. [4]. The most relevant clinical endpoints for the COVID-19 patients are the admission to critical care unit, need for invasive ventilation and quality indicators of survival in terms of morbidity and mortality. Less evident endpoints include the requirement for supportive oxygen therapy. The extended analysis of these endpoints need advance models which deal on the time-dependent dynamic of the data.

Common statistical pitfalls observed in clinical epidemiology. Clinical data are highly time-critical factors and require advanced statistical methods to avoid common pitfalls such as selection bias, length, time and competing risk bias [7,8].

Suggested analysis strategies

It is recommended to analyse data in an accepted standardized way as for the accepted way of collecting data. Statisticians are highly encouraged to form an appropriate analytical strategies to analyse data which were collected from well recognized protocols (such as above stated ISARIC, LEOSS).

Communicating statistical effects and distinguishing them from artefacts

It is well evident that communicating statistical effects and distinguishing them from artefacts, in a pandemic situation is quite a hard task. Statisticians are encouraged to extend their support with clear and transparent explanations.

Lessons learnt from preceding similar studies, SARS, MERS and influenza A(H1N1)

As for the previous outbreaks such as SARS in 2002–2003, the clinicians are encountered with novel diseases where there is a scarcity of knowledge for effective treatment options [9]. As there was no evidence proved therapy for for COVID-19 at the begining of the outbreak, use of available anti-viral therapy and corticosteroids is discussed [9,10,11,12,13,14,15,16], based on reported random case series [17,18,19,20,21,22,23]. It is expected that large observational clinical studies will be performed, until promising high quality randomized controlled trials available to evaluate potential treatment effects as it was done, for instance, for SARS, MERS and influenza A(H1N1) on hospital mortality [24,25,26,27]. However, observational studies are considered as far inferior compared to randomized controlled trials due to their limited ability to draw causal recommendations. Still, they can be used to encourage conducting further research on the efficacy of potential therapeutic options.

Guidelines for observational studies during a pandemic

In a pandemic setting, availability of valid information without undue delay is crucial. Guidelines, which are reported to last longer, might cause more harm than good. Hence, specific guidelines are required for pandemic settings.

Statistical support for randomized trial

The first randomized trial on the use of Lopinavir–Ritonavir for Covid-19 patients, is already published and did not show any promising effect[28]. The expert statisticians were consulted to comprehend the potential effects on the complexity of clinical endpoints.

2. Challenges in research on COVID-19

Beyond challenges related to data analysis, there are many other methodological challenges related to research on SARS-CoV-2 and SARS COVID-19.

Difficulties in searching for relevant information sources

In the field of evidence based medicine, there is a serious challenge for the methodologists and researches to search for the relevant information sources, although there's a tremendous growth of articles published related to COVID -19. Availability of a specialized, accessible collection of researches with original studies related to COVID-19 can surely help in this. WHO has launched a collection of articles about COVID-19, which is also compiled in a publicly available database. By 30th of March 2020 this database had already included 3294 articles. WHO describes the source of those articles as; "We update the database daily from searches of bibliographic databases, hand searches of the table of contents of relevant journals, and the addition of other relevant scientific articles that come to our attention" [29].

However, it was not publicly reported which databases and journals are searched for this purpose even by 6th of April 2020 . The WHO web site offers several crude search filters as well as offers filtering for "Newest updates", but it is not clear how new are the newest updates. The articles in the database can be downloaded, but cursory look at those articles indicates that the most of them do not have the original data; hence it appears that the majority are news, commentaries and opinions.[36] Therefore, it would be quite beneficial to classify articles in this database, which actually represent the original data. However, articles related to covid-19 were being announced and set up, indicating that multiple teams globally are creating the same or similar evidence collections, leading to needless waste of human resources[33,34,35,36].

Rapid exploration of evidence

When there are so many studies and articles are published related to a particular clinical behaviour, it become a very challenging task to synthesis of evidence pertaining to the clinical context. It is a well known fact that systematic reviews are considered as the acceptable standard level of evidence based medicine, however, their production usually takes years [30, 31]. There are published multiple systematic reviews on COVID-19, however the quality of those rapidly produced systematic reviews remain questionable.

Exploring the evidence syntheses within a shorter time frame usually requires frequent amendment of methodology. For this particular reason, rapid reviews have been evolved. Rapid reviews are conducted with a condensed timeline, amids sacrificing certain aspects of systematic review methodology for speed [32]. A Pilot study has shown that a rapid research needs appraisal can be conducted within 5 days in case of an infectious disease outbreak [33]. However, another study highlighted that transparency and inadequate reporting as for the major limitations of rapid reviews [34]

Quality of published research

There is so much of demand and pressure posed over the journal editors to publish articles on COVID-19 with no further delay.It has also been argued, that this early release could be of useful fact in the long run to popularize and make the journal more efficient media in future. On the other hand, a famous quote says, " haste is likely to be detrimental to the quality of publications. Speed is not necessarily a friend of good science"[36].

The articles which are assembled fast and published hastily, may not be adequately peer-reviewed as it is for the expected standard.
Anecdotal evidence indicate that advance peer-review experts in the field may be swamped with many requests for peer-review that they are unable to accomplish, which may lead to inviting inexperienced peer-reviewers, to the detriment of manuscript quality review. We are yet to see the corrections and retractions of the journal articles published hastily related to COVID -19 and in-addition to compare the quality of methodological and reporting standard as opposed to articles published on other topics. However, even in the times of emergency, the researches and publishers should make a greater effort to maintain transparency and adequate reporting of their research, to ensure its reproducibility [36].

Data sharing

To enable analysis of data gathered during COVID-19 pandemic, principles of open science and raw data sharing will be of utmost importance. During global health emergencies, global norms have been proposed for data sharing and encouraging the researches to share their own data on articles related to COVID-19 [35].

3. Mobilization of scientific expertise and evidence in responding to the pandemic-ways and concerns during COVID pandemic in Sri Lanka

The use of evidenced based policy making practice has been instructed by the government and reputed organizations in order to improve the policy outcomes since 1990. The evidence based policy makers, urge for maintaining uniform standards on fundamental policy decisions in order to minimize the bias, which in turn may interact with ideology, value judgements and political expediency. In addition, pertaining to epidemic and pandemic in the country, the data collection, analysis, interpretation and finally reporting processes are conducted under the guidance of disease surveillance system. The disease surveillance system is facilitated by institutions like hospitals, Regional Director of Health Services (RDHS), Medical Officers of Health [MOH], to national level public health authorities and institutions that include the Epidemiological Unit, the Deputy Director General of Public Health Services and the Director General of Health Services.There is a smooth conduct of notification system in Sri Lanka,for communicable diseases including communicable epidemics and pandemics that is reserved for notifying diseases displayed in the list of notifiable diseases.[36,37].

The Epidemiology Unit of the Ministry of Health and Indigenous Medical Services in Sri Lanka took the leadership role being in the centre of disease surveillance and reporting of data pertaining to the virus situation during the COVID-19 pandemic. Upon the receipt of notifications from island wide hospitals, the Epidemiology Unit prepared daily situation reports. In these reports, data pertaining to the total number of confirmed cases, deaths and the number of recovered cases as well as the total number of disease suspected cases were reported [14]. The complied reports were shared with the DGHS and other relevant officers during morning working hours on the following day [36].

The pandemic motivated on launching 'the National COVID-19 Surveillance System',under the patronage by the Ministry of Health and Indigenous Medical Services as a platform for COVID-19 designated hospitals to enter their daily review of resources, epidemiological and clinical information of patients, data on equipment needs and results of laboratory investigations. In order to maintain up-to date accurate information specific deadlines for the data entering were also established. This data collected in this records was used for decision making and media updates by the Ministry of Health and Indigenous Medical Services in Sri Lanka. [36].

In addition, a weekly update on the data of the global pandemic situation obtained from the WHO, was released by the Epidemiology Unit. Both these daily reports and weekly global reports were made available on the Epidemiology Unit's official website. The references were taken from journals, the WHO, Centre for Disease Control and Prevention [CDC] and some reliable institutional data sources. Such data was freely archived in the web to be used by the investigators [36]. When there was a concern on cases of possible community transmissions the Epidemiology Unit conducted investigations to identify and report such cases. Those cases were closely monitored for the geographical spread of the virus, disease intensity and spread, along with the characteristics of the virus behaviour and impacts on health care services [34].

Furthermore, recording of required data and analysis of such data was essential for detecting high risk communities and tracking case origins to facilitate decision making on imposing lockdown,self- isolation,group quarantine and self-quarantine measures on independent cases and communities [37]. The vulnerable communities were traced using mass-data analysis and verification of records with agencies like Immigration and Emigration and voter registration. On the other hand, identifying of case origins was carried out through mass-data analysis, performing record checks, analysis of boarder control data and reference to information from sources like hotel reservations. Collection and analysis of data pertaining to detecting and tracing were conducted with the liaise of governing bodies such as the Directorate of Military Intelligence, State Intelligence Service and the Sri Lanka Police.[37].

Similarly, the District Health Information Software – DHIS2 Tracker for surveillance of COVID-19 pandemic in the country, was introduced by the Health Information Systems Program [HISP] of Sri Lanka. This software is being used to track and register travellers arriving Sri Lanka from countries with a high risk of COVID-19. This software facilitates the recording and analysis of individual data which could be finally degraded for reporting purposes at the national level. Subsequently, a DHIS2 custom made web application was created which allowed for the visualization of the extent of spread of the virus across a cohort of cases with their traced contacts. Those visualization of data was used to support public health interventions and epidemiological investigations [37].

In conclusion, there are methodological challenges pertaining to producing, gathering, analysing, interpreting, reporting and publishing data in condensed time-lines required during a pandemic. The knowledge and experience we gain from these challenges will certainly to contribute to research methodology related to COVID-19. It is customarily said that each crisis is also an opportunity, and therefore we believe the recent development and progress of research field is a s one of the blessings of pandemic given to the world which will help the humanity win the any future battle against deadly micro-organisms such as SARS-CoV-2.

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PMCID: PMC7836425

HOW TO ENSURE HOLISTIC APPROACH DURING PANDEMIC?

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Over the past 18 months, we have seen unprecedented challenges to our healthcare imposed by the COVID-19 pandemic. Since December 2019, COVID cases have steadily increased and surged to levels that incapacitated even the most robust health care systems. The need for mandated social distancing norms, restricted activities, curtailing of daily routines and constant media messages created a state of frustration, anxiety and fear among people across all walks of life. Handling the recent COVID-19 pandemic has taught us valuable lessons on being prepared and coping with similar situations if they were to occur in the future. At times of pandemics when the health care system and providers are under extreme duress, providing holistic care to patients becomes a daunting task. How does one then ensure provision of comprehensive care amidst a pandemic?

First point of any care provision, would be identification of individuals afflicted in a timely manner, followed by expedited triage, allocation of optimal resources and swift initiation of basic medical care. Development, validation and availability of cost-effective rapid testing hence becomes crucial. Establishing clear guidelines for hospital admission and education of both health care workers and the public will to some extent ensure matching of resources to the needy. Directive and collaborative work between government and private institutions will create uniformity and accountability across both the sectors and enhance efficiency. Expert panel comprised of specialists from both public and private sectors to sieve through evidence and frame clear evidence based guidelines will provide guidance to providers and ensure homogeneity of care. Task forces at a local level need to constantly evaluate the available resources, the case load and find ingenious ways of matching the supply with the demand.

During time of pandemics, resources are inevitably diverted towards handling the large patient volume and acuity. This creates a huge void in providing care to patients with other acute and chronic illnesses. Patients in general refrain from coming to hospitals for fear of crowd, long waits and anxiety of exposing themselves. In addition, space, personnel and other resources are significantly limited during pandemic times making provision of care extremely stressful. Digital application based video follow-ups and titration of care for chronic health conditions are very viable options to tide over crisis. Clear compartmentalization of all acute care areas for pandemic and non-pandemic care needs thoughtful planning and execution. Areas where potentially cross contamination can happen including emergency room (ER), radiology department, operating theatres (OT) ideally need a strategy to handle new patients and minimize cross exposure. Special screening areas need to be set up outside each institution and human traffic into the hospital regulated strictly to avoid inadvertent cross contamination of patient population.

Every healthcare organization needs to embrace and adapt the local directives and guidelines to their internal milieu. Multi-disciplinary committees inclusive of hospital administration need to evaluate infrastructure and plan modifications for optimal allocation to patients in need, non-emergent work paused and work force re-directed to pandemic care. Pairing of trained and non-trained personnel can help in stretching the existing work force to meet the increasing patient care demands. Having separate teams for specific tasks, will delineate clear roles and responsibilities, increase efficiency of care while providing a way for an all-inclusive collaborative model. Using health care providers across their areas of expertise for specific roles will allow for the core group of care providers to focus on critical management issues and allow for adequate off times minimizing physical and mental burn out. Institutional guidelines should be developed and updated periodically to ensure evidence based cost effective medical care. Risk and benefit of experimental therapy should be carefully weighed for each patient and detailed explanation of these to the patient and family done before adopting them. Pandemics offer a huge opportunity for collecting data, which then could be utilized to serve other future patients. When feasible enrolling patients in studies evaluating newer diagnostic or therapeutic strategies should be considered and prioritized. Dissemination of evolving evidence and guidelines via digital messaging enables rapid, mass transfer of concise information relevant for patient care. Using remote monitoring using easily available audio video equipment can minimize provider exposure without compromising patient care. Tele-medicine and tele ICU monitoring as a model has been extensively evaluated and has been consistently shown to augment bedside care and decrease the burden imposed on bedside team.

Care of the patient should ideally go beyond the acute illness. Often, underlying illnesses can flare up and these need to be screened for and aggressively managed. Patients undergo substantial physical deconditioning and mental stress during acute illnesses. Isolation from friends and family and the fear of unknown outcomes, cost and length of stay all add significant mental burden. It is important that bedside clinicians risk stratify patients based on their admission frailty, severity of acute illness and physiological reserve and focus on support and early rehab as soon as medical condition allows. Nutrition is a key part of holistic care and the recommended 25-30 Kcal/Kg IBW and 1-1.5g/kg of protein per day need to be delivered. Sometimes a reasonable allowance of salt and fluids need to be given to patients when possible to enhance their compliance, boost their morale and alternate methods of removing the excess salt and water planned (usually via medications) when possible. Dieticians should be an integral part of the treating team and interact with patients on a daily basis and help balance patient requests with medical needs. Screening patients' suitability for early mobilization and ambulation should be done on a daily basis and protocols developed. Senior nurses and physiotherapists should be empowered to screen and execute the protocolized mobilization inside acute care areas. Mobilization when done should be gradual, graded and progressive.

Adequate counselling of patients and families becomes increasingly difficult in pandemic situations, but play a crucial role in enhancing quality of care and patient/family satisfaction. Direct family contact becomes increasingly difficult and hence efforts should be made for daily video counselling of families. Providing an opportunity for patients to see their family via digital video applications will help them cope with the social isolation and anxiety that they experience. Social workers and counsellors can supplement the support provided by care givers and bridge any gaps in knowledge or understanding of the illness or treatment, the patients or families may have.

There is plenty of literature describing the myriad of physical, cognitive and mental disabilities that follow ICU and hospital discharge. Multidisciplinary discharge follow-up clinics to assess progress, titrate therapy and pick up new sequelae must be a part of the holistic care provided for patients. Although the duration of follow-up needed may be variable, a consolidated plan to follow patients upto a year after discharge seems a reasonable target.

Care provider illness, fatigue and burn out are factors that would immensely affect quality of care provided. Contingency coverage plans at all levels of health care providers need to charted out ahead of time and executed if need arises. Physical and emotional fatigue is extremely common and understandable among health care workers. Adequate rest periods and limiting shift work to short periods of time will help them recover and provide able care at work. Peer to peer evaluation of physical and mental wellness of care givers would be a practical way of identifying those who need rest and help. Mechanisms to assist care givers with counselling that is easily accessible and yet discreet should be developed at the institutional level. Acknowledgement and appreciation of care givers who have contributed towards enhanced care will boost the overall morale of all involved.

Pandemics leave us with a lot of after thoughts. Mistakes from the past enable us to proactively plan better and be more prepared for future similar situations. Although all of the above may seem utopian, thinking through each of the above issues carefully will almost always enable us to find solutions and put systems in place that serve the purpose. These solutions should be individualized to the patient population and the institution. Carrying forward the lessons learned and experiences shared from our previous pandemic will make way for better preparedness in providing complete 360 degree care to our patients.

THREAT RECOGNITION AND RESPONSE IN A PANDEMIC

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The COVID-19 pandemic that swept around the world in the fall of 2019.Of course, disease has always plagued humanity, but as the last great influenza pandemic (1918–1920) passed from living memory, many seemed to believe that infectious diseases posed a more negligible risk than the vaccines that would protect against them.

How Does a Pandemic/Epidemic Start? Can They Be Predicted/Forecasted?

Most outbreaks cannot currently be predicted with adequate accuracy and timeliness to permit specific countermeasures to be employed in advance. To cause large outbreaks in humans, these infections must not only possess the ability to infect a single human, but then to become well enough adapted to the new host so that person-to-person transmission can be sustained free of the need for repeated contact with the original animal host.

Once these infections are established in humans, earlier detection of epidemics may be possible by monitoring reports of prodromal symptoms or illness-related behaviour patterns tracked through Internet searches, telephone use, or other proxy means. Finally, regional and global detection and response efforts would benefit from a more unified and better integrated rapid communication and analytic capability.

World Health Organization Pandemic Response Framework and Public Health Security
International Health Regulations (IHR) 2005

With the 2005 update of the International Health Regulations, the WHO members greatly expanded the scope of infectious disease reporting and surveillance activities.

The expansion of infectious disease reporting under the 2005 IHR reflected the realization of the significance of emerging and unanticipated infectious diseases and their potential to cause disruptive and destructive epidemics.

Under IHR 2005, WHO conducts global surveillance to detect and assess significant public health risks.

The WHO has established the Global Outbreak Alert and Reporting Network to support outbreak detection and response preparedness.

Members of the network support IHR 2005 by

- establishing global surveillance and response standards
- creating networks of partners for preparedness and rapid response
- strengthening laboratory capacity and laboratory networks
- providing training in field epidemiology
- assessing and strengthening national surveillance systems

Once outbreak has been detected, WHO must inform member states about threat and assist members in outbreak investigation and control.

Response Activities During Outbreaks/Epidemics

Outbreak Investigation Technique, Goals, Steps

- recognition of an unusual number or distribution of cases of disease or injury should trigger an investigation of the event
- extensive data collection and field work, usually supported with laboratory resources-to identify sources or causes and to mitigate or interrupt the outbreak
- An essential initial step is confirmation of the existence of the outbreak, comparing the number of cases in cluster compared with number would be expected to occur in the population.
- Initial descriptive statistics include demographic data (age, sex, race/ethnicity) and a plot of case counts over time to create the "epidemic curve" histogram. The shape of this curve reflects key information about the outbreak.
- Causal hypotheses of risk factors, dose-response relationships, potential confounders, etc. can be analysed using case-control studies or other methods.
- As control measures are implemented, surveillance for additional cases must continue in the population at risk and instituted elsewhere as indicated.

Breaking the Chain of Transmission:

The importance and priority of these varies with the infectious agent and circumstances:

- Treat and isolate cases
- Quarantine and prophylaxis of potentially infected contacts
- Sanitize or eliminate contaminated sources
- Enhance personal hygiene (hand-washing, cough hygiene)
- Dispose of waste
- Immunize susceptible persons

Use of Technology

• A lot of prediction models have given a reasonable estimate of the pandemic growing. The models use various techniques, like Test Positivity Rate (TPR), Mortality rate and also track mobile phone coverage data to come to various estimates of how the pandemic is growing and where is it likely to shift next.

