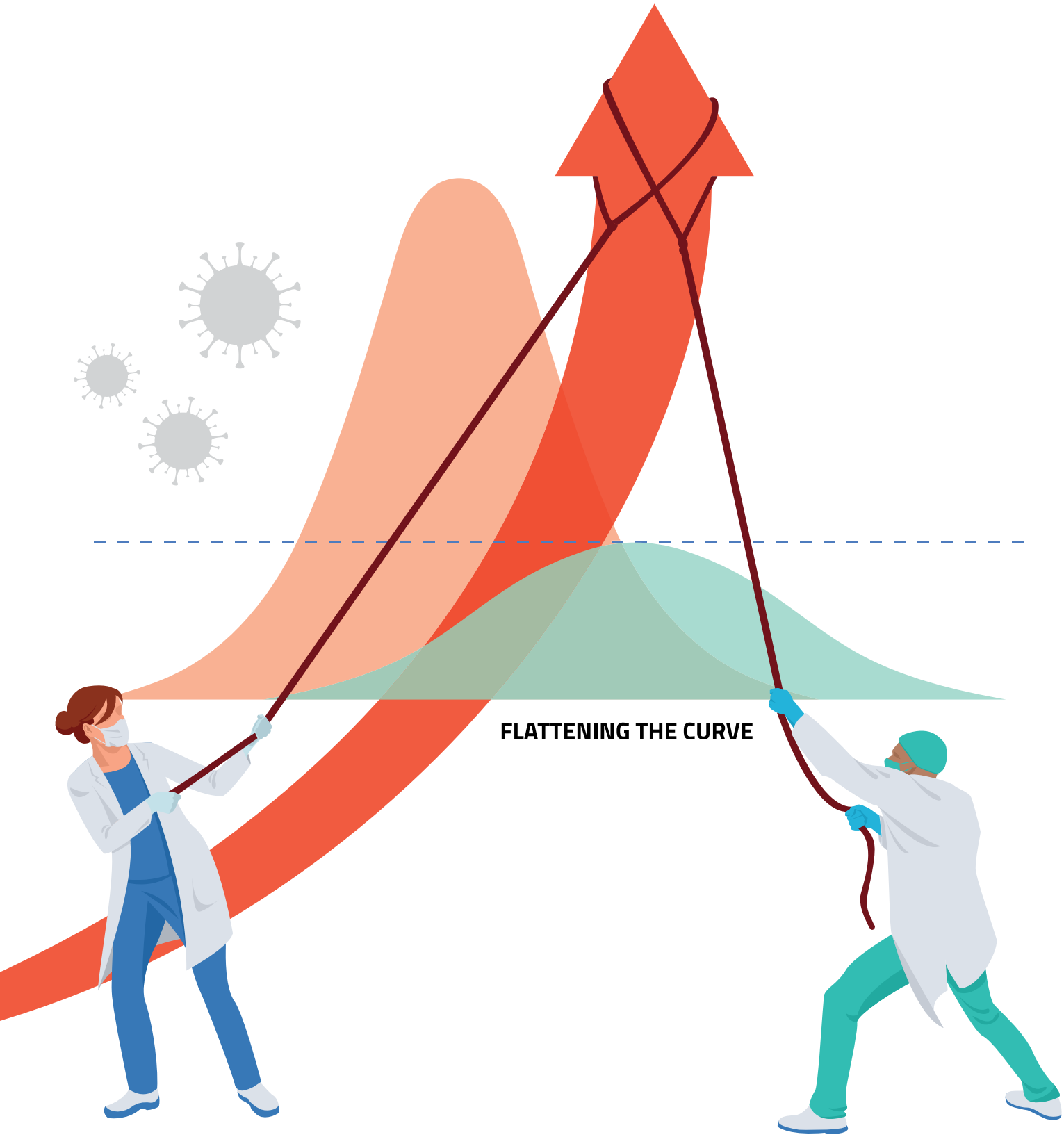
Aster DM Healthcare

Strategic Response to COVID-19 Through Active Risk Mitigation



JUNE 2020

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INTRODUCTION

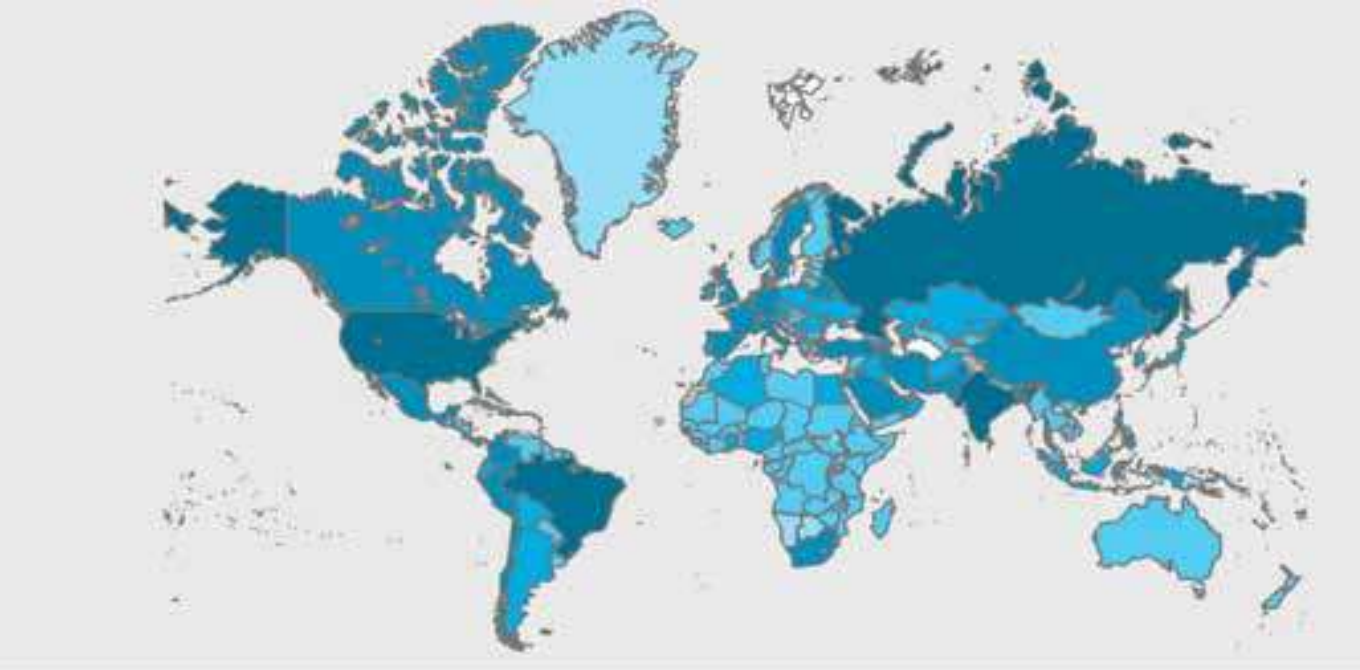
The 2020 COVID-19 Pandemic has made society and the global economy volatile, uncertain, and ambiguous, even though high levels of preparedness have been developed for the situation. Late 2019, and early 2020, when the Coronavirus outbreak was limited to China, there was little expectation that it would grow to such pandemic proportions. No aspect of life, including business ventures, has been left untouched by this scourge. While the world stands still due to the COVID 19 pandemic, the impact that this disease has had on healthcare systems in various countries has been profound. Healthcare organizations, along with government functionaries from across the country, have delved into innovative ways to battle the disease, and have devised policies and protocols to ensure continuity of care and therapy for both COVID and non-COVID patients, within the ambit of safety for both patient and healthcare workers.

This paper provides a case study of how ASTER DM Healthcare handled the COVID-19 situation, to keep afloat both clinical and operational functions while ensuring the safety of healthcare workers. This was achieved by adopting new protocols based on updated scientific information and guidance from thought leaders across the Aster Group, which enabled the leadership team and staff at Aster to plan and respond swiftly to the daily dynamic uncertain environment created by the COVID-19 onslaught.

OBJECTIVES OF THE WHITE PAPER ON COVID 19 STRATEGIC PREPAREDNESS AND RESPONSE PLAN

1. It provides an insight to the reader on how Aster DM worked towards establishing best practices within the healthcare scenario and act as a foundation for action if the future again inflicts similar challenges.
2. Ensure continuity of clinical and operational functions, albeit within the ambit of safety and mitigation of the risk of cross-infection for patients and health care workers.
3. Create a base document that records the futuristic approach for handling emergency and elective cases with new protocols during this new "normal" COVID era.
4. Share the arduous journey of almost three months, which paved the way for new learnings, to make Aster DM battle-ready in these uncertain times.
5. Implementation of a top-down approach for clinical and nonclinical staff to stringently follow the new rules of engagement in the workplace, based on the three pillars of safety- hand hygiene, social/ physical distancing, and universal masking (along with adequate PPE).

This journey has been arduous, and fraught with uncertainty and unprecedented business challenges, but has been fought on many fronts with passion and indomitable spirit by the team at Aster DM.



Our widespread presence in different geographies paved the way to our learning in such a challenging scenario and helped in sharing the best practices in the delivery of care to those in need

IMPACT & COVID PREPAREDNESS

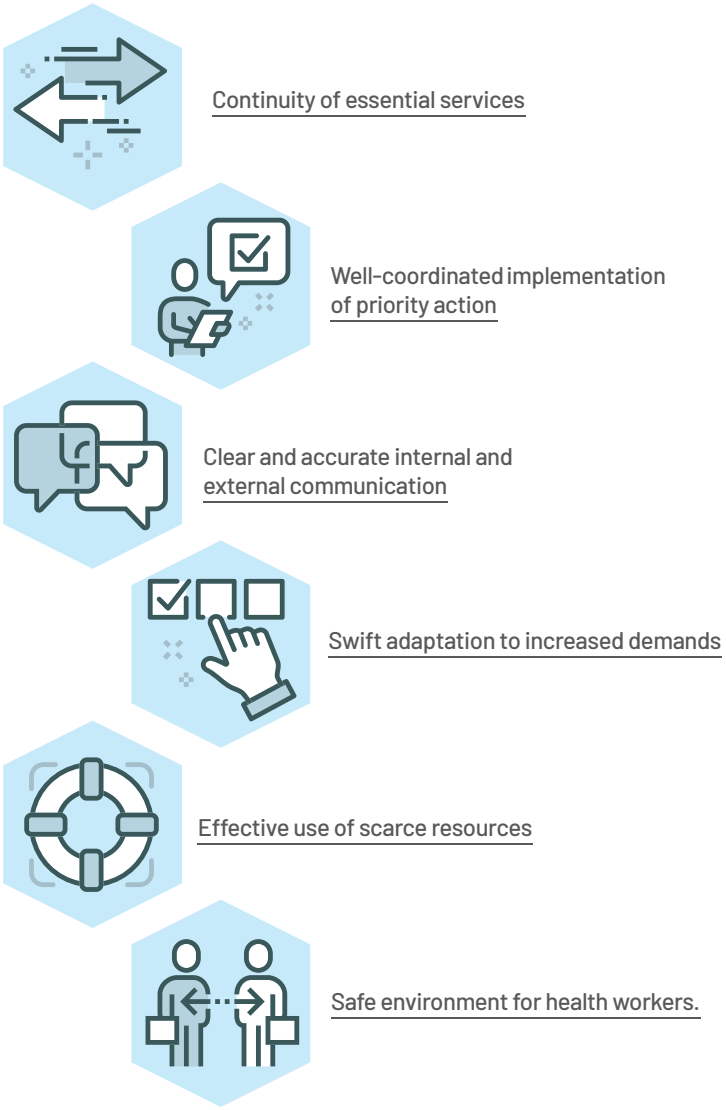
An outbreak of the respiratory disease was reported from Wuhan, a city of 11 million people in China, on 31st December 2019. The causative agent was discovered in January 2020 to be a novel enveloped ß-coronavirus of the same sub genus as SARS-CoV,1 and has been named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) also called Coronavirus disease 2019 (COVID-19).2 Novel Corona Virus (SARS CoV2 / COVID-19) is a highly contagious infection and has been declared as a pandemic by the World Health Organization. It is important to be vigilant about the spread of the disease and be able to provide the rapid implementation of outbreak control and management measures. The lack of a proven treatment and vaccine as well as the high vulnerability of hospital staff makes it imperative to have guidelines as to how we can protect our staff.

Hospitals are complex and vulnerable institutions, dependent on crucial external support and supply lines. Under normal working conditions, many of our hospitals frequently operate at near-surge capacity. Consequently, even a modest rise in admission volume can overwhelm a hospital beyond its functional reserve. Well-established partnerships with local authorities, service providers (e.g. of water, power, and means of communication), supply vendors, transportation companies, and other organizations are required to ensure the continuity of essential services.

During the current outbreak of COVID-19, well-prepared health facilities are at the center of an effective response. The rapidly evolving outbreak requires all hospitals to be able to adapt to a swift increase in demands while continuing to ensure safe environments for health workers. All hospitals need to take precautions against potential interruptions of critical support services and shortages of equipment and supplies. This document aims to provide a Risk Assessment and mitigation strategy based on lessons learned from Aster DM Healthcare Hospitals in India & GCC.