• Some new applications are able to track the temperature and saturations of their application users, by sending survey questioners and in fact they survey yield of greater than 60% have a very high specificity and sensitivity of predicting an unusual rise in cases fairly early.
Such warning signs need to be incorporated so that we get early warnings if a new out break or a new epidemic/pandemic starts.

EPIDEMIOLOGICAL RESPONSE DURING A PANDEMIC

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Introduction

""Sanitary Spartans" have broken out in San Francisco in protest of the … mask wearing ordinance. A league was organized last night which is to be known as the "Anti-Mask" League. Its members declare the masks unsanitary and useless."
Sounds familiar?

Well, it is an article in "The Long Beach Telegram" from January 1919 protesting the mask mandate during the Spanish Flu pandemic.

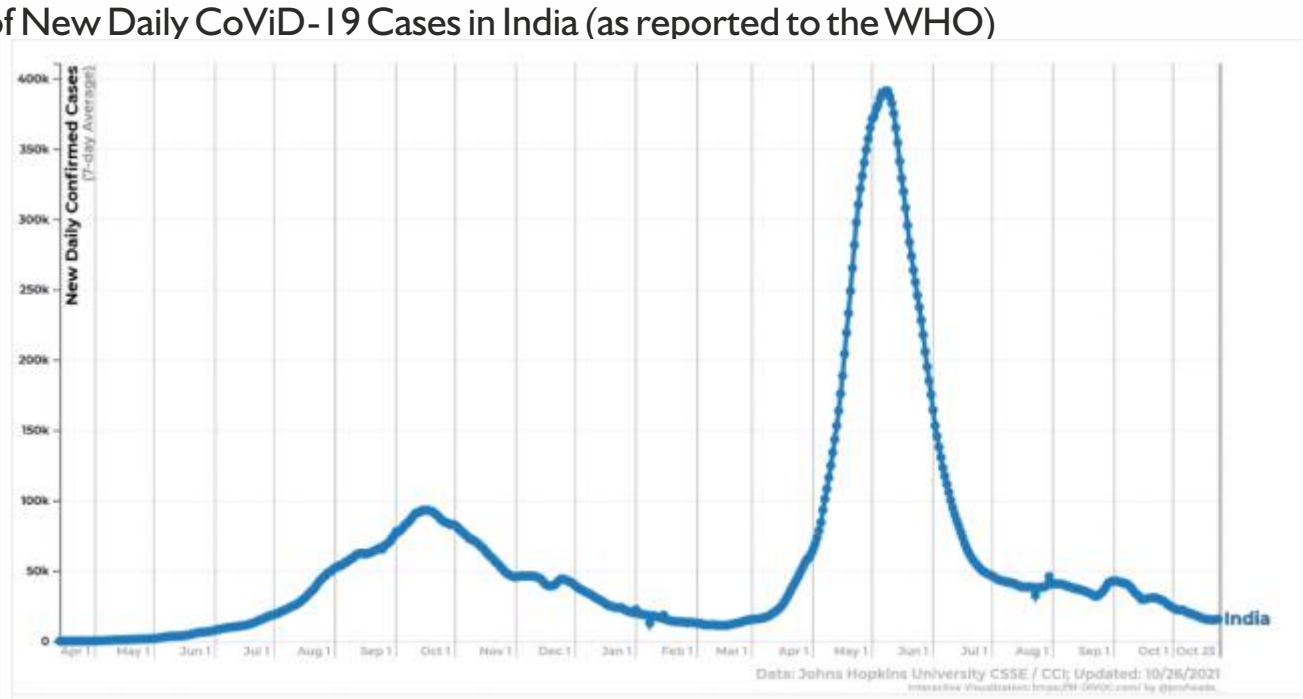
The SARS-2 CoV pandemic is not unique, in fact many of the features we saw, are comparable to other pandemics, in particular the most devastating of the last century, the Spanish Flu pandemic of 1918-1920. It was caused by an Influenza A H1N1 virus and plagued the modern world of that time in four different waves, amounting to a death toll of at least 50 million, possibly 100 million (Knobler S, Mack A, Mahmoud A, Lemon S, eds. (2005). "1: The Story of Influenza". The Threat of Pandemic Influenza: Are We Ready? Workshop Summary (2005). Washington, DC: The National Academies Press. pp. 60–61).
The courses of an epidemic and its bigger brother pandemic are epidemiologically surprisingly similar. The purpose of this article is to describe the tools to describe and fight pandemics.

Understanding Pandemics

If we want to understand pandemics more thoroughly, the first item we need to address is the concept of exponential growth. It means that a population of plants, bacteria or in our case sick persons will double at a constant rate – if undisturbed. The human brain is not well equipped to deal with exponential growth. Imagine a pond with one water lily. Let's assume that the lily will multiply once per day. So, on day two, we have two lilies, on day three four lilies, on day four eight lilies and so forth until the pond is overgrown with lilies. Many people are surprised when they realize that half the pond is full only one day before the pond is overgrown! The message here is clear. The process is slow at the beginning, but at the end overwhelmingly fast, making it difficult to react. In a pandemic, it makes a big difference whether 100 ill persons will double in a week or 1000.

Several parameters are used to describe the dynamics of an epidemic. The basic reproduction number R0 is a measure of contagiousness and describes, how many persons will be on average infected by one case. If this number is smaller than 1.0, the pandemic will wane. Equally important to know is the doubling time of the pandemic, a number which describes after what time the current number of cases will be twice as many

Fig. 1: Pandemic Curve of New Daily CoViD-19 Cases in India (as reported to the WHO)



(from: http://91-divoc.com/pages/covid-visualization/ , last accessed October 25, 2021)

Please note that the doubling time during the first wave is around 6 weeks (from 50 to 100k new cases per day) whereas the doubling time during the second wave (from 150 to 300k new cases per day) is around 10 days only. The burden on the health care system is enormous. Please also note that the R0 during the first wave was lower than during the second wave, the second curve is much steeper. The two parameters R0 and doubling time are therefore dynamic and not static. They will change over time and give us an idea where we stand.

Fighting the Pandemic

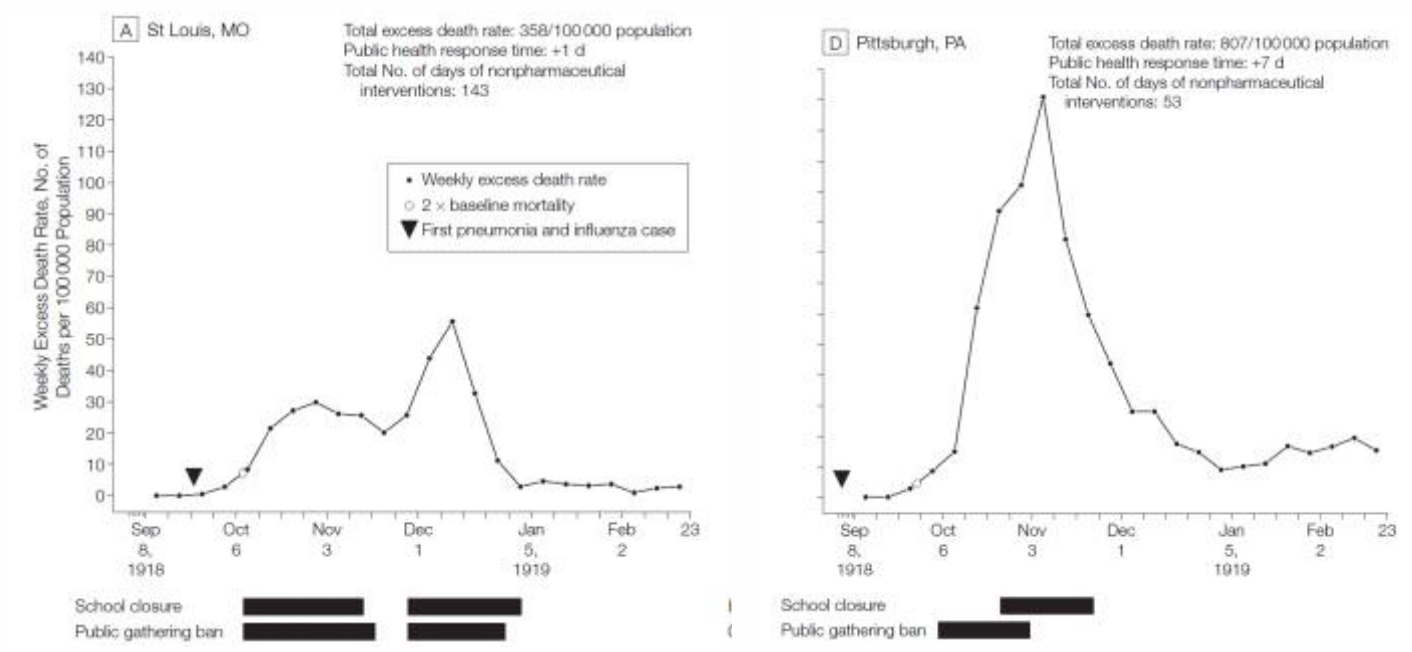
There is of course something which makes each pandemic unique – and that is the particular pathogen. In order to understand the time line and to plan ahead in terms of surge capacity, basic epidemiological data of the disease must be known, such as incubation period, mortality rates and recovery statistics. If you take SARS-2 CoV as an example, all these parameters were missing in the beginning. We had to learn about the disease while the pandemic was unfolding which implicated that also errors were made.
The ultimate goal in fighting a pandemic is to reduce the number of infected patient at a certain time. This can be achieved by two different measures:

a. Stretching the number of newly infected over time ("flattening the curve")
b. Reducing the overall number of ill or severely ill patients (vaccine, medical prophylaxis)

Flattening the curve

The Health Care System of a country is facing a unique challenge during a pandemic. There will be an increased number of patients. At some point in time, even surge capacity planning or shifting elective procedures may not be enough to stem the flood of patients visiting the emergency room. If a vaccine or prophylactic treatment is lacking, the only way to alleviate these occurrences is to stretch the epidemic curve over time or flatten the curve. This can be done ideally by considering how the disease causing the pandemic is transmitted and then avoid exposure as much as you can. Again, the recommended measures are not new: reduce contact by increased social distancing (i.e., limit the number of people in public places, avoid mass gatherings, closures of businesses and/or schools). But remember, pandemics follow an exponential growth path. That means, the earlier interventions are started, the less invasive they can be. And frankly, because of public and economical pressureour governments did not always a good job in introducing these measures early enough. Let me give you another historic example from the Spanish Flu Influenza Pandemic. Two large American cities, Pittsburgh and St. Louis were dealing with the recommended prevention measures very differently. Pittsburgh did not recommend the wearing of masks and did not restrict public gatherings. There was even a big parade in the state's capital Philadelphia which attracted around 200,000. St. Louis, however recommended that "people stay at home, rest, and avoid drinking alcoholic beverages"(Schneidermann, L; "Stricken: The 1918 flu pandemic in Western Pennsylvania", Pittsburgh Post-Gazette, October 18, 2020). "Six of Pittsburgh's 12 ambulances, serving a population of between 534,000 and 580,000, broke down because they were used so much that no one had time to repair them…. The local hospitals overflowed. Makeshift hospitals with tents and cots were set up all over" (Schneidermann).

Fig. 2: Weekly Excess Death Rates From September 8, 1918, Through February 22, 1919 in St. Louis and Pittsburgh



(from: Markel et al., JAMA, August 8, 2007—Vol 298, No. 6 (Reprinted))

But remember: Flattening the curve does not reduce the overall number of people falling ill – it will just spread out the disease and enables the Health Care System to react more appropriately.

The secret here again is to act fast. In the wake of the H1N1 influenza pandemic in 2009, the World Health Organization (WHO) published recommendations for public preparedness to coordinate government policies regarding a pandemic (WHO, Recommendations for Good Practice in Pandemic Preparedness, 2010. To be downloaded at: https://www.euro.who.int/en/health-topics/communicable-diseases/influenza/publications/2010/recommendations-for-good-practice-in-pandemic-preparedness-identified-through-evaluation-of-the-response-to-pandemic-h1n1-2009). These recommendations – if implemented – will cause a swift reaction to a new pandemic like SARS-2 CoV.

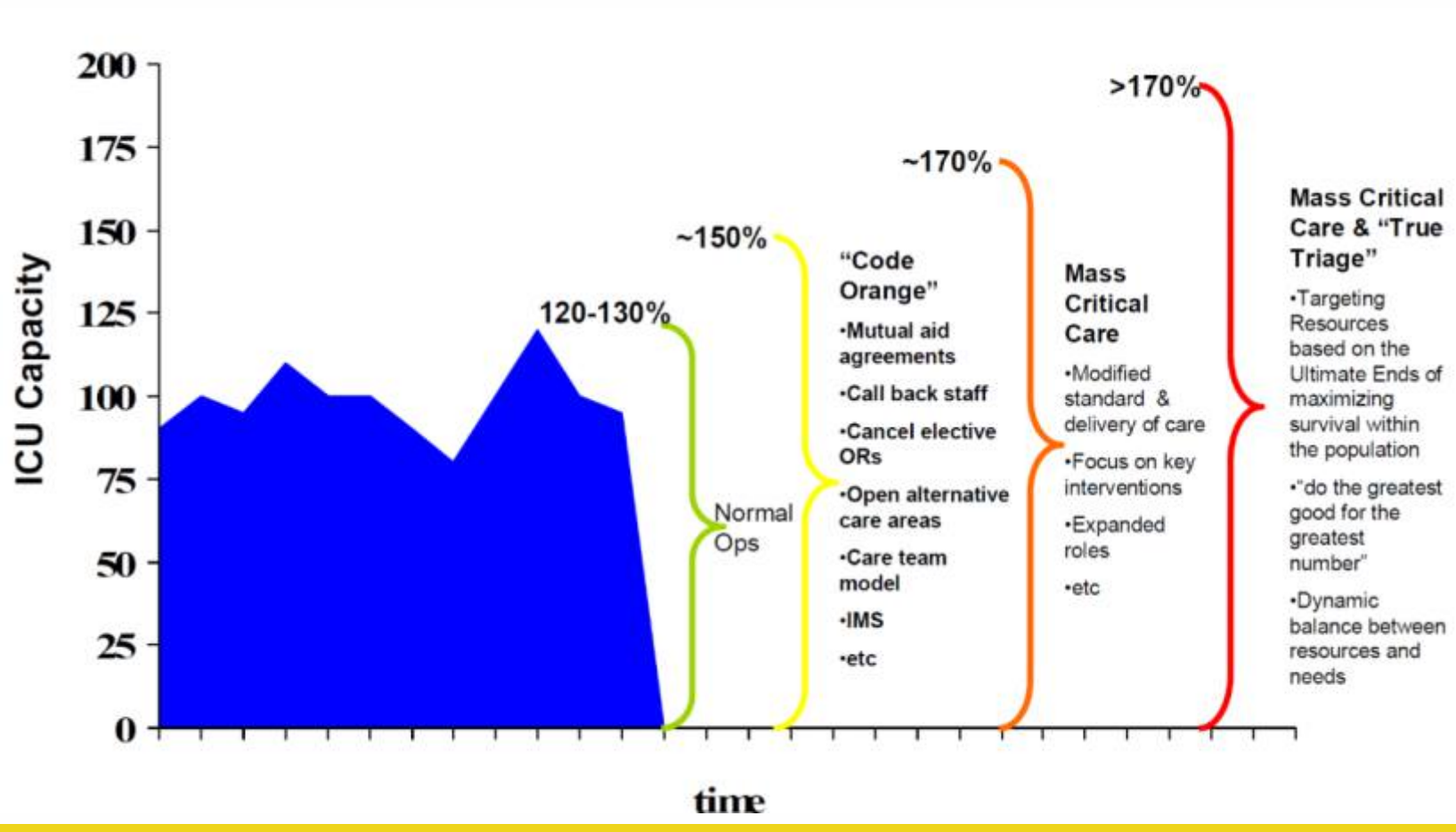
Reducing the incidence of the disease

The overall number of ill people can only be reduced by medical interventions, preferably vaccination. The goal here is to give immunity to a number of people which is high enough to protect other persons which are not infected ("herd immunity"). If we don't intervene in that sense, the disease will run its natural way until herd immunity is established naturally. The concept of herd immunity is also very complex. Some governments tried to handle the pandemic by "letting the disease go its natural way" and achieve this herd immunity by letting enough people be infected by the disease. In my opinion, it did not work very well, and they paid a heavy price by having increased mortality in their districts.

Pandemic Preparedness on the Hospital Level

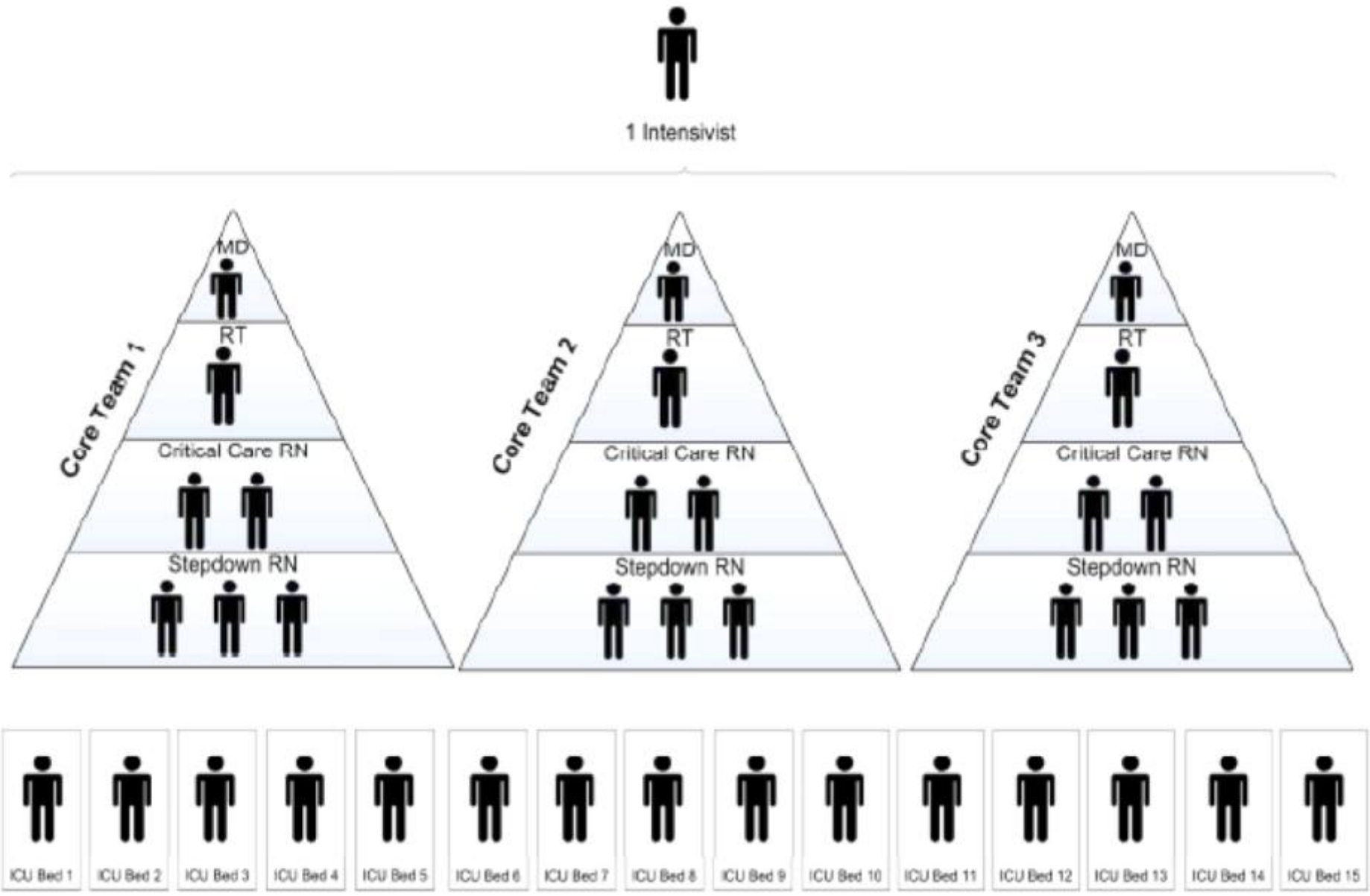
Like on the government level, preparedness should start before the pandemic hits. WHO recommends that "…it is beneficial for local level/hospitals to have an obligation to prepare their own plans. Also, hospital plans should include options for different scenarios (mild/severe);…Training of hospital staff and the establishment of stockpiles for treatment, personal protective equipment etc., are crucial…" (WHO, Recommendations for Good Practice in Pandemic Preparedness, 2010). The Centers for Disease Control provides free-of-charge software which helps in planning surge capacity for the hospitals. (to be downloaded from: https://www.cdc.gov/flu/pandemic-resources/tools/flusurge.htm) Using the assumptions of an average influenza pandemic and the metropolitan area of Atlanta, GA, USA (note: all assumptions can be changed to the specific hospital needs), the importance of flattening the curve becomes obvious: the course of a six weeks pandemic would mean 1000 additional hospital admission in week one and a peak of 1750 additional admission in week 3 and 4; if the pandemic is stretched over 12 weeks, those numbers are reduced to 84 admissions in the first week and a maximum of 1250 admissions in weeks 6 and 7. The peak number of patients requiring a ventilator is also reduced from 193 to 138. An excellent resource is the Canadian Working Group on Adult Critical Care Report (2006) "Critical Care During a Pandemic" which already before the 2009 H1N1 outbreak summarized the necessary actions to be taken.

Fig.3: ICU Response Thresholds During A Pandemic



(From: Critical Care During a Pandemic, Ontario Health Plan for an Influenza Pandemic, 2006)
Similarly, staffing needs to be planned and intensivist should assume the role of supervisors for core teams which are lead by Medical Doctors of different specialties.

Fig. 4: ICU Staffing During a Pandemic



(From: Critical Care During a Pandemic, Ontario Health Plan for an Influenza Pandemic, 2006)

Summary

After the Ebola outbreak of 2014-2016, WHO has listed a priority of diseases of pandemic potential. Among these is a "Disease X" caused by an unknown pathogen. (Simpson S., Disease X: accelerating the development of medical countermeasures for the next pandemic; Lancet Infect Dis 2020; 20: e108–15). Bill Gates said in 2017 at the Munich Security Conference "Whether it occurs by a quirk of nature or at the hand of a terrorist, epidemiologists say a fast-moving airborne pathogen could kill more than 30 million people in less than a year. And they say there is a reasonable probability the world will experience such an outbreak in the next 10 to 15 years." (Forbes, https://www.forbes.com/sites/brucelee/2017/02/19/bill-gates-warns-of-epidemic-that-will-kill-over-30-million-people/?sh=401649dc282f, last accessed October 25, 2021). Isn't it ironic that his prediction came true after two years only?

Pandemics will always pose a threat to humanity. The only way to unnecessary suffering and death is to be prepared. That requires additional supplies, staff, resources or in short – money. Money which many governments are not willing or able to spend. But do you ever question why you have a fire extinguisher in your home? Preparedness is our fire extinguisher for the next pandemic to come.

PANDEMIC CHRONOLOGY AND WORLD RESPONSE

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China had been experiencing "Mystery viral illness/ Pneumonia' cases since October/November 2019 but the details of the same were not shared with the world initially. Officially, the first human cases of COVID-19 were reported in Wuhan, China, in December 2019.[1] During the next one month, a lot happened and the world responded differently to the news. Many were countries and their leaders were skeptical, many were worried and reacted sharply while many of them dismissed it and the claimed it to be "just another flu like illness.

The World Health Organization declared the COVID-19 outbreak a Public Health Emergency of International Concern on 30 January 2020, and a pandemic on 11 March 2020. Till date it has not been possible to conclusively determine the fact that how humans in China were initially infected.[10] Furthermore, some developments may become known or fully understood only in retrospect. The world started taking notice and WHO declared that it was concerned about the outbreak and was working at ground level in China. On 3rd January 2020 when out of 44, 11 cases were reported to be critically ill in China. At this time CDC and WHO started contemplating that the outbreak could be "big". With the genetic sequence of the novel -genus corona viruse and identification of three distinct strains the pandemic was getting established.[2] Even at this time, WHO and CDC were not very serious, and the Chinese authorities were busy suppressing/ silencing the voices in the city about the spread of the illness.

On 7th January, Scientists of the National Institute of Viral Disease Control and Prevention (IVDC) confirmed the novel coronavirus isolate, and named the disease as a novel coronavirus-infected pneumonia (NCIP).[2]

We need to recognize the fact that the world we live in is a varied place. An amalgamation of rich and poor, abundant and restrained resources in different regions, and even discrepancies in various countries within the same geographic region, make this world a unique melting pot. The response of any country to a pandemic is a complex process that is guided by its existing health infra¬structure, the scalability of both skilled labour and machinery to counter the infection, the rapidity in establishing vaccine immunity, and the economic feasibility of a lockdown. At this point in time, when health and economic crises cannot be separated from each other, the only way out for medical communities is to stick to what they do best: the science of preventing and treating diseases.

The world response of acknowledging the pandemic, testing strategies, vaccination dosing, and treatment algorithms have all been well considered by teams of doctors and health-care professionals with knowledge and understanding in both public health and infectious diseases. Many health decisions, although seemingly guided by economic policy, have existing evidence at heart.

What happened in the first month of 2020:
The events in the last months of 2019 and first few months of 2020 shaped the modern pandemic. Let us see what happened in the first few months of 2020.

In first week of January
The Huanan Seafood Market was identified and declared as a contaminated zone and was closed for cleaning and disinfection.
At the same time WHO declared that its China country office, Regional Office for the Western Pacific and headquarters have been working together to respond to the outbreak.[3]
Later in the week, Chinese government formally notified the U.S. of the outbreak. At the same time the health authorities in Wuhan started to report more cases with many of them being seriously ill. The public health measure of screening and isolating contacts were ramped up in Wuhan by Municipal Health authorities.[4]

Chinese scientists at the National Institute of Viral Disease Control and Prevention (IVDC), studied at least 26 common respiratory viruses and ruled out the possibilities of these pathogens being responsible. These included, influenza A and B virus, parainfluenza virus, adenovirus, respiratory syncytial virus metapneumovirus rhinovirus, enterovirus, and other common respiratory viruses. Within first week the scientist also determined the genetic sequence of culprit coronaviruses. They named it '2019-nCoV' identified from specimens collected from patients in Wuhan, China. [5]

At the same time China's National Health Commission (NHC) ordered institutions to not publish any information that related to the disease, and ordered labs to either transfer all samples to designated testing institutions, or destroy them. The speed at which the genetic sequencing was obtained and the restraining orders raised the possibility of something going amiss at the lab. It also raised concerns regarding the possibility of the virus being synthesized at the laboratory and the possibility of its escape.

The scientists started looking at and warning the authorities of a possible human to human transmission and feared that the upcoming Chinese new year would lead to a possible spread if strictest possible monitoring system and isolation policies were not put in place by the authorities to counteract the spread of the mystery new viral pneumonia that had infected dozens of people on the mainland. Meanwhile, Singapore Ministry of Health notified the first suspected case of the "mystery Wuhan virus" in Singapore, a claim which was refuted later as the patient tested negative. [2]

It was at this time that Disease Outbreak News, WHO's first international media published a brief report summarizing details of the Wuhan outbreak.[4]

Later in the week, alarmed by these rapid developments and information provided by WHO,[3] U.S. Centers for Disease Control and Prevention (CDC) created an "incident management system" in the US. They also issued a travel notice for travelers to Wuhan, Hubei province, China due to the cluster of cases of pneumonia of an unknown etiology

Second week of January 2020
Since the entire world had taken notice of the illness by now, more and more reports of the suspected cases started appearing. South Korea isolated the first case of the Wuhan virus infection.[2]

During the second week first death from the virus occurred.[2] During the second week, WHO confirmed isolation of novel corona virus a hospitalized person[2] and Chinese authorities announced the discovery of a new "corona virus responsible for the illness in Wuhan. The scientists, at this time were convinced that the 'Wuhan Virus', was not as lethal as SARS.[1]

During the second week of January 2020, Li Wenliang, Chinese coronavirus whistleblower, developed symptoms this dreaded disease . He was admitted to the hospital on 14 January 2020 and eventually died on 7 February 2020.[2]

During this period more and more cases were being reported from other cities in China. By the end of second week, respiratory wards in Wuhan hospitals were reaching capacity, with many people being denied care.[2] At this time WHO published its initial travel advice, guidelines for testing in the laboratory and other medical investigation.[4] Even with fast rising cases and accumulating evidence of transmission, WHO reported “no clear evidence that the virus passes easily from person to person".[6] By the second week various government agencies in different countries had started taking notice of the possibility of a rapid spread of the infection and started gearing up to face the outbreak.

The third week of January
At this time Thailand witnessed the first confirmed case of 2019-nCoV, the first outside China.[6] The WHO, got concerned and urged China to continue searching for the source of the new virus[7] but the Chinese authorities were adamant regarding “no clear evidence of human-to-human transmission in Wuhan, China".[2] However, WHO raised the possibility of “limited human-to-human transmission” in small clusters in families, yet refrained from commenting regarding sustained human-to-human transmission"[6-10]

In the second week, second death occurred in China[2] and first known travel-related case of 2019 novel coronavirus entered the United States. During the third week, the US Embassy in China issued a Health Alert Watch for an outbreak of pneumonia in Wuhan, preliminarily identified to be caused by a novel coronavirus.[2]

The world had started recognizing the threat and the efforts were on to develop test for early detection of nCoV 2019. Researchers from Germany reported a new laboratory assay to detect the novel coronavirus. The new assay was supposed to detect virus in suspected cases quickly.[11]

During this week, Japan reported the first case with no documented contact with Huanan Seafood Wholesale Market, but possible close contact with an affected person in Wuhan.[2] Thailand's reported a second confirmed case and epidemiological team from Beijing reported 17 confirmed cases. [2]

At this time, two medical staff were infected in Guangdong, China and National Health Commission confirmed human-to-human transmission of this dreaded virus.[12] By this time scientists from the China CDC had already identified three different strains of the 2019-nCoV, confirming mutation.[2]

With more cases being reported from United States and South Korea, concerns regarding a raging pandemic were strengthened.[2] The good news came from US CDC when it announced the development of its testing kit[and US National Institutes of Health had begun its efforts to develop a vaccine for the corona virus.[2]

When five attendees of an international sales company at the Grand Hyatt Hotel, Singapore were diagnosed with the corona virus, the evidence about the spread through human-to-human contact was strengthened. The WHO raised concern of a much larger outbreak.[12] After 300 confirmed diagnoses and 6 deaths from various parts of China, and new cases reported outside of mainland China, the pandemic raged. Amidst all this confusion, Wuhan Institute filed the first patent for the use of Gilead's research molecule remdesivir for the treatment of novel coronavirus.[2] This further raises the concerns regarding the availability of scientific information much before the actual pandemic as it is difficult to fathom the speed at which various diagnostic test and treatment strategies were announced by both China and the USA while failing to put concrete preventive measures in place.

Last week of January:

In the last week of January, WHO Emergency Committee met to declare that the virus had reached the level of a Public Health Emergency of International Concern.[13,14]

The first report by Chinese doctors and scientists published in The Lancet discussed the "Clinical features of patients infected with 2019 novel corona virus in Wuhan, China". It clearly indicated that people can be symptom-free for several days and spread the virus coronavirus is incubating. Coupled with the knowledge of human to human transmission, and transmission during incubation period, a concern regarding the increased risk of spread of this contagious infection without forewarning signs became stronger. This was the first time that a strong recommendation regarding personal protective equipment for health workers dealing with patients was made public. This also stressed the need for early testing for the virus in symptomatic patients and contacts. This paper raised concerns regarding the "pandemic potential" of the virus necessitating a careful surveillance.[15]

In the last week of January, Chinese authorities raised concerns reading rapid spread, criticality of the illness, the mutating potential of the virus and the need to enhance preventive measures to contain the illness.[2]

Australia, Malaysia, Japan, Sri lanks as well as Canada confirmed more cases worldwide. Following the confirmation of cases in Europe, the WHO released a statement noting that "the Time is now to 'act as one'" in fighting the virus.[16,17,18]
Later in the last week of January, Scientists from the University of Hong Kong medical school projected the true number of COVID-19 infections to be 10 time more than the official reported numbers. Amidst reports of new cases from around the world, no concrete restrictions in place, there was surging increase of warnings from its intelligence agencies in US regarding the extent of pandemic. But the US authorities were dismissive because he did not believe that the virus had spread widely throughout the United States.[2]
Amidst rising number of cases from around the world, the isolation and quarantine practices were considered in travelers and imposed in various countries. Canada halted all direct flights to and from China and in USA restrictions on travel from China were considered.[2]

On 30th January WHO declared the virus was a Public Health Emergency of International Concern and advised "all countries should be prepared for containment, including active surveillance, early detection, isolation and case management, contact tracing and prevention of onward spread of 2019-nCoV infection, and to share full data with WHO."[13,14] On 31st January 2021, quarantine for people travelling from China was imposed and US banned the entry of foreign nationals who had been to China in the previous 14 days.[2]

At the end of January, Italy emerged as a new epicenter of the pandemic with large number of elderly admitted and dying. In March 2020, The WHO designated COVID-19 as a pandemic. At the time, 90 percent of cases were declared in just four countries, according to the WHO, with 81 countries reporting no cases at all, and 57 countries reporting up to 10 cases. By April 2020, The WHO urged its member states to speed up the development, production and distribution of various treatment (drugs) and vaccines and ensure universal access to therapeutics.[2]

In April 202, as the lockdowns were being lifted by many countries, WHO urged countries to test, isolate and treat suspected cases while ensuring physical distancing. The aim of these measures was to prevent the second wave of infections.[2]

In May 202, It was felt by the scientists that the virus may never go away and could become a disease that the world has to learn to live with.[2]

This time line of the pandemic with the first month of 2020 details everything about the world's response. From the initial efforts at hiding the facts regarding the "outbreak" of a respiratory illness in China (from December 2019 till January 2020), to the precious time wasted by the world body "WHO" in recognizing the outbreak, deciding on the declaring it a public health infection of concern to developing laboratory test, identifying drug molecules to control virus to making vaccines.[19]

Response by China:

Response by the Chinese officials and the scientists was the most disturbing. From hiding the facts regarding a mysterious illness spreading through its city to denying the facts regarding communicability, actually helped the infection to spread. The origin of the virus has been debated and probed by various agencies but the truth may never come out as the actual figures of infected people and death, the details of research on corona viruses in Wuhan lab are less likely to be made public.

Sharing the genome, filing of the patent for remdesivir and helping development of rapid diagnostic test by Chinese scientists need to be recognized. Weather they were acts of selfless service or steps taken under international pressure, would be difficult to ascertain. Inspite of many effort internationally, the truth regarding the origin of the virus may never come out.

Response by USA:

From initial denial of outbreak, ignoring the warning of a potential pandemic to delay in instituting strict travel restrictions, protective measures and denying the development of novel corona viruses as agents of biological warfare, the response from the US authorities had been bizarre. Politicizing of treatment options, delaying strict containment measures (lockdown, air travel restrictions) in spite of a clear evidence of human to human spread, ignoring scientific warning to impose quarantine etc has been responsible for the spread of the infection and perpetuation of pandemic.

The contribution regarding developing evidence for and against various treatment options, development of vaccine and other preventive equipments, dissemination of scientific literature by CDC and other health authorities/scientists is commendable. This sharing of scientific knowledge resulted in formulation of strategies worldwide to combat the infection. The efforts by the scientist to detect newer mutations and sharing of this knowledge with the world had led to limiting the damage. On the flip side, strict patent laws and inequality in sharing of resources with other countries resulted in fractured response in management and vaccine related prevention worldwide.

Response by EU:

Many countries in EU and UK in particular were disjointed in responding to the pandemic. Large number of patients with limited availability of resources led to massive case fatality in many countries like Italy and Spain. In UK, although the NHS geared up for the patient surge but the overwhelming number of patients, lack of support from the politicians and BREXIT hit the management of pandemic in UK hard. From initial reluctance to impose strict curbs in travelling, announcing lockdowns, quarantine policies and vaccination strategies baffled international community. In the end, travel restrictions, quarantine policies and mass vaccination campaigns helped contain the pandemic in UK. The development of most recognized, and used vaccine in the world (covishield) cannot go unrecognized.

Response by South American countries:

The response was variable. Many South American countries, suffered massively from new variants of COVID-19, pushing its death rate up even higher. The new Lambda variant, for example, had the highest mortality rate. Brazil, Argentina and Venezuela also suffered due to Delta and Lambda variants. There were reports of corruption and delay in drugs and vaccine procurement, which led to lots of civil unrest too. Of all the South American countries, Argentina did the best. [20]

Response by India:

With a massive population of vulnerable individuals to illiteracy and resource crunch, were recipe for disaster during the current pandemic in India. A robust political decision making, regarding early lockdown, relatively younger population, putting travel restrictions and quarantine policies strictly in place to up scaling the diagnostic and treatment facilities, helped India respond in a better manner. The complete decentralization of administrative control provided to local governments, the monetary support in up scaling of health care facilities, provision of medication, distribution of essentials like oxygen, up scaling/conversion of existing facilities as COVID care centers, in tiered approach to patient management helped in minimizing mortality. India also helped provide PPE, generic medication and vaccines to the world for containing the pandemic.

There were problems of inadequate implementation of health check and quarantine policies in international travelers, the mass exodus of migrant workers from cities spreading the infection to the hinterland, poor compliance with masks in the community, confusions regarding vaccination policies and vaccine hesitancy. In spite of all these issues, we have faced the pandemic bravely and have shown to the world that we can fight against any adversity. Response in SE Asia:

It varied from country to country and was dependent on the GDP of the country. With help from India and China, some of the resource limited countries were able to up scale their health infrastructure. Countries like Singapore, South Korea, Malaysia, Thailand have a robust economy and were able to respond better. [20] Exposure to many different viral infections, younger population helped many SE Asian countries to have lesser mortality during the pandemic.

Response by Australia and New Zealand:

Strict travel advisories and quarantine practices imposed early in the course of the pandemic, coupled with good health infrastructure helped Australia and new Zealand to mount a robust , effective response during the pandemic.

Development of newer technologies and sharing of scientific knowledge, rapid transmission of information and research, somewhat unified world response after the initial hiccups was responsible for a more than appropriate and adequate response to the nCoV2019 pandemic. We could have done better. An honest introspection into “what, when and where did we go wrong” would go a long way in drafting our policies for national and international response to future pandemics.