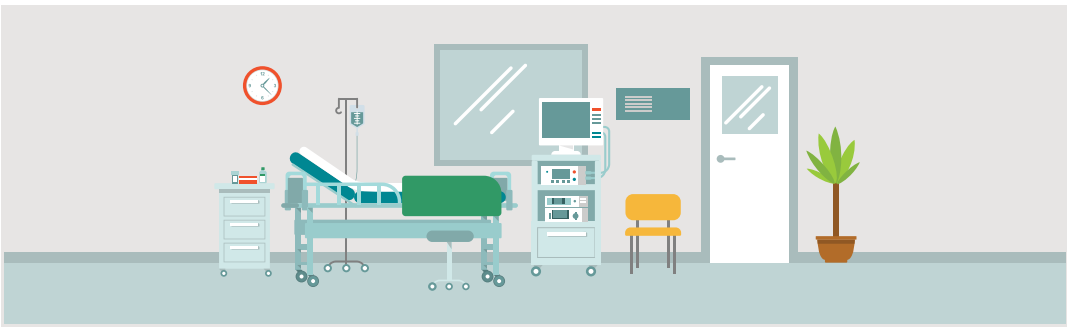
Also, a high rate of staff absenteeism can be expected. A shortage of critical equipment and supplies could limit access to needed care and have a direct impact on healthcare delivery. Panic could potentially jeopardize established working routines. Even for a well-prepared hospital, coping with the health consequences of a COVID-19 would be a complex challenge. Despite the difficult demands and obstacles foreseen, the proactive and systematic implementation of key generic and specific actions facilitated effective hospital-based management during a rapidly evolving pandemic.

The benefits of an effective, Preparedness and response plan include



Hospital emergency preparedness is a continuous process that needs to link to the overall national preparedness program of the country in which the hospital operates. Many of the principles and recommendations outlined in this document are generic and applicable to other contingencies. This document is intended to complement comprehensive, all-hazard, multi-sectoral hospital emergency preparedness planning programs and not replace them.

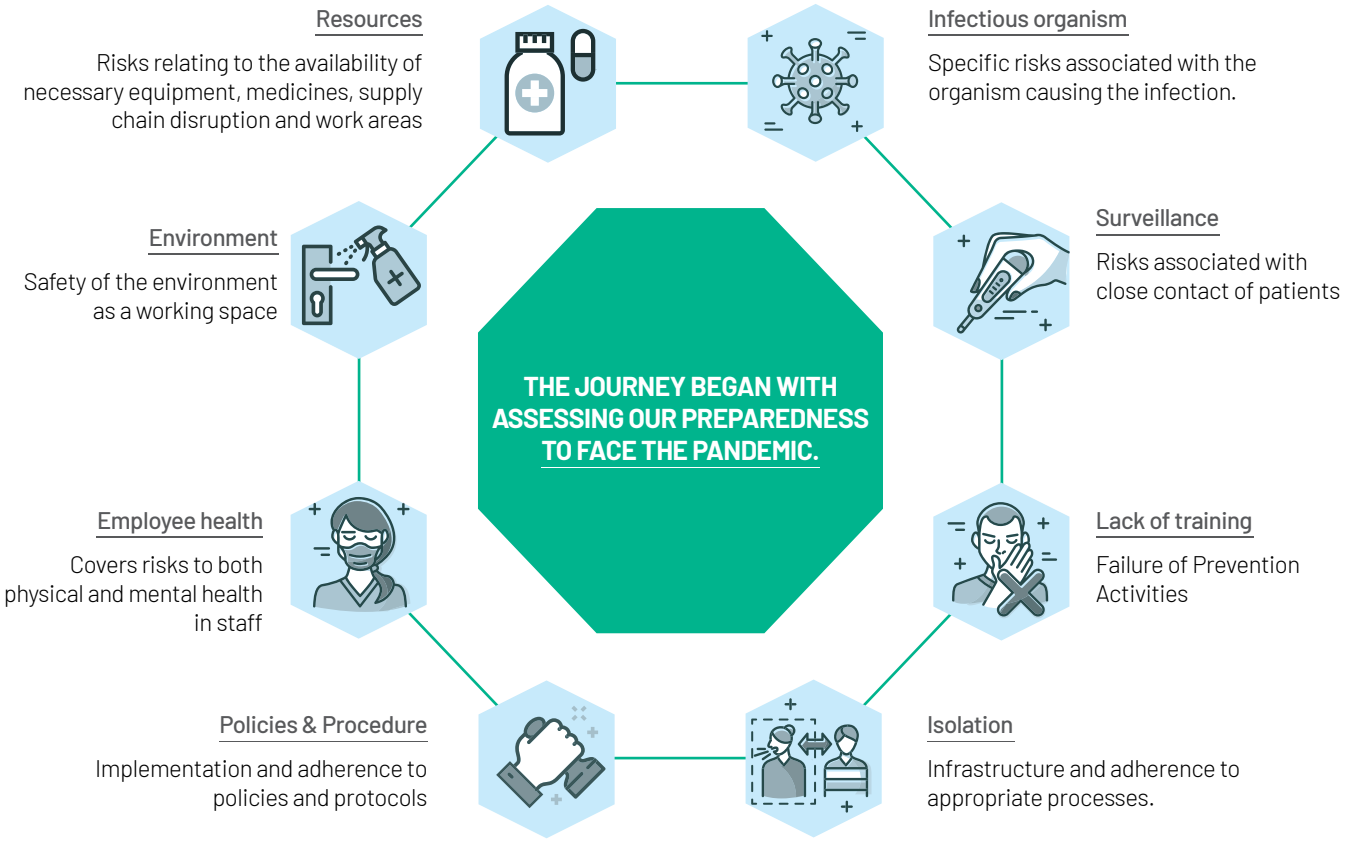
Process Flowchart - Aster DM Command Center