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ADAPTING AN ICU DISASTER PLAN IN RESPONSE TO A PANDEMIC

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Introduction

The term "Mass Casualty" refers to a combination of patient numbers and care requirements that challenge or exceed a community's ability to provide adequate patient care using day-to-day operations. A Mass Casualty Incident (MCI) in any community has the potential to quickly exhaust resources available for response. MCIs that occur with some level of frequency, also known as "conventional MCIs" (transportation incidents, burn, and severe weather events); chemical, biological, radiological, or nuclear agents from an unintentional or accidental release or act of terrorism; catastrophic health events (nuclear detonation, major explosion, major hurricane, viral pandemic, or others). Nonetheless, the sudden arrival of a surge of patients presents a logistical challenge to rapidly process a large number of casualties through the system.

Traditionally, this surge has been managed by the emergency department (ED) and trauma surgery in order to triage patients based on acuity of injury and risk of decompensation. ED MCI triage uses a color-coding process (Table 1) as a quick method to sort out acuity levels of casualties. Among conventional MCIs, 20% of victims will be categorized as 'red' or casualties with emergent or severe injuries, likely requiring intensive care unit (ICU) level care (1). However, despite 20% of severe casualties requiring ICU level care, ICU triaging for MCIs is generally not applied.

Color	Acuity	Need for Treatment	Comments
RED	Emergent	Immediate	Threat to life, limb, or organ
YELLOW	Urgent	Delayed	Significant injury or illness but can tolerate a delay in care
GREEN	Non-Urgent	Minimal / Non-urgent	Can safely wait for treatment
BLACK	Expired or Expected	No treatment; Expectant: Treat if resources are available	Consider transport and care for expectant patients after initial "Reds" are cleared, if resources exist and it does not delay care for Yellows. FEMORS offers guidelines on palliative care.

The 2019 novel coronavirus (COVID-19) pandemic has been unlike any seen prior, spreading across every country on every continent, infecting more than 200 million individuals, with greater than 4 million deaths worldwide. More than 40 million cases would require ICU level care, per the MCI level categorization. (1) This surge of critically ill patients has over-exhausted the healthcare system and caused an unprecedented ICU surge, for which nearly all health care systems were unprepared for.

In order to organize and adapt a disaster plan to the COVID-19 pandemic, focus must be shifted to the "space, staff, stuff" model. (2) This includes adjusting the admission criteria by narrowing the admission criteria to patients with rapidly deteriorating hypoxemic respiratory failure requiring non-invasive or invasive mechanical ventilation +/- the diagnosis of acute respiratory distress syndrome (ARDS), patients with suspected COVID-19 related viral pneumonia and suspected bacterial/viral superinfection, and patients with sepsis/septic shock unresponsive to volume resuscitation requiring vasopressor support. An exclusion criteria to ICU admission must also be created to include the following: 1) all patients with advanced directives/do not resuscitate orders and 2) patients who suffered cardiac arrest that were a) unwitnessed b) witnessed but refractory to defibrillation or c) suffering recurrent arrests. Discharge from the ICU criteria should not be altered.

Staff

Roles within the ICU should not be significantly modified from an original ICU disaster plan. The role of ICU commander should be a position rather than a person in order to alleviate strain on the system. Due to intensivist shortages, providers of other specialties should be deployed in the various ICUs. (3) The ICU commander role should be assigned to the senior most critical care trained attending on service. Given pandemic conditions, consider tele-ICU if capabilities are present.

ICU commander duties were further narrowed after hospital visiting hours were suspended given the extreme circumstances surrounding the COVID-19 pandemic. The ICU commander will be responsible for communicating with the hospital's medical director and incident command, quickly determining the number of open available beds in the ICU, and rapidly downgrading any medically appropriate patients. Depending on the scenario and the severity of illness of patients in the ED, it may be necessary to lateralize ICU patients to contingency units. The ICU commander, with input from the CNO and nursing managers, will designate the nursing team which will be caring for coronavirus patients, as well as which attendings will be caring for coronavirus patients. The ICU commander will also be the contact point for direct communication with the ED and infection control.

ICU staffing would ideally be exclusively dedicated to coronavirus patients. (4) Nurse staffing ratios 1:1 or 1:2, with the understanding that nursing shortages are to be expected given potential infection or fear of working in a COVID-19 unit. Should nursing shortages cause ratios to exceed 1:3, PACU nurses and per diem/traveling/agency nurses should be placed in the various ICUs.

Additionally, the ICU commander will direct all staff to CDC employee preparedness planning, educate staff on proper donning/doffing of personal protective equipment (PPE) and educate all staff on federal, state, institutional and ICU COVID-19 disaster planning. The ICU commander will also work closely with infectious diseases (ID) to develop a surveillance plan for staffing exposure based on whether PPE was used and symptoms.

The focus of staff time should be on core clinical duties, minimizing administrative time in the interim. This should be done by minimizing meetings, relieving all administrative responsibilities not related directly to the pandemic, reducing documentation requirements, and restricting all elective procedures.

Space

The overall ICU bedding strategy is to designate one area as a "Respiratory Isolation Unit" for patients with suspected or diagnosed COVID-19. The rationale is to prevent spread of COVID-19 among other critically ill patients and healthcare personnel, as well as conserve PPE.

If allocated respiratory isolation unit beds are occupied and capacity needs to be increased, lateralizing to additional ICUs or opening contingency units with the ability for continuous hemodynamic monitoring should be done immediately. Non COVID-19 critically ill patients should be triaged and admitted accordingly.

As mentioned previously, contingency units must be established. PACU may not be a potential contingency unit in any institution during a pandemic situation as the operating rooms are still open for emergent cases, and in a pandemic condition there is increased risk of cross-contamination and infection with lack of isolation rooms to post-operative patients and PACU staff. ED holding is also not an acceptable contingency unit, as they would likely be at their surge capacity and would require every available bed. This leaves areas such as catheterization lab holding areas, gastrointestinal procedure holding areas and telemetry beds. However, the number of beds able to accommodate a ventilator needs to be determined

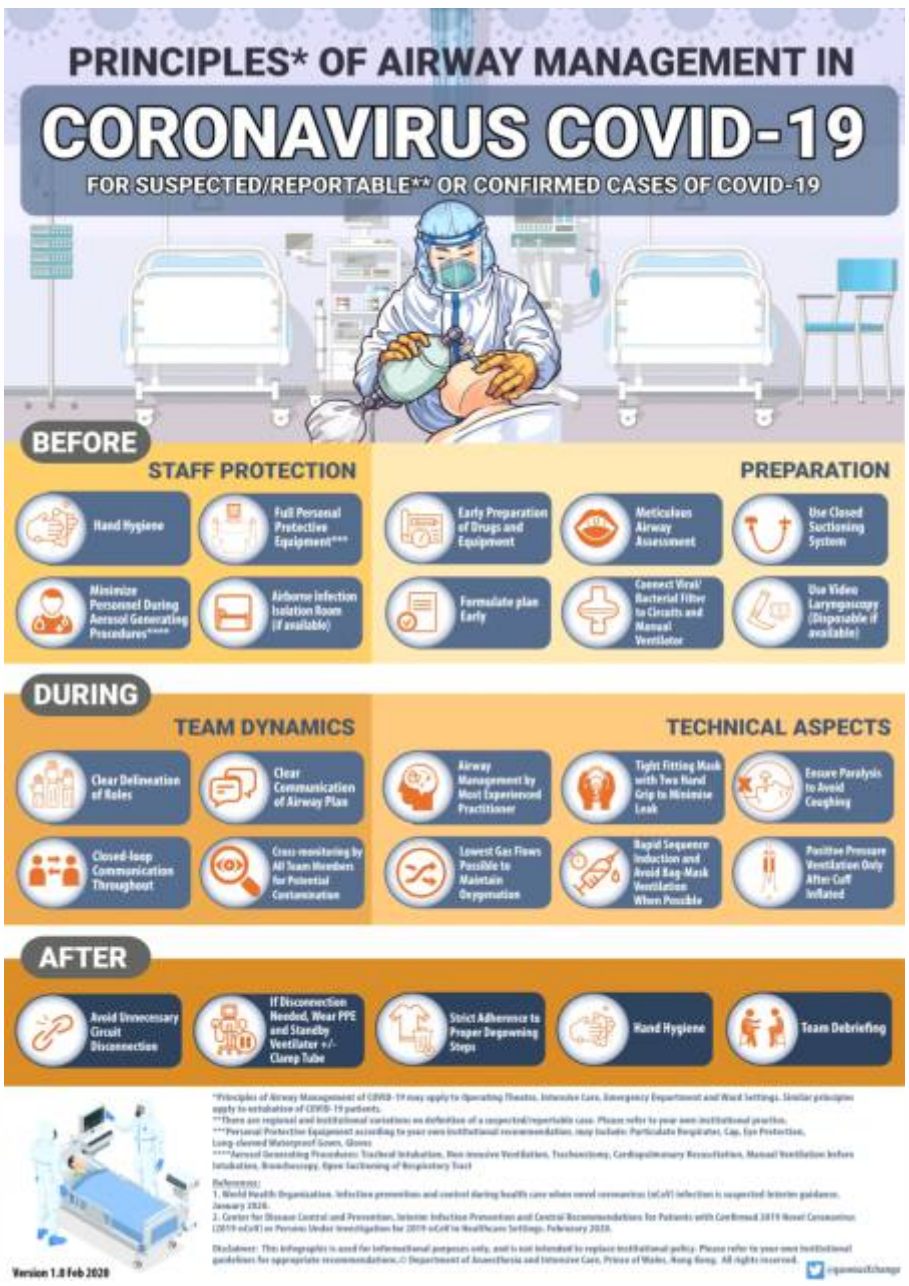
Stuff

Supply shortages will likely be the most challenging part of re-accommodating an ICU disaster plan. PPE supplies invariably became sparse as no country was adequately prepared for a pandemic level infectious process. In China throughout January 2020, using one N-95 mask per encounter, Chinese demand was estimated at 240 million masks per day. (5,6) With PPE shortages, an adequate cache of PPE and support supplies should be stored in an accessible location by administration. Additionally, cohorting COVID-19 patients will conserve PPE, as it will not need to be doffed after every encounter if all the patients are COVID-19 positive. Attempts to minimize the number of non-essential staff in the ICU and COVID-19 patients' rooms should be made. This includes coordinating with infection control to create a PPE donning/doffing area within the ICU.

Additional equipment for infection prevention and control should be instated. This includes PPE as mentioned above, and the use of disposable monitoring equipment, i.e. disposable stethoscope and blood pressure cuffs. For airway management, early vs delayed intubation remains controversial (6); nonetheless, oxygen delivery devices will need to be made available. This includes high-flow nasal canula (HFNC) oxygen therapy, basic nasal cannulas, equipment for non-invasive mechanical ventilation and ventilators for invasive mechanical ventilation. Each institution must determine the number of ventilators readily available, and should more be required, state and federal stockpiles may need to be accessed; although in a world-wide pandemic it is unlikely they will be available and ventilators may need to be triaged.

Pharmacy formulary should also be evaluated, and commonly used medications determined. These medications will be in high demand and supplies will decline. In pandemic conditions, the following medication classes will need to be either increased or alternatives to be considered: analgesics, sedatives, paralytics, vasopressors, antibiotics, antivirals, antifungals, and metered dose inhalers (MDI). Coordinate with ID and pharmacy for supplies of Tociluzimab and the use of Remdesivir.

Finally, Albert Chan from the department of Anesthesia and Intensive Care, Prince of Wales Hospital, Chinese University of Hong Kong created a COVID-19 Airway Management infographic (Table 2). Intubation should preferably be performed by video laryngoscopy, the video laryngoscope used should exclusively used for COVID-19 patients to avoid infection of non-COVID patients. This means our non-COVID patients who require intubation will require direct laryngoscopy by an experienced airway provider, or video laryngoscopy by a dedicated non-COVID video laryngoscope. Intubation techniques preferred for COVID-19 patients is outside the scope of this paper.



Multiple papers regarding COVID-19 have been published, among the first - data from a series of 99 Chinese patients with COVID-19 pneumonia, diagnosed in all patients by real-time reverse-transcriptase polymerase chain reaction (rRT-PCR), was published in 2020(7). Three patients out of four received oxygen therapy, 13% had non-invasive ventilation and 4% invasive ventilation, 9% required renal replacement therapy and 3% extracorporeal membrane oxygenation.(7,8) According to the authors, 11% of these hospitalized patients worsened within a short period of time and died of multiple organ failure.(7,8) The multiple papers published have demonstrated a clinical overview of the patients affected with this viral respiratory illness novel to humans, it is obvious that COVID-19 could cause severe respiratory failure requiring ICU admission. (7,8)

The COVID-19 created an environment in the United States' hospital system that was unprecedented causing mass shortages of ventilators, medication, and oxygen supply equipment. In New York, a ventilator shortage occurred at the height of the COVID-19 pandemic, state and federal stockpiles were all used up and ventilators were triaged. (8) Triaging ventilators led to the increased mortality in New York, as patients over the age of 60 and those with multiple co-morbidities had ventilators withheld, and a palliative liberation team was deployed terminally extubate the aforementioned patient population in order to increase the cache of ventilators. (9,10,11)

Conclusion

Planning for disasters has changed over the years. A previously government-centric approach is no longer enough to meet the challenges posed by a catastrophic incident. Thus, the focus has shifted to a 'whole community approach' which leverages all of the resources of a community in preparing for, protecting against, responding to, recovering from and mitigating against all hazards. When planning and implementing disaster strategies both the composition of the community and the individual needs of community members, regardless of age, economics, or accessibility requirements, should be accounted for. The COVID-19 pandemic has tested the limits of the healthcare system, and it has shown the importance of having a hospital wide and an ICU disaster plan in place.

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A CASE SERIES OF COVID-19 PATIENTS WITH CRITICAL ILLNESS MYOPATHY: OUR EXPERIENCE

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Abstract

Use of steroids, antibiotics, muscle relaxants, prolonged hospital stay, long-term ventilatory care along with fluctuating hemodynamics, blood sugar levels, secondary sepsis, systemic inflammatory response syndrome, and multi-organ dysfunction increases the risk for developing critical illness myopathy. The literature assessing effect of these risk factors on mortality in patients with COVID-19 is scarce. We assessed the effect of various risk factors and interventions on the long-term outcome in these patients. The use of protocol based physiotherapy intervention led to significant reduction in mortality in COVID-19 patients.

Introduction

The coronavirus disease 2019(COVID-19) caused by the SARS CoV-2 virus is a potentially life-threatening condition. World Health Organization on March 11, 2020 has declared it as a global pandemic .[1] The incidence of neuromuscular complications in COVID-19 patients is around 11-36%.[2] Management in COVID-19 related acute respiratory distress syndrome includes the use of steroids, antibiotics, immunotherapy, sedatives and muscle relaxants. These patients are subjected to fluctuating hemodynamics, blood sugar levels, secondary sepsis, systemic inflammatory response syndrome, and multi-organ dysfunction. Hence patients with severe acute respiratory distress syndrome are at increased risk for developing critical illness polyneuropathy and myopathy.[3,4] SARS CoV-2 virus has also been shown to have neurotrophic properties and hence implicated as a cause of critical illness polyneuropathy and myopathy.[5] CIM in turn is associated with prolonged intensive care unit (ICU) stay, poor long-term outcomes, dependency, morbidity, and mortality, which increases the burden on the health care system during this pandemic.

Hence we collected retrospective data of critically ill COVID-19 patients who developed CIM and assessed the effect of various risk factors and interventions on the long-term outcome in these patients.

Methods

The data of all the patients admitted in the ICU with COVID-19 from mid-August 2020 to mid-December 2020 was assessed retrospectively. The data of patients who developed critical illness myopathy was collected. The diagnosis of CIM was made clinically based on the presence of flaccid limb weakness more in proximal extremity than the distal, absence of extraocular muscle involvement, preserved pinprick sensation, and a score of less than 48 out of 60 on the Medical Research Council scale.[6] Data regarding demographic details, Heart rate, Blood pressure, Glasgow Coma Scale(GCS), Sequential organ failure assessment (SOFA) scores at arrival, Glucose levels, arterial blood gas analysis, complete blood count, electrolytes, and use of antibiotics, steroids, hydroxychloroquine/chloroquine, antivirals were collected. Use of interventions, various physiotherapy measures, renal replacement therapy, and vasopressors/inotropes were recorded. The physiotherapy interventions used were protocol-based using the Medical Research Council scale. These interventions included re-education, long sitting on the bed, chair mobilization, walking, and gait balance. The outcome was measured using in-hospital mortality, dependency (Barthel Index), and weakness at discharge. The effect of these factors on mortality was assessed using Mann Whitney U test. Continuous variable expressed using mean ± standard deviation or median (range). Categorical variables are expressed using frequency and percentage. The association between dependency, weakness, and mortality assessed using Fischer Exact Test.

Results

A total of 324 patients were admitted to the COVID ICU during the period of our study. The mortality in our COVID ICU during the study period was 52.5%. Out of the total 324 patients, 11 patients were diagnosed with CIM based on the above-mentioned criteria and were included for data collection. The incidence of critical illness myopathy was around 3.5%. The demographic characteristics of these patients are discussed in Table 1.