	WHY	WHAT	ACTIONS STEPS			
			a	b	c	d
PURPOSE AND CORE COMMITTEE	To provide immediate response to COVID19 Pandemic and identify responsibilities of individuals and departments and initiate action **3 LEVELS:** EXCOM - CHQ Executive Council Vertical Executive Committee Unit Level Incident command center/ -Task Force HOD ID & CEO (India) part of the National Task force *India Unit CEO's part of the District COVID management task force Deputy Managing Director Member of CHQ Exe. Council appointed representative at National Level Task Force–DHA* constituted by Niti Ayog for sharing of best practices in management of COVID 19	**Objectives:** 1. To identify the level of risk and impact on organization/each Business vertical/ community 2. To initiate disaster management plan for the Business Unit hospitals to combat COVID 19 3. To respond & minimize the danger allow the most effective utilization of available resources 4. To provide support to the community and government	Review risk at each location and develop immediate and back up mitigation strategies according to situation. Identify high risk units provide immediate response to deal with COVID19 Pandemic. Initiate resource stockpiling and the identification of priority units for receipt of these	Identify resources –manpower, supplies, and infrastructure capability. Form Emergency task force at all units and initiate trainings on infection control and required specialized training in clinical management of COVID 19 patients, Coordinate technical aspects. Open alternate care sites if required working with health authorities	Ensuring preparedness/ implementation of safety standards/ protocols laid down by health authorities for COVID 19 surge. Support and handle staff queries to reduce/ avoid panic, Provide emotional and professional support	Provide timely information to stakeholders Work alongside authorities. Support organization and community in convalescing from COVID 19
						
TIMELINE	Incident command centres activated by GCMO on 31 Jan 2020	**Schedules:** Unit Level: Daily Executive; Vertical Level Daily; CHQ- Council: Biweekly	**Schedules:** Unit Level Daily; Vertical Level Daily; CHQ-Executive Council: Bi-weekly/ Immediately on very urgent matters	Immediate action as per risk identification Unit Level: Daily; Vertical Level Daily; CHQ-Executive Council: Biweekly	Ongoing /Immediate Unit Level: Daily; Vertical Level Daily; CHQ-Executive Council: Biweekly	As per situation report. Unit Level: Daily; Vertical Level Daily; CHQ-Executive
ACCOUNTABILITY	Incident commanders at all levels	Incident commanders at all levels	All members of emergency and disaster management committee			

RISK, MITIGATIONS & STRATEGIES

WELL-PREPARED HEALTH FACILITIES

Well-prepared health facilities is the key to saving the lives of COVID-19 patients. Preparations have been well done for global outbreaks and disasters in our system with our knowledge & experience from Kerala floods and the Nipah virus outbreak. On 30 January 2020, a public health emergency of international concern was declared by the World Health Organization (WHO). We activated our incident command centers across the group and carried out a rapid risk assessment. The overall objective was to strengthen the preventive action to reduce COVID-19 risk and enable Aster to take a timely and useful response. Priority measures were identified based on significant references like WHO, CDC, and national guidelines. An executive council was established to cascade our business units with effective strategic plans.



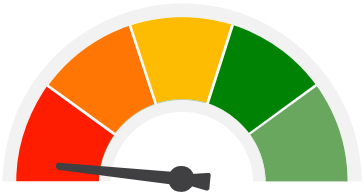
Under each of the 8 elements described above, the core departments scored were:
ER, HR, Radiology, Outpatient department (OPD), ICU, Laboratory, OT, Wards, CCU, Mortuary, Stores, and Pharmacy.

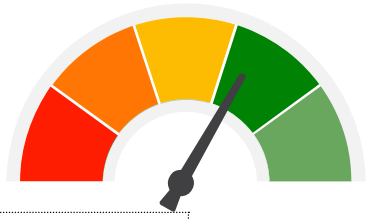
The probability, the severity of impact and system preparedness for each event were scored on a scale of 1-5 as per the

Likelihood	CONSEQUENCES				
	1 - MINIMUM No injuries/ minimal financial loss	**2 - MINOR** First aid treatment/ medium financial loss	**3 - MODERATE** Medical treatment / high financial loss	**4 - MAJOR** Hospitable / large financial loss	**5 - FATAL** Death / massive financial loss
5 - ALMOST CERTAIN Often occurs / once a week	5	10	15	20	25
4 - LIKELY Could easily happen / once a month	4	8	12	16	20
3 - POSSIBLE Could happen or known it to happen / once a year	3	6	9	12	15
2 - UNLIKELY Hasn't happened yet but could / once every 10 years	2	4	6	8	10
1 - RARE Conceivable but only on extreme circumstances / once in 100 years	1	2	3	4	5

Fatal (>15) | High (10-15) | Moderate (4-9) | Minimum (1-3)

The average risk scores across all departments were in the range of 21 to 40. The six most consistently identified risks across departments and their total scores and actions are shown below.