Table 1: Demographic Characteristics

Age , years (mean ± SD)	55.27 ± 7.9
Weight, kg (mean ± SD)	72.91 ± 7.4
Gender Male (n,%) Female(n,%)	 8 (72.7%) 3 (27.3%)
ICU* Stay, days (median, range)	34.50 [16.0]
Ventilator Free Days (median, range)	9[15.0]
Random Blood Sugar, mg/dl (mean ± SD)	158.18 ± 27.8
Average Insulin requirement, Units/day (mean ± SD)	1.07 ± 0.7
P/F Ratio*, (mean ± SD)	176.45 ± 24.2
Atracurium Use, mcg/Kg/Min (mean ± SD)	5.48 ± 0.6
PCO_2,* mmHg (mean ± SD)	47.00 ± 6.2
Lactate Average, mmol/L (mean ± SD)	1.73 ± 0.4
Hemoglobin, g/dl (mean ± SD)	11.47 ± 1.5
Total WBC count, cells/mm^3 (mean ± SD)	14.60 ± 2.1
CRP,§ mg/L (median, range)	92.45 [193.2]
LDH,|| Units/L (median, range)	641.00 [618.0]
Ferritin, ng/ml (median, range)	714.50 [763.0]
D dimer, ng/ml (median, range)	2253.00 [2752.0]
Dexamethasone Dose, mg/kg (mean ± SD)	0.17 ± 0.06
Dexamethasone, Number Of Days Used (median, range)	19.50 [13.0]
SOFA score,** at Admission (mean ± SD)	2.64 ± 0.8
Mortality, Death (n,%)	4 (36.4%)
Weakness Severe (n,%) Significant (n,%) Normal (n,%)	 5 (45.5%) 4 (36.4%) 2 (18.2%)
Dependency Total (n,%) Significant (n,%) Normal (n,%)	 5 (45.5%) 5 (45.5%) 1 (9.1%)

*ICU: intensive care unit, †P/F ratio: Partial pressure of oxygen/ Fraction of inspired oxygen, ‡PCO2: partial pressure of Carbon Dioxide, §CRP: C-reactive protein, ||LDH: lactate dehydrogenase, **SOFA: Sequential organ failure assesssment

Among the patients who developed CIM, in-hospital mortality was around 36.4%. The patients who developed CIM were further divided based on in-hospital mortality into those who survived or died. The groups were compared based on clinical characteristics, laboratory values,(Table 2) and physiotherapy interventions. (Table 3) Although no significant difference was seen concerning demography and clinical characteristics, lactate levels in the patients who died 2.25 ± 0.50 mmol/L were significantly higher than those who survived, 1.57 ± 0.53 mmol/L (P= 0.06). Also, the number of ventilator and neuromuscular relaxant-free days was higher in the patients who survived. Similarly, the use of corticosteroids was much higher in patients who died. On assessing the effect of physiotherapy interventions, there was no significant effect of re-education on survival. However, interventions like long sitting on the bed and chair mobilization improved survival significantly in COVID patients with CIM. The association between dependency, degree of weakness, and mortality is discussed in Table 5. The level of dependency and degree of weakness was significantly higher in those who died. (P=0.02)

Table 2: Comparision of clinical characteristics and laboratory values in both group

	Survived (N= 7)	Died (N= 4)	P value
Age (yrs)	59 ± 1.41	63 ± 4.24	0.24
Gender, Male (%) Female	 5 (71.4%) 2 (28.6%)	 3 (75%) 1(25%)	0.72
Weight, kg	80 ± 2.82	73±7.07	1
ICU stay* (No. of days)	41 (2)	26 (5)	0.57
Ventilator days	32.5 (11)	13 (1)	0.61
Ventilator Free days	9(15)	5(14.5)	0.67
P/F ratio†	179.57 ± 13.66	171 ± 39.04	0.60
PCO_2, mmHg‡	46.42 ± 7.43	48 ± 4.08	0.70
SOFA score§	2.57 ± 0.97	2.75 ± 0.50	0.74
Neuromuscular relaxant Free days	17(17)	13.5(23)	0.75
Corticosteroid use, days	15.1±3.3	20.2±5.6	0.08
Polymixin use, days	7.8±5.3	7.5±3.5	0.90
Colchicine use, days	8.3±3.8	9.5±1.9	0.58
Random Blood Sugar, mg/dl	140.50 ± 7.78	188.50 ± 21.92	0.86
Lactate, mmol/L	1.57 ± 0.53	2.25 ± 0.50	0.06
CRP, mg/L‖	92.50 ± 88.38	129 ± 152.73	0.50
LDH, Units/L**	641.50 ± 44.54	467.50 ± 567.80	0.24
Ferritin, ng/ml	565 ± 244.65	1042.50 ± 497.09	0.24
D-Dimer, ng/ml	2253 ± 654.78	2246 ± 2375.87	0.12

ICU: intensive care unit, †P/F ratio: Partial pressure of oxygen/ Fraction of inspired oxygen, ‡PCO2: partial pressure of Carbon Dioxide, §SOFA: Sequential organ failure assesssment, ||CRP: C-reactive protein, **LDH: lactate dehydrogenase

Table 3: Comparison of physiotherapy intervention in both group

	Survived (N= 7)	Died (N= 4)	P value
Re education, number of days	16.29 ± 5.55	14.50 ± 4.12	0.59
Long Sitting, number of days	10.43 ± 3.15	2.75 ± 3.09	0.007
Chair mobilization, number of days	7.14 ± 1.95	2 ± 1.41	0.001
Standing, number of days	3.43 ± 3.15	0	0.06

Table 4: Association between myopathy severity and mortality

		Survived (N=7)	Died (N=4)	P value
Dependency,	Total (n,%)	1 (14.3%)	4 (100%)	0.02
	Significant (n,%)	5 (71.4%)	0	
	Normal (n,%)	1 (14.3%)	0	
Weakness,	Severe (n,%)	1 (14.3%)	4 (100%)	0.02
	Significant (n,%)	4 (57.1%)	0	
	Normal (n,%)	2 (28.6%)	0	

Discussion

We present a case series of CIM developing as a consequence of COVID-19, its systemic manifestation, and treatment used for COVID-19. To our knowledge, this is the first series comparing the effect of various factors on mortality in patients with COVID-19 related critical illness myopathy, published so far. COVID-19 has a wide spectrum of clinical presentations, ranging from pulmonary to extrapulmonary symptoms.[2] The mortality rate of COVID-19 in ICU admitted patients varies from 20-80%. Frithoif et al. In a similar case series with 11 patients of critical illness myopathy, showed no significant difference in mortality in COVID-19 patients with CIM compared to those without (27% vs. 20%, P=0.58). During the study period, around 324 patients were admitted to our COVID ICU, out of which 170 died, with a mortality rate of 52.5%. However, the mortality in COVID-19 patients with critical illness myopathy was 36.4% only. This difference is probably due to higher ventilator-free days and the use of intensive protocol-based physiotherapy in our study population. Other factors like antibiotics and corticosteroids were not assessed in the study by Frithofi et al.[7]

Martinez et al. In a case series of COVID-19 patients with critical illness myopathy showed an incidence of 5.3% for ICU acquired weakness and 3.1 % for critical illness myopathy. Our study also showed a similar incidence of 3.5% of critical illness myopathy. However, assessing the exact incidence of the disease might be difficult as many patients died with COVID-19 before the diagnosis of critical illness myopathy could be made. This might have contributed to lesser mortality in patients with critical illness myopathy in our study population.[8]

One important finding in our case series was the effect of protocol-based physiotherapy interventions on survival. Though not statistically significant, the number of days of re-education interventions was higher in the survived patients. This would have led to a significant difference seen later on concerning long sitting, chair mobilization, and standing.
We have to admit that our study has some limitations. First, the number of patients in our series is limited, and a higher number of cases is necessary to draw stronger conclusions. Secondly, due to the disease's infectious nature, limited resources, and medical staff, diagnostic studies were delayed or canceled and hence not included in the diagnostic workup.

Conclusion

In patients with COVID-19 related critical illness myopathy, use of protocol based physiotherapy interventions leads to improved survival. Use of such interventions on regular basis and education of health care professionals regarding the same will help in reducing health care burden arising from CIM.

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HOW ADVANCED TRAUMA CENTRE CHANGED DURING COVID 19 PANDEMIC- ANAESTHESIOLOGIST PERSPECTIVE

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Global fluctuations in health care system due to covid-19 crisis posed myriad challenges at our premiere institute, Post Graduate Institute of Medical Education and Research, Chandigarh . One major caveat was reorganising the hospital services due to stringent rationing of staff .

The decision to configure buildings and isolate patients infected with Covid 19 was expedited but hospitals had a burden of duty to render safe care for trauma patients in non-COVID areas too. Trauma care in our Advanced Trauma Centre created changes at four levels for safe patient care.

Changes in Trauma OPD:

Identifying methods to maintain distance between patients to decrease potential transmission of COVID-19 in a busy trauma bay was a considerable challenge. To ensure social distancing among patients, their attendants and the hospital staff, cubicles were installed in the trauma emergency room. It was made mandatory that "COVID screening" at the patient reception area will be performed . Demographics, symptomology, history of travel, and contact history were taken in this area for all patients. Any patient with a COVID-positive status or failed screening test was shunted immediately to the predefined isolation area, and only non-COVID suspect patients were received in the trauma bay.

. Nasopharyngeal swabs for SARS CoV-2 reverse transcription-polymerase chain reaction (RT-PCR), or GeneXpert test were sent for all patients after initial resuscitation and stabilization depending on the urgency of patient status. If the patient was a non-responder to resuscitation or required urgent surgery, a GeneXpert test was sent; otherwise, RTPCR was sent. Patients in need of immediate surgical intervention and awaiting results of GeneXpert were wheeled into a "suspect operation theatre (OT) (2 tables)," which was set up adjacent to the trauma emergency by converting off a minor OT., All COVID positive precautions were taken while surgeries are performed in this OT. Performance of aerosol-generating procedures (AGPs) was limited to the resuscitation area. The anaesthesiologists posted in the trauma intensive care unit (ICU) were entrusted with attending to all intubations in the trauma emergency. The team consisted of one resident and one technician. All intubations were performed using a CMAC -video laryngoscope after donning a PPE kit

Changes in Trauma operation theatre Complex

All patients were mandatorily tested for COVID using either RTPCR or GeneXpert within 48hrs before surgery. Along with the help of surgical colleagues, to prevent any cross-infection among patients, a limited number of patients were brought in at a time for a pre-anaesthetic check-up in recovery.

Education and training regarding wearing N95, gown, and face shield while performing any aerosol-generating procedures like intubation, airway suction, and extubation was provided to staff working in OT at the institute level. Two Heat and Moisture Exchange (HME), one between the tracheal tube and breathing circuit and the second between patient end and expiratory limb of the breathing circuit, was placed to minimize contamination of the OT environment. Video laryngoscope was made available for elective intubation. CMAC assisted intubation increased compared to non-covid times. It was preferred to do cases under regional Anaesthesia. Surgical colleagues were requested to wait outside OT to minimize exposure at the time of intubation/extubation of a patient Regular teaching of staff in trauma OT regarding proper waste segregation and disposable were held. Medical and paramedical staff working in OT was requested to adhere to guidelines issued by government and institution. Combined meals, teas, or meetings were strictly halted during the peak of both waves.

Teaching

We were unable to continue with the physical teaching programme. To facilitate this, we purchased a zoom platform to enable us to have our regular teaching sessions. An unexpected benefit was that link was shared on a larger scale and colleagues/friends from different parts of the country were able to join these classes for topics of interest. Regular audits were conducted and essential guidelines were laid. These were explained to all residents posted in trauma and revised as per the need of the hour.

Trauma ICU

Patients taken up in Trauma ICU were required to have a Negative COVID report within the last 48 hrs. Testing was repeated after 5 days of ICU stay. During the peak of the pandemic, weekly admissions declined

HEALTHCARE PREPAREDNESS FOR A PANDEMIC OF PRIVATE HOSPITAL IN THE UAE

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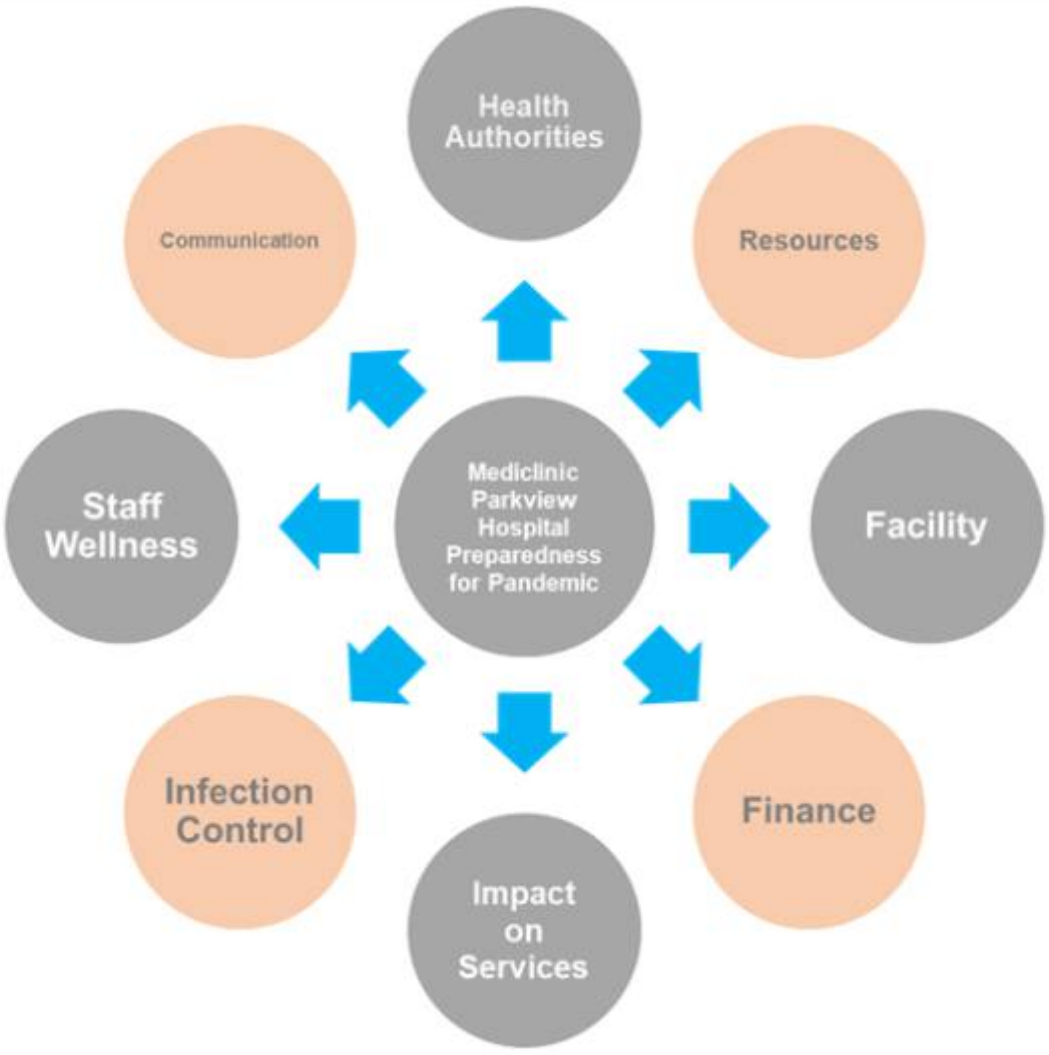
Introduction

It was on 21st of December 2019 when the world was awoken by an unknown viral pneumonia that originated in Wuhan China (WHO 2019). Little did we know that it will be a global concern that will lead to a pandemic, which will greatly affect the people's daily living.

The leadership of the UAE was steadfast in their preparation and guidance for all health care facilities, government and private. Collaboration between government and private hospitals were key in the managing of this pandemic, and were effective in doing so.

The increasing cases of the viral pneumonia in China became a global concern wherein Dubai is at risk in relation to international travel (Kamel 2020). Because of this concern, in the 2nd week of January 2020 all Emergency Departments heightened its surveillance measures. In relation to this event, all hospitals were faced with disaster management strategy implementation. The goal in view is to survive the pandemic, protect the society and frontliners, while trying to mitigate the socio-economic impacts on the UAE economy.

Moreover, figure 1 below is the framework of a private Hospital's preparedness for pandemic



Facility, Resource Allocation and Impact

Supply chain management in pandemics, “when several supply chains failed to get products to the market during the COVID19 pandemic—specifically, hand sanitizer, cleaning supplies, and toilet paper—many in the consumer market leveraged wide-scale media attention to demand answers. The response highlighted the many processes and people required to move goods through supply chains, the safety and welfare of these workers, and the role of local, state, and federal governments in overseeing the work required to get products to store shelves. This focus also stimulated important research imperatives regarding the consumer welfare and policy impacts of SCM processes, particularly during times of crisis” (Esper, 2021).

All private hospitals in the UAE was impacted by the news of the pandemic. For large business holdings comprising of multiple business units, the impact can be that positive, productive outcomes if the corporate offices and business units are able to support each other during the pandemic. It could alternatively be a negative impact if no support is rended in which these business units may collapse. The article below discusses the change in approach to Supply chain management and restructuring flows within the facility

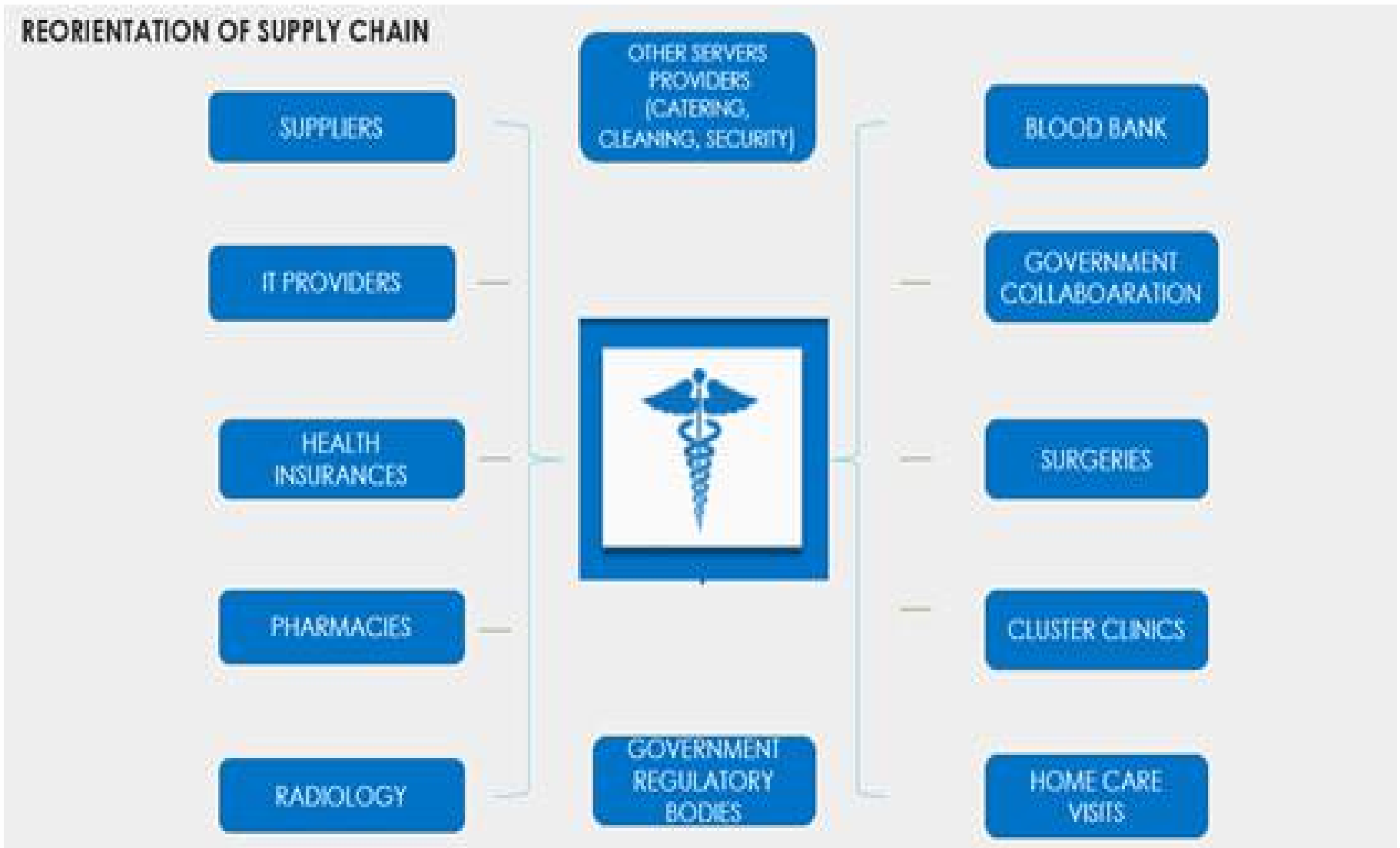


Diagram 1 A typical orientation of supply chain management

Diagram 1 illustrates some of the current inputs to supply chain management, with the pandemic on hand this approach needs quick effective strategies to be implemented. This approach needs to be initiated, through good communication with all the relevant stakeholders. A Covid 19 taskforce group can be initiated with the objective of identifying all the requirements needed in the pandemic, strategies then identified and implemented to manage the coming demands on capacity. It is integral to have support and good communication from all levels to ensure success in process changes needed. Fear of outcomes from corporate to operational level is an expected norm is a situation like this and hence tackling the situation face on and involving all stakeholders of the emergent strategic changes needed ensure good flow of outcomes. Change models can be applied in these scenarios.