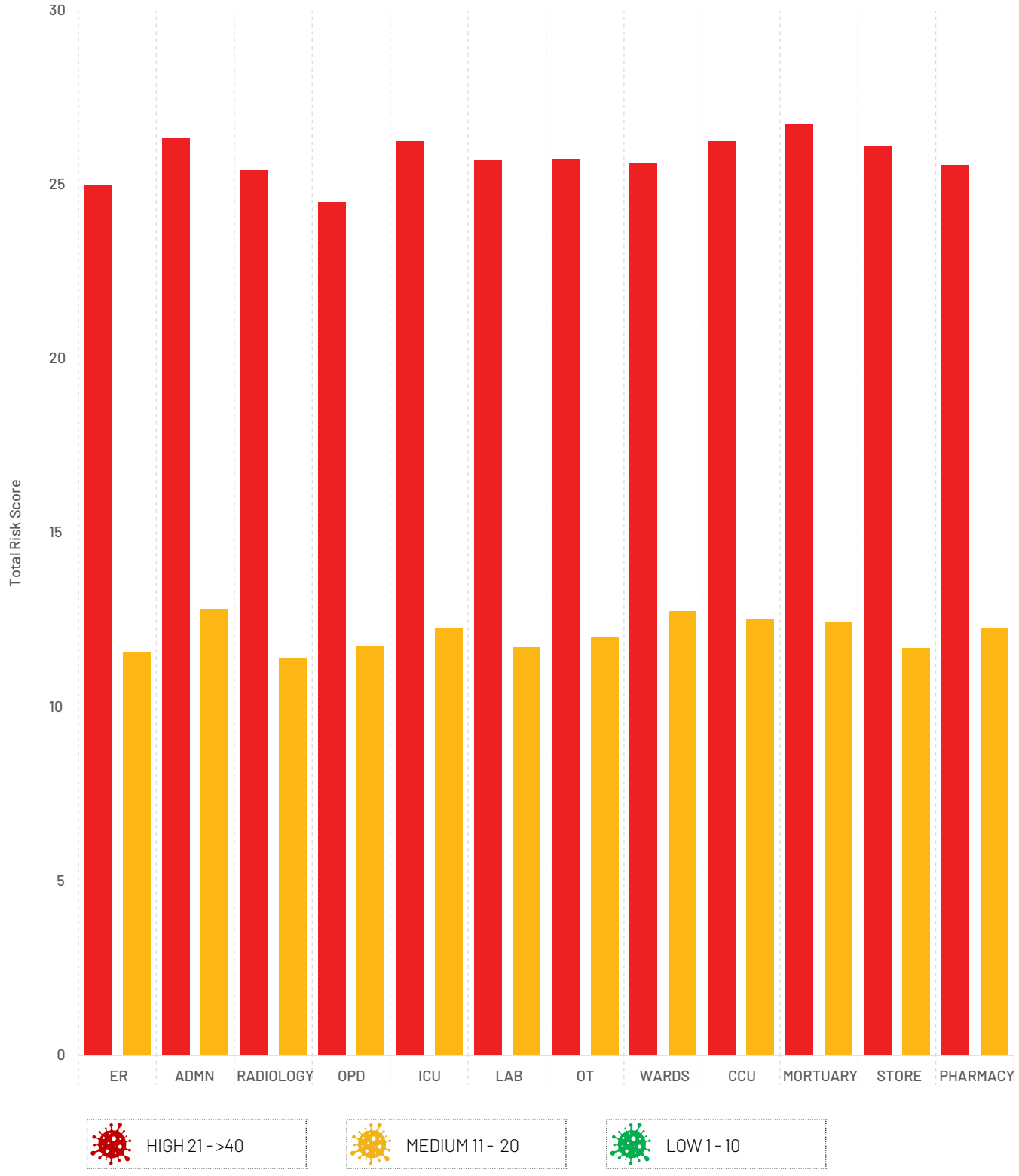




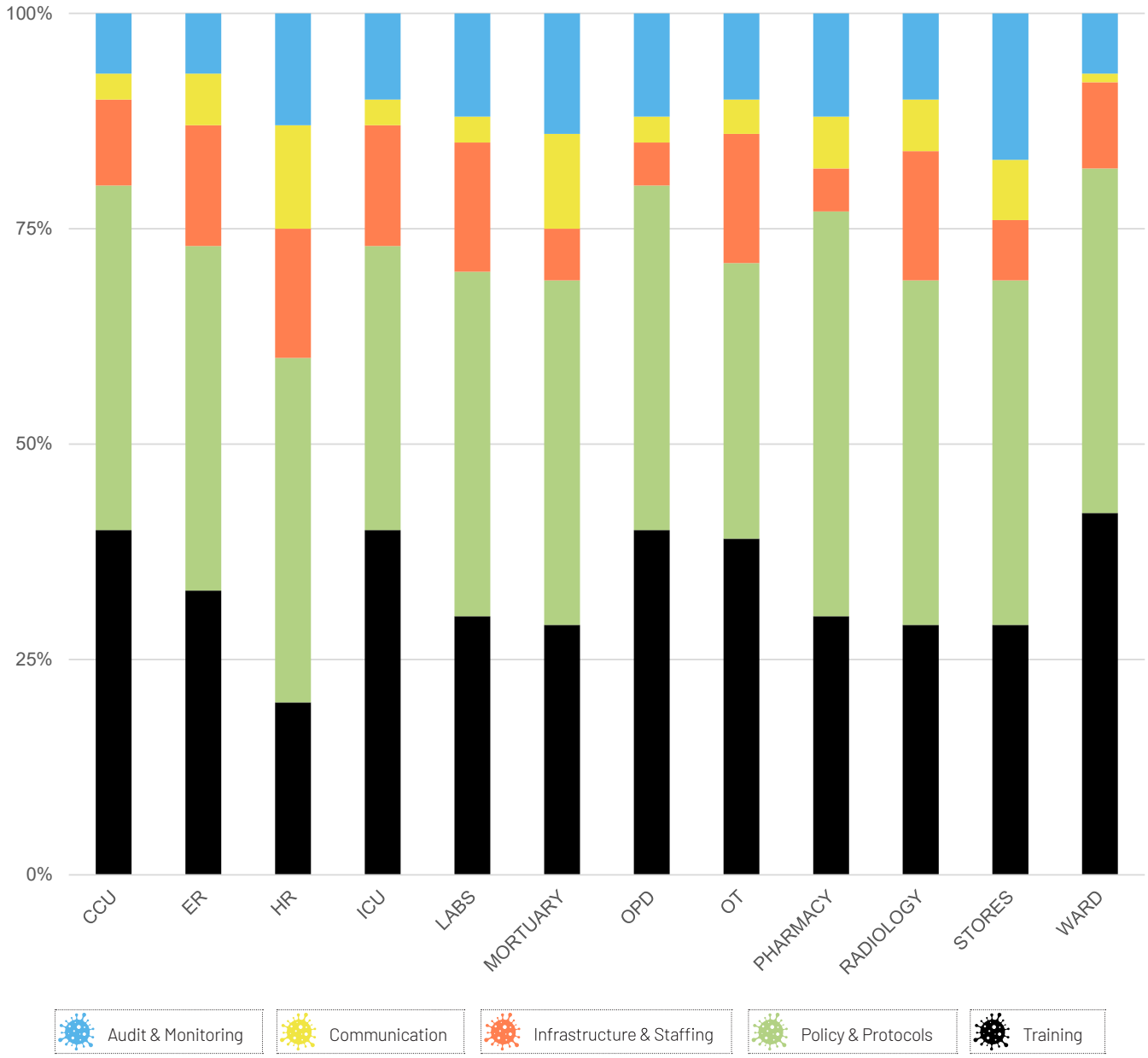
HIGH 21 - >40 | MEDIUM 11 - 20 | LOW 1 - 10

PRE-IDENTIFIED RISK (32-40)	POST-RISK REDUCTION METHOD (12-16)
Inadequate critical care staff	Competency upgrading and up-skilling programs
Lack of staff education in COVID prevention measures	Education programs and awareness strategies
Improper use of PPE	Policy and protocols for the proper use of PPE
Transportation protocol	Transport measures to prevent spread and transmission
Work Culture	Work from Home
Fear of transmission of virus among staff and their families	Communication strategies to encourage reporting of concerns, psychological support

DEPARTMENT WISE REDUCTION IN RISK SCORES



The focused mitigation strategies were staff training, new or revised protocols, infrastructure, staffing, communication, audit, and monitoring. The percentage contribution of the focused strategy is depicted in the graph below:



Medium risks were further identified in some areas following the audits. The mitigation strategy focused on staff education. Also, methods to expedite the diagnosis and circumvent the delays in PCR test results were implemented.