Diagram 2 Current challenges on Demand Vs Capacity at Mediclinic Parkview

Below are some of the challenges discussed when demand versus capacity in Private Hospital.During the initial surge of Covid 19 the restructuring of departments resultant in closures of certain departments, as supported by the UAE Government in which all elective operations were cancelled and only emergencies managed, hence operating theatres were managed on an on-call system only with reallocation of their staff to other areas needed, the recovery staff could be allocated the ICU'sand technicians can support as porters and runners where needed. All OPD and cluster clinics were closed, the staffing mainly nursing could then reallocated to the inpatient departments in need. Departments that are not servicing like Day Ward was identified as an area for ICU backup to increase bed capacities, that would cater for critical cases. The minor to moderate cases provisioned for with the extension of areas like medical/surgical wards, then increasing bed capacity. Post surge period the hospitals need to ensure that silent ICU's and medical ward facilities are at all times prepped and ready for any resurgence.

The Emergency departments can initiate a drive through for PCR testing including changing flows of triage to accommodate Positive patients. On a positive note the Curfew implanted by the Dubai Authorities resulted in fewer cases like Trauma road accidents in the ED. Other departments impacted were allied services, the physiotherapy departments that closed to OP visits is one example in which the staff could be reallocated to areas needed like the medical ward and ICU, where their skills of patient mobilization would be profoundly needed, especially in the ICU where patients are proned and deproned. Respiratory technicians could be allocated to the ICU as well to support the multidisciplinary team in ventilator support. Maternity and Labor and delivery departments (LDR) pending on the impact would have to cancel antenatal classes and the maternity tours if applicable. LDR has to identify a flow for emergencies of a covid positive mothers in labour with a specified theatre allocated.

Radiology needs to look at the possibility of increased mobile x-rays requested and should initiate a process to decrease the movement of flow within the hospital of Covid 19 positive patients, with an emphasis on terminal cleaning between cases. Laboratory has to set priority on specific services like, specified set orders related to Covid 19 positive patients frequently ordered like Ddimer, Fibrinogen level and ferritin level just to mention a few. The laboratories also face challenges of procuring the reagents needed for testing and need to be proactive in their measures to procure. Testing laboratories should be aware of the high possibility of the risks of mechanical and hence operational failures that could occur and plan on alternate measures, same as hospitals need to be aware of this possibility and action immediately. Business units that are able to open or set up small laboratories to assist in this service would be able to overcome this risk.

Catering services could change their approach in delivery of meals where disposable containers are used for meals, and the staff should not be allowed in the affected areas. Laundry and housekeeping services have to increase their quota on linen and ensure scrub suites for all staff needed in the isolation areas. Security can be allocated to ensure one way flows within the hospital and manage screening points of entry, while adhering and ensuring safe distancing.

Engineering and biomedical departments play a pivotal role as they face the major challenge of time management to resource what was needed, in collaboration with Dubai Health Authorities to loan out emergency equipment needed like Ventilators, Continuous Renal Replacement therapy machines, High flow and Extra Corporeal Membrane Oxygenation machine was noted as a major support from the leadership in the UAE. Government and leadership within countries need to be prepared as many shortages will be experienced. One major focus should be on availability of oxygen for all health facilities and those as home based. Oxygen availability should be noted as a lifeline source and not compromised.All areas required to manage covid 19 positive or any airborne precaution patients should be adapted to negative pressure flows.As can be expected in a pandemic with high mortalities the mortuary facility demand can increased and thus all facilities need to prepare for that possibility.

Pharmacy and Consumables management, through the use of(Enterprise Resource Platforms) ERP system, of which all private hospitals procure is a resourceful database that allows managers to monitor consumption and thus forecast what is required for the next 3 months. The task teams developed should involve stakeholders as Pharmacy Managers, Nursing Directors, Managers, Medical and Hospital Directors, Engineering and Biomedical Managers, who will identify what is required, what could be potential pitfalls and alternative measures to overcome any procurement gaps. As can be expected with a global impact resources were limited by suppliers and private hospitals need to liase, collaborate and expand their network infrastructure within the hospitals to be able to sustain the requirements and ensure sufficient supply going forward. Lean management principles could be applied as wastage cannot be support at a time of a pandemic.

As human resources remain a crucial resource in a pandemic, and reallocation of many employees especially nurses etc. are then allotted to manage and work in departments out of their scope. It is the responsibility of the private hospital to ensure that any employees reallocated receive the basic training for the specified departments and mandatory for Prevention of Infection Principles. There should be added focus on emergency management of Airway, Breathing and Circulation as in any disaster management, the objective is life sustaining measures. Further to that the employees should be supported by a staffing tier model, adopted to support reallocated employees in specialized departments. Mock codes in the attempt to train employees in a more realistic approach, allows for an almost real life experience. Cross training of staff then becomes a long term strategy to enable manpower when needed. Engaging with employees at all levels allows for motivation amongst the teams resulting in confidence. Daily taskforce meetings enable all decisions to be communicated to all levels within the hospital especially when it comes to specific flows of patient management within the hospital. The main objective here is to maintain patient safety with that of the staff and community.

The agility of private hospitals towards this global change, can be noted by technological and socio-economic strategies and innovations implemented at this time. The introduction of Tele medicine, pharmacy home deliveries, post-natal home visits are some examples of strategic change management implemented. The health industry has to ensure the planning and provisions to continue as Pandemics remains amidst our future. Private hospitals records systems should enable continuous monitoring of the Pandemic database in which, one of the points is screening with an alert system for tracking, hence a pivotal role in managing future planning in safety of the patients

Finance

COVID-19 presented catastrophic financial challenges in several areas of business including healthcare. This ‘black swan’ effect, called out by economists often in literature, had a projection cost of 2 trillion dollars in year 2020 by United Nations (Kaye, et al.; 2020).Patients, family members and staff were the target of healthcare facilities first response (Ferneini, 2020). Private hospitals were forced to increase patient beds by creating step down Intensive Care Units and Isolation Wards, close non-essential services such as elective surgeries and outpatient clinics. In addition, the procurement of personal protective equipment became a challenge for the first time in decades (Almirisi, et al; 2020).

Hospitals were forced to provide additional support to healthcare workers such as accommodation and transportation to create an isolation bubble, adding to the existing costs.

Treating patients became a priority, neglecting the insurances and payer’s response, which led to considerable costs bared by private hospitals. The conversion of hotels into isolation facilities became the only option to keep hospital beds available for sicker patients. American Hospital Association projected an income loss of 50 billion dollars per month between March and June 2020 (Almirisi, et al; 2020).

The unseen benefit was the rise of additional services promoted by technology such as telemedicine, which became vital for patient care. In the United States, the centers of disease control and prevention predicted that 30 billion dollars of healthcare income would be generated by telemedicine (Almirisi, et al; 2020).

Infection Control

On the context of the pandemic, Infection Control is the main agenda. The goal of the teams would be to break the chain of infection in order to prevent the spread of the virus. Because of the novelty of the virus and no known transmission precautions written in all international guidelines, it became a major stress factor for all the Infection Practitioners (IPC) (WHO 2021). However, the hospital management needs to support the Infection Control Practitioner on the highest-level like prioritizing the infection control resources.

There are Infection Control changes implemented across the hospitals, from the creation and implementation of preparedness and response plan for covid-19 pandemic, up to changes of the patient's movements in the hospital (MPAR 2020). Furthermore, staff training methodologies have to change from a conventional classroom to an online e-learning and 1:1 bedside training.

One of the main focus points of the infection control is keeping the hospital clean and disinfected. Support services teams in hospitals became the unsung heroes during this period. Housekeeping teams should be trained and empowed to manage in these pandemic phases.Emphasis is placed on ensuring access to all resources required, keeping in mind the evident risk of shortages

IPC becomes the police officers of the hospitals, making sure that staff are following infection control guidelines, from PPE's compliance, cleaning, patient bundle compliance. Lastly, staff wellness was also a focused wherein Infection Control monitors staff exposure and affected by Covid-19 disease.

Staff Wellness

A Staff wellness clinic should be established for staff presenting with respiratory symptoms and a clinical assessment becomes mandatory, if suspicious, they are tested for SARS-Cov 2 virus. For those staff who test positive with the virus, triage to pending admission is required.

Furthermore, assistance and counseling is provided by the HR department, for staff refusing to work in the covid-19 areas because of fear. A temporary accommodation could be setup by the private hospitals in a hotel or residence accommodation to create an isolation bubble for the staff to reduce exposure to the community. In addition, part of the bubble is to transport to and from the hotel to hospital. Staff meals also provided to prevent movement between the staff and additional housing facilities could be arrange for the quarantined.

Part of the wellness program is the regular screening of all staff on a weekly basis to make sure that they are not a super spreader and to assure the patients that all staff working in the hospital are all virus free. Once the surge dissipates the staff screening can be extended over a longer period, or maintained for high risk areas only.

Communication

A Covid-19/Pandemic task force needs to established, consisting of the senior leadership of the hospital, infection control, critical area mangers and consultants of ICU and internal medicine. This daily meeting could be extended with to a "What's App" group to cascade the communication on an efficient and timely manner.

The agenda was set on the following: (i) Health Authority guidelines changes, (ii) Communication to staff and staff wellness, (iii) Laboratory investigations turnaround time,(iv) occupancies, (v) Medication and (vi) Consumable availability. Furthermore, Senior Leadership can doweekly virtual meetings with frontline staff during their lunchtime, on a question of "what can we do for them? or "how the management can help them?" This is to show that the management supports the staff and they are happy to listen to all of their concerns. Lastly, videoscreated and distributed to all the front-line staff including security, housekeeping, and catering staff to make sure that they are part of the team and the management cares for them.

Preparedness and Response Plan was drawn up to ensure and distributed between units

(a) continuity of essential services during the pandemic;
(b) a well-coordinated implementation of priority action;
(c) clear and accurate internal and external communication;
(d) rapid adaptation to increased demands;
(e) effective use of limited resources;
(f) asafe environment for patients an

Health Authorities

Dubai Health Authorities (DHA) plays a major role in drafting and implementation of covid-19 management across the hospitals in Dubai. DHA is also responsible in giving off site training and awareness sessions were launched across the city on what is Novel Coronavirus and how the hospitals should handle it (DHA CIR39 2020). Furthermore, the first external circular on Novel coronavirus (2019-nCoV) alert shared to all healthcare provided to prepare the facilities (DHA CIR47 2020).

In relation to this circular, frequent facility preparedness audit was been conducted. The DHA provided a checklist to make sure that private facilities comply with the regulations and to eliminate gaps (DHA CIR47 2020).

Lastly, because of all the efforts of the private sector management and staff some facilities received a Non-Covid facilities accreditation on 21 June 2020.

Conclusion

Preparing for an unknown battle is always a questionable task. Furthermore, Private and Government hospitals are hit by different challenges like the ongoing pandemic. However, resiliency and stability always prevail because of the guidance of the management and staff compliance with covid-19 precautions and guidelines. We face many challenges; however, we chose to fight and learned from those occurrences. Collaboration and communication strategies are highly effective methods utilized in disaster management. Preparation and anticipation are key in surviving the future of health care.

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PREPAREDNESS FOR COVID - MY EXPERIENCE

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The first wave of the covid pandemic was an unjust war among in equals. We were caught off-guard without any knowledge of the virus and its manifestations. There were myriads of ever changing guidelines and utter confusion created on a daily basis by barrage of information pouring in from different parts of the country and the world added to the chaos. To maintain the supply chain of essential medicines, equipment, PPEs, made worse by non-availability and black marketing, was nothing short of a nightmare. Physical and mental stress of the doctors, nursing staff, paramedics and everyone related to health care delivery system was unsurmountable.

Few months of respite after the initial onslaught gave us time to rethink, replan and regroup and prepare for the second wave. Strong vaccination drives were carried out in a phase wise manner for the hospital employees which were later extended to senior citizens and then to the general public of the city. Hospital Laboratory services were revamped to cater to more samples and extensive testing were done. Current virology lab was upgraded to VSL 2B level. Trunat analyser for Closed RTPCR analysis was procured to handle more samples and early reporting. The Biomedical engineering team (BME) geared up and prepared more negative pressure isolation rooms on the war footing. A section of the hospital floor was cordoned off and converted to Covid and Post Covid ward. Attending RMOs and Nurses were updated and trained to identify and alert for signs of clinical deterioration. A flexible protocol for admissibility and discharge criteria were formulated. Two Critical care ambulances were deployed for transportation of critically ill patients. A statistician was entrusted with the extensive data and records for future analysis. A direct liaison with the pharmaceutical companies and Govt Authorities were established to supply essential medicines on demand. Hospital based protocols were formulated based on updated guidelines. From triage to admission and till discharge strict biosafety measures were followed. Surface disinfectants were used at regular intervals. Experience from the first wave cemented our trust on the use of Steroids, Proning and early mechanical ventilation as a mainstay of treatment for severe cases. D dimer assay was the prominent prognostic marker among others. Doctors, Nurses, and paramedics were updated and trained to identify, diagnose and treat extra pulmonary manifestations of Covid. Regular virtual meets were conducted to keep abreast with changes. Clinical psychologists were constantly involved to counsel patients, attendants, attending medical teams.

THE 2021 SURVIVING SEPSIS GUIDELINES

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The 2021 Surviving Sepsis Campaign guidelines for the management of sepsis and septic shock have been published.1 The guidelines continue to emphasize the importance of rapidity and appropriateness in the recognition and care of patients suspected to have sepsis. The recommendations represent an important guidepost for the busy bedside clinician in providing optimal care and incorporate the best contemporaneous evidence. However, clinical situations are unique and a flexible approach may often involve deviation from general recommendations.

What is new and what may be the contentious in the current iteration of the Surviving Sepsis Guidelines (SSG) that may call for a deviation from the general recommendations?

Screening and early treatment

Recommendation against qSOFA

The qSOFA screening parameters include a systolic BP < 100 mm Hg, respiratory rate > 22, and a GCS < 15. The presence of 2 or more criteria denotes a positive qSOFA.

The SSG make a strong recommendation against the use of qSOFA as a single screening tool, compared to the National Early Warning Score (NEWS), Modified Early Warning Score (MEWS), or the systemic inflammatory response syndrome (SIRS) considering its poor sensitivity for the diagnosis of sepsis. This recommendation is mainly based on systematic reviews that have shown that qSOFA has a high specificity and predictor of poor outcomes, but low sensitivity for the diagnosis of sepsis.2,3

Lactate measurement and lactate-guided resuscitation

The SSG make a weak recommendation for the measurement of lactate levels among patients suspected of sepsis. This is largely based on a good correlation between raised lactate levels and the likelihood of sepsis. However, the lactate level must be interpreted based on the clinical situation; it is neither sensitive nor specific enough to confirm or exclude the diagnosis of sepsis. The most common reason for raised lactate levels in sepsis are probably due to adrenergic stimulation and stimulation of cAMP leading to increased aerobic glycolysis and activation of Na+–K+ ATPase pump. This leads to a rise in pyruvate levels which overwhelms the capacity of pyruvate dehydrogenase that coverts pyruvate to acetyl CoA. Instead, lactic dehydrogenase converts the excess pyruvate to lactate. Lactate levels may also rise due to hepatic dysfunction, release from the lung in the presence of acute respiratory distress syndrome, and epinephrine administration to support the circulation.4 Although hyperlactatemia is a marker of adverse outcomes, raised lactate levels in sepsis is usually not due to reduced oxygen delivery with triggering of anaerobic metabolism. In fact, lactate may be an important substrate for the heart and the brain for aerobic energy production.5

The 2016 guidelines had recommended initial resuscitation aimed to target normal lactate levels. However, the 2021 guidelines have revised this recommendation and favor the guidance of resuscitation aimed to decrease (not normalize) lactate levels. This is based on the realization that normal lactate levels may not be achievable in many septic patients during the early phase of resuscitation.

Fluid resuscitation

How much fluid as part of initial resuscitation?

The 2021 guidelines continue to recommend fluid resuscitation with 30 ml/kg of a balanced crystalloid solution over the first 3 hours. The level of recommendation has been upgraded from weak to a strong. This recommendation in based on a retrospective study,6 and the mean volume of resuscitation fluid administered prior to randomization of patients in the ARISE, PROCESS, and PROMISE trials that evaluated early goal-directed therapy in sepsis. The mean volume of initial resuscitation in these trials was 27 ml/kg.7

The requirement of volume resuscitation is likely to be highly variable in septic patients. Although 30 ml/kg may be reasonable to begin with, a fixed volume is clearly not optimal in all settings.

In the three-armed FEAST trial, children with evidence of hypoperfusion related to sepsis were randomized to receive a bolus of normal saline, 5% albumin, or no fluid. The 48-hour and 4-week mortality were significantly higher among children who received either fluid bolus compared to those who received no bolus fluid.8 In a randomized control trial of septic patients in Zambia, patients received protocolized resuscitation including intravenous fluids, blood transfusions for a hemoglobin level of <7 g/dl, and vasopressors for a target mean arterial pressure (MAP) ≥ 65 mm Hg or usual care. The median volume of fluid administered was 3.5 L (IQR, 2.7-4.0 L) in the protocolized care group compared to 2.0 L (IQR, 1.0-2.5 L) in the usual care group. In-hospital mortality, the primary outcome, was significantly higher in the protocol-based care group that received a higher volume of intravenous fluids (48.1% vs. 33%; RR: 1.46, 95% CI: 1.04-2.05). These studies suggest that overzealous, fixed volume fluid resuscitation during the initial phase of sepsis may lead to adverse clinical outcomes.

After initial resuscitation, the guidelines recommend further administration of fluid based on dynamic parameters. A Scandinavian multicentric randomized controlled trial evaluated this question among 151 patients. In the standard care group, patients could receive continued fluid boluses if the hemodynamic variables improved based on dynamic or static indices. In the fluid-restrictive arm, additional boluses were administered only if the lactate level was >4 mmol/l, the MAP was <50, skin mottling was present below the knee, or the patient was oliguric in the first 2 hours after randomization. This pilot study demonstrated that a restrictive protocol resulted in a significant reduction in the resuscitation volume. Although not powered to evaluate clinical outcomes, the use of a restrictive strategy resulted in a significantly lower incidence of worsening of acute kidney injury during the 90-day follow-up period. There was no significant difference in the incidence of ischemic events, days alive without ventilator support, or renal replacement therapy.9

The question remains unanswered if an arbitrary volume of bolus fluid is administered within a fixed period as part of a general approach, would this lead to iatrogenic fluid overload in a significant number of patients?

What type of fluid?

A balanced crystalloid is preferred over normal saline during the initial resuscitation phase. This recommendation is based on the SALT-ED and the SMART randomized controlled trials that demonstrated worse clinical outcomes with the use of normal saline compared to a balanced crystalloid.10,11 The recently published BaSICS trial compared plasmalyte to normal saline in critically ill patients who required fluid resuscitation in 75 ICUs in Brazil. No difference was noted in the 90-day mortality, the primary outcome of the study. Besides, the incidence of acute kidney injury requiring renal replacement therapy was also not different between groups.12 Further research regarding the resuscitation fluid is warranted, considering these contrasting reports.

Antibiotics

How soon should antibiotics be administered?

The SSG recommend antibiotic administration with an hour in patients presenting with septic shock and within 3 hours in patients with sepsis without shock. This is a departure from the previous guideline that recommended a 1-hour time frame in both situations. There is no argument that timely administration of antibiotics in septic patients is crucial to improving outcomes. However, setting a short, rigid timeframe may likely lead to logistical problems and overtreatment with antibiotics among patients who may not have an infective illness, considering the limited time available to arrive at a definitive diagnosis in a busy emergency department

Alam et al. compared the effect of antibiotic administration by ambulance personnel with usual care involving antibiotic administration in the emergency department in patients with sepsis. In the early administration group, the median time to antibiotic administration was 26 min before presentation at the emergency department; in the usual care group, it was 70 minutes after arrival. There was no difference in the primary outcome of 28-day mortality between groups, regardless of the severity of illness.13

Monotherapy vs. combined therapy

The new guidelines recommend empiric therapy with two antimicrobials in situations with a high risk for multidrug-resistant organisms and monotherapy if the risk is low. Both are categorized as weak recommendations with a very low quality of evidence. Therapy should be scaled down to a single antibiotic once sensitivity reports are available. Although a rational recommendation, there is scant evidence to support the use of combination therapy in septic patients. A meta-analysis of randomized controlled trials revealed no difference in mortality or other patient-centered outcomes among patients who received monotherapy compared with combination antibiotic therapy in patients with severe sepsis.14

What should be the target mean arterial pressure (MAP)

The SSG recommend a target MAP of 65 mm Hg over higher targets for septic patients receiving vasopressors. This recommendation is based on the study by Lamontagne et al. with titration of vasopressors to a target MAP of 60–65 mm Hg, compared to usual care in patients with vasodilatory shock. There was no difference in the 90-day mortality between groups; exposure to vasopressors was significantly lower when a lower MAP of 60–65 mm Hg was targeted.15 However, in the SEPSISPAM trial, a target MAP of 80-85 compared to 65–70 mm Hg resulted in a significantly lower requirement for renal replacement therapy among patients with chronic hypertension, although there was no difference in the 28- and 90-day mortality.16 Assiduous adherence to fixed targets of MAP may not be appropriate; a flexible approach with a focus on measures of perfusion is likely to be more optimal.

Oxygenation targets

Considering the lack of robust evidence, the SSG do not make any recommendation regarding oxygenation on sepsis-induced respiratory failure. Several randomized controlled trials have addressed this question. The ICU-ROX study randomized critically ill patients to a conservative SaO2 target of 91–96% compared to usual care, with SaO2 maintained between 91–100%. No difference was noted between groups in the number of ventilator-free days at day-28, and mortality at 90 and 180 days. However, a post hoc analysis revealed a trend towards improved survival at 90 days among septic patients who received usual care (higher SaO2).17 This hypothesis needs to be tested in future controlled trials.

Time to ICU admission

A 6-hour window is suggested for admission to the ICU in patients suspected to have sepsis. There is strong evidence that delay in ICU admission from the wards18 or the emergency department19 leads to adverse outcomes in septic patients. The 6-hour timeline recognizes time and space constraints, especially in lower and middle-income countries. Although a 6-hour timeframe is suggested, it is important to emphasize the early identification of septic patients and prioritized admission to ICU to optimize clinical outcomes.

The bottom line

No set of rigid guidelines can replace rational clinical judgement by the bedside clinician in the face of complex clinical scenarios. The SSG strongly emphasize this important caveat. The guidelines reflect general recommendations based on updated evidence. Clinicians will frequently need to deviate from guidelines when such divergence is meant to improve patient outcomes. No guidelines are cast in stone and context-based modifications in management are expected from the astute clinician. On the other hand, obsessive adherence to guidelines is likely to result in harm. Furthermore, modification of management options need to be incorporated into practice with the emergence of new evidence.

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SEPSIS 2021 GUIDELINES - WHAT'S NEW

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Recently in October 2021, the Surviving Sepsis Campaign (SSC) released the updated global sepsis guidelines. Sepsis and septic shock are major healthcare problems, impacting millions of people around the world each year and killing between one in three and one in six of those it affects. Improvements in standards of care have decreased mortality rates since the initial publication of the Surviving Sepsis Campaign Guidelines in 2004. Early identification and appropriate management in the initial hours after the development of sepsis improve outcomes. Subsequent updates to the guidelines have culminated in the 2018 creation of the 1-hour sepsis bundle. This provided a more pragmatic approach for obtaining cultures, lactate levels, administering fluids, antibiotics and initiating vasopressors in a timely manner. As a result, it has been noticed a decrease in-hospital mortality from sepsis. However, disparities have been found among different populations diagnosed with sepsis. Most of the world's population resides in low-income and middle-income countries (LMICs), where the burden of sepsis is extensive, outcomes are often poor, and socioeconomic consequences are devastating.

These disparities raise concerns and many challenges. Previous guidelines, for example, focus on the management of bacterial and fungal sepsis as most frequently encountered in high-income countries. For instance, HIV infection, which poses specific challenges to sepsis care in LMICs, particularly in sub-Saharan Africa and Southeast Asia, was not considered on previous guidelines. Not only is the disease pattern different, but effective delivery of sepsis care in many LMICs is challenged by the shortage of appropriately trained healthcare personnel (physicians, nurses, and allied healthcare personnel), material resources (equipment, drugs, and supply materials), supporting infrastructure, laboratory facilities (e.g., lactate measurement) and others. Considering all these challenges, many changes have been made in the current sepsis guidelines. As for sepsis screening tools designed to promote early identification of sepsis, current guidelines recommend against using qSOFA compared with SIRS, NEWS, or MEWS as a single screening tool for sepsis or septic shock. They are suggesting rather than recommending 30ml/kg of resuscitation fluids for everyone. Capillary refill is now in the guidelines to guide resuscitation as an adjunct to other measures of perfusion. They suggest balanced crystalloids rather than saline for resuscitation. For effective sepsis care delivery, especially in places with a shortage of health care personnel or material resources, starting vasopressors via peripheral access is an essential change in the guidelines. This is to avoid delaying the initiation of vasopressors until central venous access can be secured. Also, now they suggest starting IV corticosteroids in septic shock patients with an ongoing requirement of vasopressors, as previous guidelines suggested against this practice if fluid resuscitation and vasopressors were able to maintain hemodynamic stability. Intravenous vitamin C was also suggested against, although complete revision of this data has not been done yet. High flow nasal oxygen over noninvasive ventilation was also added for sepsis-induced hypoxemic respiratory failure. The use of veno-venous (VV) ECMO was suggested for sepsis-induced severe ARDS.

It was also noticed that these new guidelines emphasize improving the care of sepsis patients' post-ICU and hospital discharge. Also, greater comprehensiveness is noted, as they try to address disparities in sepsis-related management and outcomes. Challenges like long-term effects in sepsis-treated patients were also discussed due to the prolonged ICU stays that these patients experience and face after a long and complicated recovery. In addition to these, recovery challenges were also addressed due to the uncertainty that patients and family members experience coordinating care to promote recovery based on their care goals. The new guidelines encourage more patient and family members' involvement in discussing goals of care and plans after hospital discharge to address the latter. These can include ongoing follow-up with clinicians to manage long-term outcomes. It was also recommended screening for economic and social support (including housing, nutritional, financial, and spiritual support) to make the appropriate referrals to meet those needs available. You can read and access the SSC 2021 guidelines at Surviving Sepsis Campaign: International Guidelines for Mana... : Critical Care Medicine (lww.com) and visit the Surviving Sepsis Campaign website for additional resources.

SUPPORT OF HEALTH CARE WORKERS IN PANDEMIC

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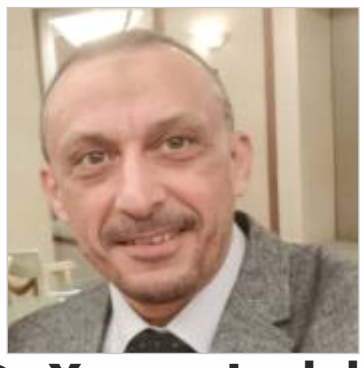

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Introduction

The most recent and devastating worldwide pandemic of Covid 19 have once again underlined the prime importance of Health Care Workers (HCW) in managing such a public health catastrophe. The pivotal role played by HCWs in different areas of care while tackling the pandemic was a huge factor in combating the same. While a lot of talk and discussion was put forward on the disease, pandemic, logistics, drugs and vaccine, the plight of the HCWs and their needs largely went unnoticed. As per the WHO, HCWs represent less than 3% of population of most countries and less than 2% in low to midlevel income countries. Yet, they constituted 14% of reported Covid 19 cases, signifying the greater risk of infection amongst HCWs.(1) They are the frontline foot soldiers in the pandemic war, and as a consequence often suffer the most damage during such times. The damage is not just because of contracting the serious disease; it is manifold and has immediate, near and distant far reaching adverse outcomes.(2) Let's have an overview of the gamut of problems faced by HCWs during a pandemic and find some ways as suggestion to try and mitigate it.

Social Distancing

One of the main tools of prevention of getting covid infected is maintaining social distancing. But, HCWs have to work in close proximity of covid patients. Their job doesn't allow social distancing from covid patients. Not only that, they are hands on with patient care which often requires them to be exposed to highly infectious materials or procedures. The personal protective equipment (PPE) and other infection control measures, however stringent and meticulous, are not fail-proof and don't make them immune to being infected. As a result hundreds of thousands of HCWs have fallen victim by contracting the disease from likely source of the patients they care for. Amnesty International report published recently has shown that worldwide 17000 HCWs have died from covid 19, in an attempt to help others.

Long work hours

In a pandemic situation, the sudden steep rise in case-load puts undue and exaggerated pressure on an often not so robust existing healthcare system, especially in the developing or lower socio-economic countries. All of it has to be borne by the beleaguered HCWs. Higher than usual working hours under more than normal stressful and uncomfortable working conditions ultimately takes its toll on the physical and mental condition of the HCW. Inadequate rest and less time available for the body to recover leads to never ending and perpetual fatigue.(3)

Psychological stress

A pandemic often achieves a proportion when even the HCWs who are normally well conversant with disease, suffering and death, can get emotionally overwhelmed. Dealing with incessant wave after wave of patient load, having to work under compromised and constrained logistics, little or insufficient knowledge about the disease and finally patients dying in hordes adds to the confusion, demoralization and a feeling of helplessness. Many of them suffer from Post-Traumatic Stress Disorder (PTSD) like symptoms.(4)

Shortage of PPE and supplies

Production insufficiency (at least in initial months), national lockdown, public anxiety, illegal hoarding, all can lead to rapidly vanishing stocks of essential supplies like personal protective equipment (PPE), sanitizers, eye shields or dress. This makes the job for HCWs even more precarious and makes them vulnerable.(5)

Lack of training

During a pandemic, as the huge caseload overwhelms the existing manpower, volunteers are recruited from other medical or non-medical fields. These people, however well-intentioned, are not properly trained or don't have enough time for such training, find themselves dealing with very sick contagious patients with which they were not acquainted before. It generates even more anxiety, fear, confusion and depression.

Family worries

HCWs, the foot-soldiers in a pandemic, are undeterred in their responsibility to help the sick, even by compromising their own safety sometimes. But, at the same time they are also worried about their individual family and close contacts. The worry that they might carry the dreadful disease back home, and infect family members including children or ailing parents, almost never leaves the frontline workers.

News reports

While the HCWs are fighting and struggling each day with the disease and their own physical and mental stress and strain, they are also almost constantly bombarded with news of huge increase in case load, death of other HCWs or their family members, appearance of newer and more contagious variant strains of virus and vaccine delays or shortages. Also, they witness gross public apathy towards preventative rules and restrictions, even protests in some areas against restrictions. So, while they put the safety of themselves and their beloved family in line, others are questioning or flouting the very restrictions which can contain the spread of disease with impunity. Overall, it gives rise to a sense of despair and pulls down the morale of workers.(6)

Rumors

Difficult the situation as may be, add to that periodic ill-founded rumors about "new deadly strain", "unaccounted deaths", "vaccine ingredients" and "corruption in test-kits and results". All these, certainly, doesn't help the job of HCWs as it adds to public outrage and some of it could be directed at the hapless workers.

Abuse and violence against HCWs

As public anxiety and worry ran very high during a pandemic, several reports surfaced of violence unleashed upon HCWs on issues which were not entirely under their control ranging from non-availability of suitable beds to rumors about vaccine.(7)

Social stigma

HCWs also faced social stigma at their living quarters and in housing societies there have been reports of resistance against their accommodation as well as social ostracism.(8)

Financial woes

During pandemic, as more and more health resources were earmarked for treating a particular disease and related activities, HCWs from other fields suffered from lack of adequate work and resultant financial constraints.

Lack of coordination

During the ongoing covid pandemic, as the disease was new, there was lack of knowledge and understanding about it, and the International and National health authorities kept on changing the directives and guidelines in frequent intervals which was difficult for the frontline workers to cope up with at times.

Ways to support HCWs during a pandemic

The best way to support a HCW or a frontline worker during a pandemic is to provide adequate workforce. Increasing manpower in pandemic related different segments of work in itself can be a great boost to relieve the burden of over-work and job-stress.(9) Next in line could be creating more and more public awareness about the disease, its preventative aspects, and the recognizing the important role played by all HCWs. Govt support and acknowledgement of the work done by HCWs has to be visible. It not only enhances the morale of the workers but also attracts public attention to the reality, and generates more respect and acceptance in society at large for them. Institutions and Govt should come up with robust plans for incentives for frontline workers as a financial package, as well as shoulder the burden of treatment related financial woes if they or their family get infected. Some govts did announce limited incentives for treatment but in actual they were hard to come by. Private institutions were even worse. Also, whatever support there was, the discrepancy between Govt and Private health sector employees just added to the depression for the lesser. Enhanced production of PPE and related equipment and preferential allocation of good quality stuff for the frontline workers can solve some issues with their non-availability for those who need it the most. Psychological assessment, counseling and support of HCWs can also be a major boost in improving their mental strength and resilience to carry on under severe adversities.(10)

Conclusion

Whenever a pandemic happens cases happen in an unprecedented scale and it puts the whole healthcare system under huge stress. Frontline healthcare workers play a central role in combating the calamity and yet they have to suffer maximum pressure, both physical and mental, even to the extent of losing life and livelihood. More awareness on behalf of the policy makers to general public is needed to actually feel this often neglected issue. Honest and earnest practical measures are needed to be implemented to take care of the HCWs and their inconvenience, as much as possible. Not only its ethical to “protect the protector” but also it, when pursued, may bring about a better work output and good result.

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COVID 19 & Disaster Management Act 2005

COVID 19 was the first biological disaster that effected the entire country after independence. The entire legal and constitutional machinery of India was put to test. The Disaster Management Act 2005, is one law that has been extensively used and is in fact the backbone of most of the actions and decisions taken by the government authorities. The Actwhich came into force on 23rd December 2005intends to "provide for the effective management of disasters". Although pandemics are not expressly defined or stated but the Act is wide enough to cover them. TheAct provides the broad legal framework within which activities to contain COVID-19 are being carried out by the Union and State governments.

Broadly speaking, this law gives the Central government powers to take quick policy decisions, impose restrictions on people to manage a disaster, declare the entire country or part of it as affected by a disaster, and make plans for mitigation to reduce "risks, impacts and affects" of the disaster.

As compared to The Epidemic Disease Act, 1897 this Act is very wide and covers all man-made and natural disasters. It also provides powers to the government to act against anyone not abiding by government orders and regulations. The authorities under this Act can act against any government official or director of a company for defying its orders or for obstruction of duties of any officer, employees of the Central or the State Government or any person authorized by the National or State Authority under the Act. The law provides for detaining a person without warrant and a jail term of one year for first offencesor fine or both. There are other penal provisions for false claims, false warnings, misappropriation of money or materials.

The Act gives wide powers to the government to draw up a plan for disaster management for the whole of the country to be called as the National Plan. The National Plan enumerates measures for prevention of disaster and mitigating its effect and preparedness and capacity building for effective response to any threatening disaster situation.

The authority under this Actcan lay down guidelines for minimum standards of relief such as shelter, food, drinking water, medical cover and sanitation, special provision for widows and orphans, ex gratia assistance on account of loss of life and other measures for restoration of means of livelihood. It also mandates to make provisionfor 'minimum standard of relief' to disaster affected persons (Sections 12 &19), including relief in repayment of loans or grant of fresh loans on concessional terms (Section 13).

The National Disaster Management Authority (NDMA) under the Act is the nodal authority for coordinating disaster management, with the Prime Minister as its Chairperson. NDMA lays down policies, plans and guidelines for management of disasters (Section 6). Similarly, State, district and local level Disaster Management Authorities are established. All these agencies are envisaged to work in coordination.NDMA has so far formulated 30 Guidelines on various disasters including the 'Guidelines on Management of Biological Disasters, 2008'. The 2019 National Disaster Management Plan issued by NDMA deals extensively with biological disasters and health emergencies.

The powers bestowed by the Act on Central Government and NDMA are very extensive. The Central Government, irrespective of any law in force (over-riding powers) can issue any directions to any authority anywhere in India to facilitate or assist indisaster management (Sections 35; 62 & 72). Such directions issued by the Central Government and NDMA must necessarily be followed by the Union Ministries, State Governments and State Disaster Management Authorities. In order to achieve all these, the prime minister of India can exercise all powers of NDMA [Section 6(3)]. This ensures that there is adequate political and constitutional weight behind the decisions taken and enforced.

In the current pandemic,Hon'ble Prime Minister Shri Narendra Modiji, who is also chairperson of the NDMA, declared Covid-19 as a national disaster (Sections 6 &10).The first national lockdown was imposed under this Act by an order dated 24-03-2020 of NDMA 'to take measures for ensuring social distancing so as to prevent the spread of COVID 19. Additional guidelines were issued on the same day by the Ministry of Home Affairs, being the Ministry having administrative control of disaster management under Section 10(2)(l).This ensured that the entire country had uniform lockdown regulations.

This Act has beeningeniously applied in a few instances during this pandemic.

A family from Bengaluru was booked under this Act for visiting a temple during lockdown and that too when they were hospitalized with COVID. Election campaigning in the State elections were regulated and compliance of Covid-19 norms were ensured using the provisions of this Act. Ministry of Home Affairsinvoked this Act to ensure unobstructed inter-state movement of medical oxygen.Loan repayment deferment announced by RBI in the form of moratorium was anotherimportant relief under the Act.

On June 30 2021, the Hon'ble Supreme Court pulled up the NDMA for "failing to perform its duty" to recommend ex gratia assistance for families of those who lost their loved ones to the COVID-19 pandemic. The court held that the government could not excuse itself of its duty to pay ex gratia by saying that such payments would entail huge expenditure pointingout to Section 12 of the Act.

Going forward, the authorities and agencies under this Act need to be more collaborative and consultative. As far as healthcare is concerned, the Union government, the State governments and the local bodies are issuing orders and directions which are confusing and at times contradicting each other. This could have been easily avoided if the process was more collective and relevant stake holders would have been involved in the decision making process.

The learnings from this pandemic should be used to bring about requisite statutory changes to make this Act more responsive and robust.

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Conference: 18th to 20th February 2022

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Ulta Pulta	Research Symposium	Meet the Experts	Ahead of Time	What went wrong!
Sepsis Guidelines: What's New?	Pro-Con Tribate	Live Case Discussion	Pandemic Learning	Predictive Learning
Legends & History	Action & Replay	Pictography	Digi-Corner	Rendezvous: B2B/B2C
Live Demo	Physiological Implications	Quest	Connect	The other side

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CRITICARE 2022 - AHMEDABAD

Conference and Workshop Details

Registration Category	Special Rates
ISCCM Members	INR 8000
Non-ISCCM Members	INR 11000
PG Student	INR 5000
Nurses/AHCP (ISCCM/CCNS Member)	INR 1500
Nurses/AHCP (ISCCM/CCNS Non Member)	INR 2000
Accompanying Person (National Delegates)	INR 9000
International Delegates	USD 175
SAARC Country Delegates	USD 80
Accompanying Person (International Delegates)	USD 165
Accompanying Person (SAARC Country Delegates)	USD 80

Note: Registration fees is inclusive of 18% GST as per current Government Norms. For PG students, certificate from HOD is must.

Name of Workshops (Special Rates)	Duration	PG Students	Members	Non Members	SAARC	International	Nurses/AHCP: Member	Nurses/AHCP: Non member
4C Comprehensive Critical Care Course	2 days	INR 7000	INR 11000	INR 13000	$115	$165	NA	NA
Airway Management & Bronchoscopy in Critical Care Workshop	2 days	INR 6000	INR 8500	INR 11000	$95	$115	INR 3000	INR 4000
POCUS: Basic	2 days	INR 8500	INR 11000	INR 13000	$140	$190	NA	NA
Mechanical Ventilation Workshop: Basic	2 days	INR 7000	INR 9000	INR 11000	$115	$165	INR 3500	INR 5500
Neuro Critical Care Workshop	2 days	INR 7000	INR 9000	INR 11000	$80	$150	INR 3500	INR 5500
Mechanical Ventilation Workshop: Advanced	2 days	INR 9000	INR 13000	INR 16000	$165	$265	NA	NA
Multi Organ EC Support & Therapy (RRT & VVECMO)	2 days	INR 7000	INR 11000	INR 13000	$115	$265	INR 4500	INR 5500
Cardiac Critical Care (including VA ECMO, EP & MCD Support)	2 days	INR 9000	INR 13000	INR 16000	$115	$265	INR 5500	INR 6500
Safety, Quality, Accreditation & Prevention of Errors / Critical Communication	**Complimentary (Exclusive for ISCCM Members)- 50 Registrants**							
Research Methodology / Train the Teachers, Examiners & Instructors: conducted by ICCCM	**Complimentary (Exclusive for ISCCM Members)- 50 Registrants**							
Nursing Workshop	**Complimentary (Exclusive for Nurses/AHCP)- 200 Registrants**							

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Prashant Nasa

Quirino Piacevoli

Reena Shah

Ravi Kumar

Sandeep Kantor

QUIZ

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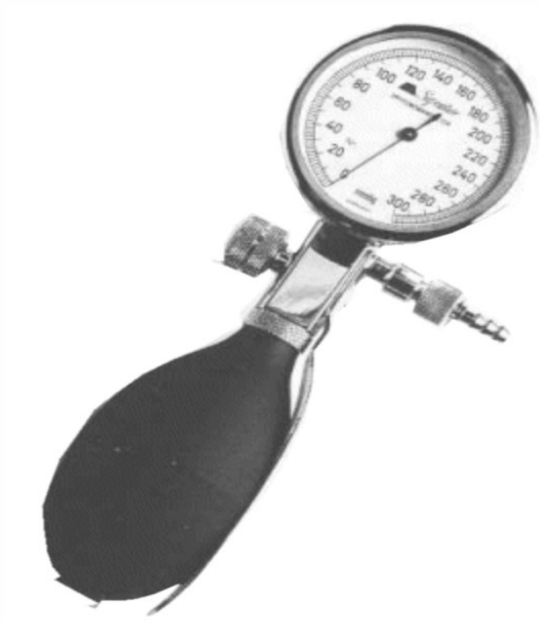
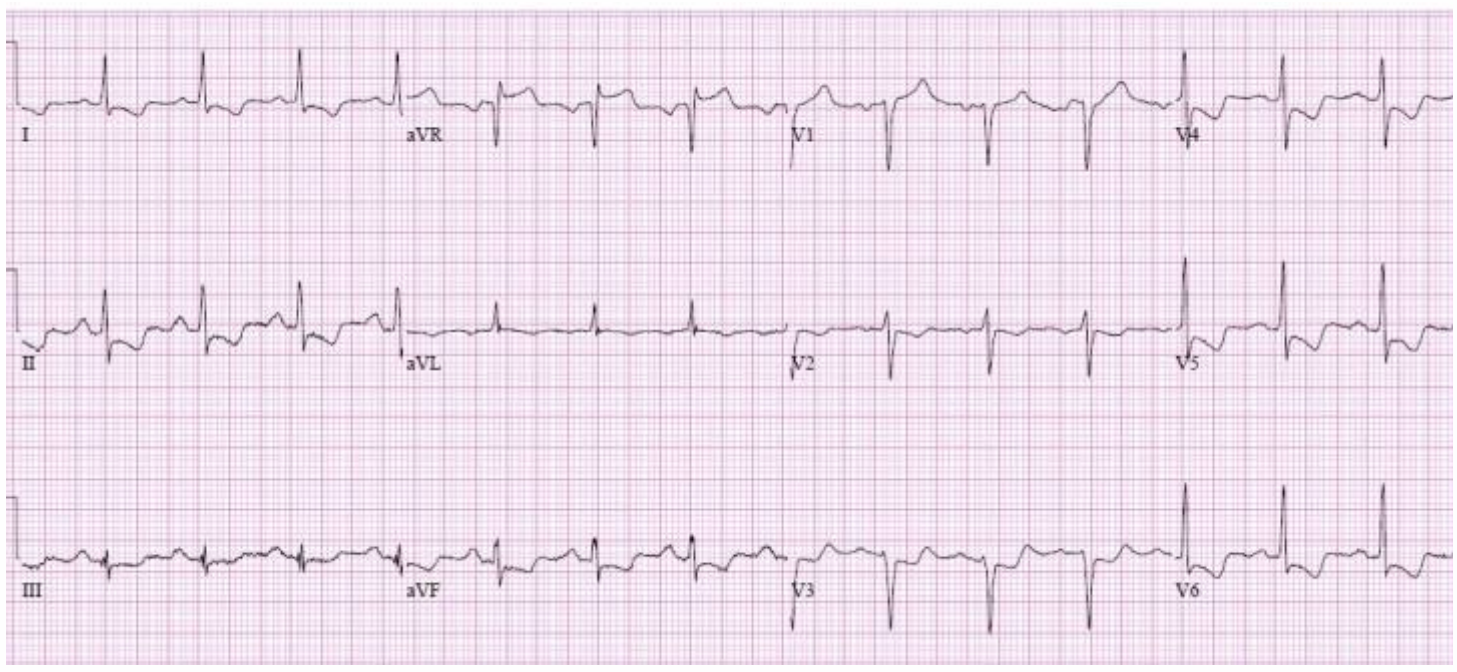
KPC Medical Colloege and Hospital, Kolkata

Dr Ritesh Shah
Director, Critical Care Unit,
Sterling Hospital, Vadodara
Executive Committee Member, ISCCM

1. What is the device used for?

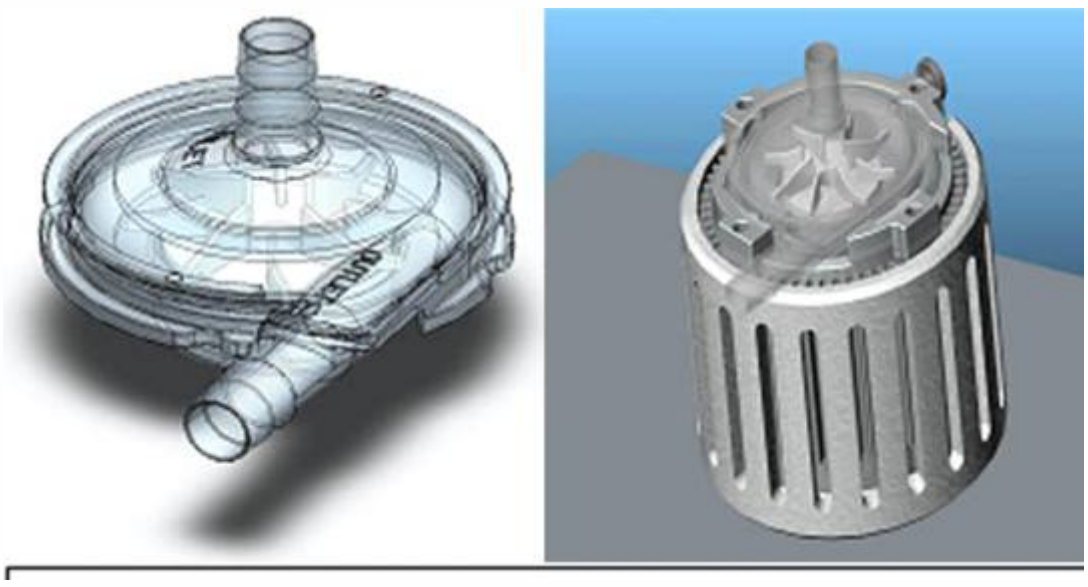


2. What is the cardinal ECG sign? What could be the possible etiology?

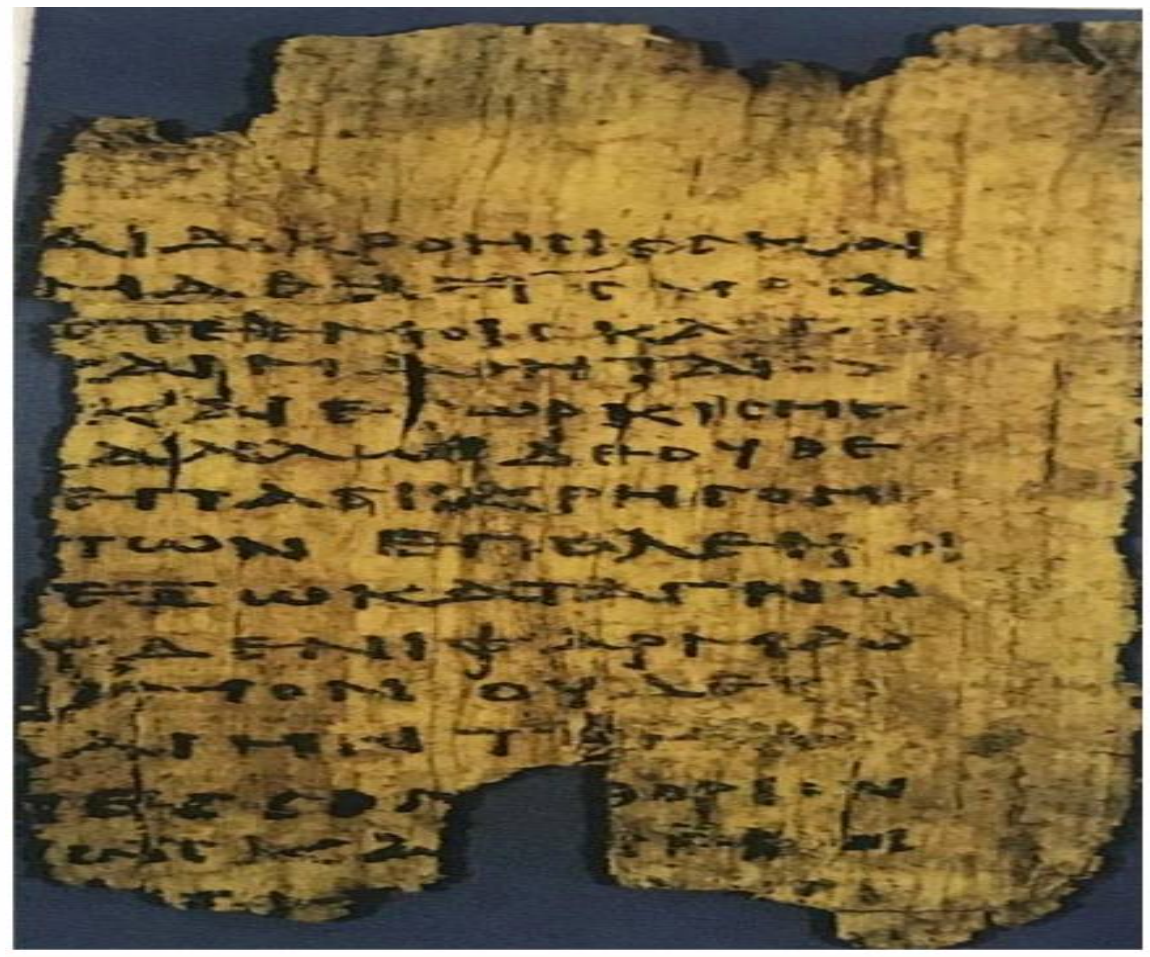


3. Identify the image ? What is the person called who wears this ?

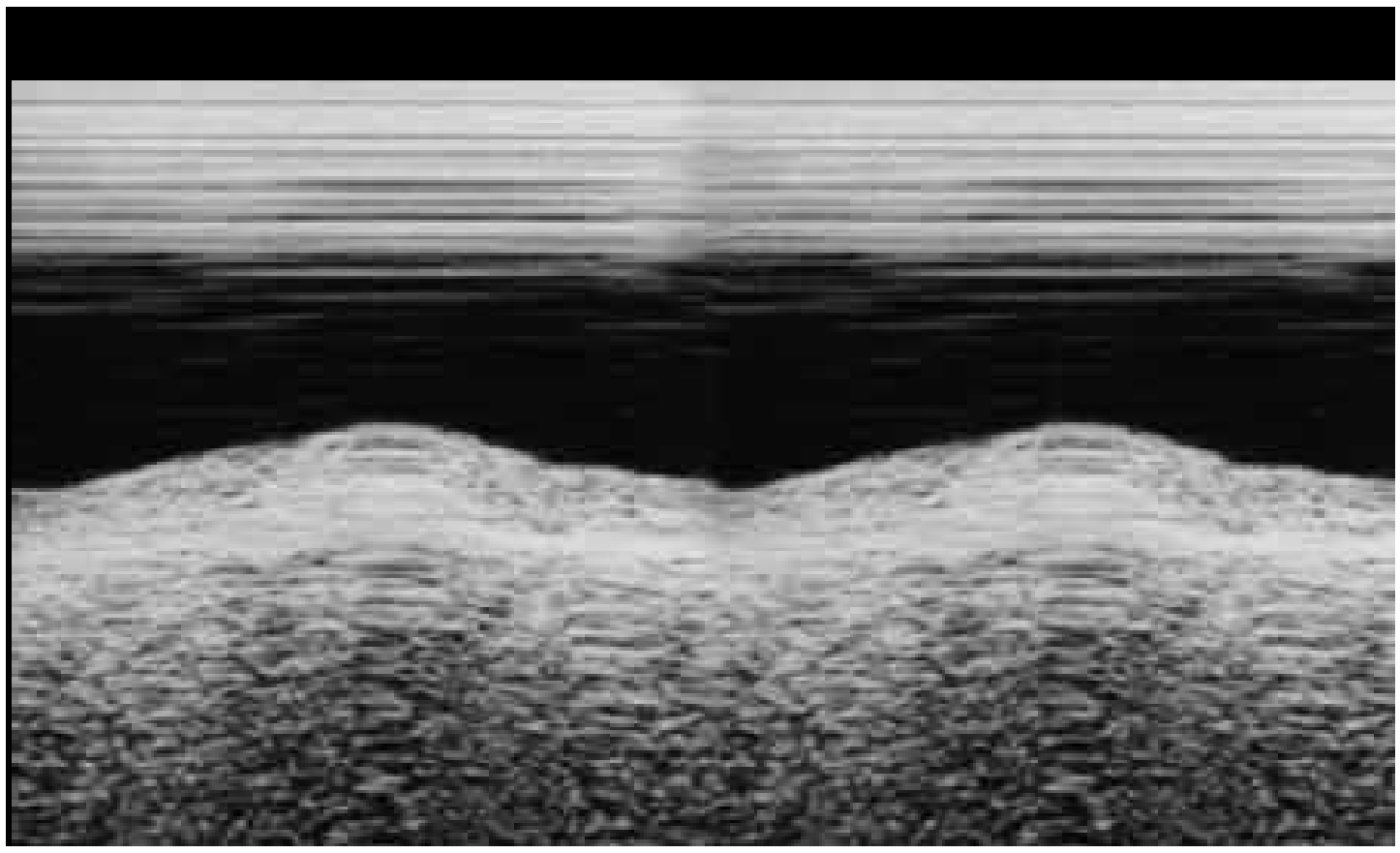
4. These are part of a machine which is shown to be a life saver during Covid pandemic. What is the machine?



5. Identify the image below and state its significance .



6. Interpret the image below and the name of the sign.



7. Following are the criteria for diagnosing Cardiogenic Shock except :

a. Systolic BP < 90 mmHg
b. MAP < 65 mm Hg
c. Cardiac Index < 1.8 L/min/m2
d. Left ventricular end-diastolic pressure < 18 mmHg
e. Pulmonary Capillary Wedge Pressure > 18 mmHg

8. 75 year old Man underwent CABG. Post op day 2- patient developed hypotension, oliguria, tachycardia. PAC data showed PAP 15/6 mmHg, CVP 7 mmHg, PAWP 5 mmHg, Cardiac Index 1.4L/min/m2 and SVR 2800 dyne/sec/cm5. Most probable diagnosis is:

a. Pulmonary Embolism
b. Cardiac Failure
c. Cardiac Tamponade
d. Sepsis
e. Hypovolemia

9. Which of the following modality of RRT uses all the principles of convection, diffusion and ultrafiltration?

a. SCUF
b. CVVH
c. CVVHDF
d. CVVHD
e. SLED

10. Which one is T ?

“CONSORT” is a reporting guideline for;
a. Meta analysis
b. Diagnostic studies
c. Observational studies
d. Randomized Controlled Trials

ANSWERS FOR THE QUIZ (JULY - AUG) ISSUE

Q1- Name 2 diseases against which a post-splenectomy patient should be vaccinated?

A- Pneumococcal
HiB
Meningococcal C
Influenza

Q2- Which year was the first Rabies vaccine administered in humans?

A- On 6 July 1885, Joseph Meister became the first human being to receive rabies vaccination. While the disease still exists, this event marked the beginning of the modern era of immunisation

Q3- What device is this ?

A- Hingson Peace Gun.
It is a high-speed jet injector, which can deliver precise dosages of medications, including local anesthetics and vaccines. The economy and speed of the jet injector enabled mass-immunization projects, which were introduced in 1956. Two years later, Dr. Hingson established the Brothers' Brother Foundation to provide this service in Asia, Africa and Latin America. It has been estimated that over 900 million people world-wide received jet-injected inoculations against such diseases as cholera, diphtheria, polio, smallpox and typhoid.

Q4- To which animal do humans owe their lives?

A- Horseshoe Crab

Limulus amebocyte lysate or LAL is extracted from horseshoe crab blood to test vaccines and medical devices to ensure they are free of pathogens.

Horseshoe crabs do not have an immune system and can not produce antibodies, therefore they have microbes that produce LAL which disables invasive bacteria or viruses by clotting around them. So vaccine/ any product is added to the blood and if there are no clots, it is safe to give.

Q5- Identify and mention the most important contribution to medical science

Ans- Anna Wessels Williams. Along with William H Park, discovered the Park-Williams bacillus, a diphtheria antitoxin which helped to eradicate the disease.

Q6 – Why was this stamp released ?

Postage Stamp released in 1999 for promoting Immunization and Commemorating Sir Edward Jenner. The image ‘on the cow’ is that of Edward Jenner, the father of vaccination, inoculating James Phipps, an eight-year-old boy with cowpox.

Q7- Which disease requires yearly vaccination?

A- Influenza

Q8- Innate immune cells such as neutrophils show higher activation in females than in males in response to some viral infections. True / False.

A- True

Q9- What is immunosenescence?

A- The changes that occur in the immune system that occur with age is called Immunosenescence – mainly progressive deterioration leading to increased susceptibility to infection, cancer as one gets older.

Q10- What does ‘C’ in CRP stand for ?

A- The name CRP arose because it was first identified as a substance in the serum of patients with acute inflammation that reacted with the "c" carbohydrate of the capsule (capsular polysaccharide /C-polysaccharide) of pneumococcus.