KEY MEASURES TAKEN TO COMBAT SPREAD

CLINICAL EXCELLENCE

As the COVID-19 situation is rapidly evolving, Aster focused on developing clinical guidelines for healthcare workers in concurrence with international organizations like WHO, CDC etc. The clinical excellence was achieved by implementing updated guidelines which were constantly shared with healthcare providers in order to achieve the best patient outcomes. Our COVID dashboards helped us to monitor our outcomes and at the same time, providing insight into improvement strategies in patient care.

MANAGEMENT OF COVID CASES AT THE FIRST POINT OF CONTACT

THE EMERGENCY ROOM (ER)

On 30th January 2020, the WHO declared COVID 19 a public health emergency which soon evolved into a pandemic. From the early days of this disaster, Aster DM has been working tirelessly with the local authorities to prepare its response to the disease.

One of the major elements of the response was the set-up of more than 4 facilities with a total capacity of 800 plus beds which helped control the spread of the virus. Meanwhile the hospitals stopped their elective activities and focused almost entirely on the management of the suspected and confirmed cases.

The COVID response team in hospitals decided to dedicate the emergency departments to the management of suspected cases and the wards and ICUs were dedicated to the management of confirmed cases. As a consequence, the more severe cases were taken directly to the wards or the ICUs and the number of severe cases seen in the ERs remained very low. The vast majority of the patients who attended the ER's were suspected cases that needed a confirmation or confirmed cases who required screening before isolation. Most of them were clinically well.

Despite this organisation the ERs received a few severe cases and the level of response was exemplary.

Few cases have been highlighted to showcase the quality of the emergency response:

CASE NUMBER 1

A 62-year-old male patient was admitted in one of the isolation hotels, having been referred directly by DHA. The patient did not have any identified risk factors other than being over the age of 60. He was not obese and had no co-morbidities identified at the time. He tested positive for COVID 19 after a period of persistent cough and fever. 12 hours after admission he was found to be hypoxic on room air and was promptly transferred to the ER . On arrival, he was found to be conscious and responsive, patent airway, breathing at a rate of 24 per minute, saturation on room air was 70% and only reached 85% with 10 liters of supplemental oxygen delivered via a non-rebreathing mask. His cardiovascular parameters were within normal limits and stable with a pulse of 71 bpm and a BP of 128/62. His GCS was 15 with no neurological deficit. An arterial blood gas showed a respiratory failure of type 1. A chest X-Ray showed a picture evocative of atypical pneumonia compatible with corona virus.

The patient was immediately referred to ICU for further investigations and management. The NIV was not started in the ER due to the speed at which the patient could be moved to a more appropriate environment given the risk of contamination of staff that is associated with the procedure.

The patient was successfully managed conservatively in ICU without intubation before being discharged home.

This case highlights the excellent level of teamwork that was displayed throughout the COVID crisis . The coordination and communication between the different teams (hotel staff, ambulance team, ER and ICU staff) was excellent, and ensured permanent safety for the patient and the members of staff in spite of the challenging circumstances.

CASE NUMBER 2

A 67-year-old male patient was brought to the ER by national ambulance in cardiac arrest. The patient was a confirmed case of COVID who was in self isolation at home and was known to suffer from diabetes, hypertension and cardiac failure. The staff members were pre alerted and had enough time to get prepared and were wearing full PPE when the patient arrived. The patient presented a trismus which was probably an early sign of rigor mortis. He was managed following the ACLS protocol for 40 minutes with continuous CPR and adrenaline on alternate cycles, before he was declared dead in view of the lack of response to the resuscitative attempt.

Despite the poor outcome, this case highlighted the level of preparedness of the all the emergency staff members. The case was managed calmly and professionally in full respect of staff safety measures, by the means of PPE. There was no precipitation and every step of the ACLS protocol was followed without failure.

These two examples demonstrate that, after weeks of training and with the help of the infection control team, internal medicine and intensive care, the ERs have been able to safely manage critical cases in the most professional manner.

Despite the constantly growing feeling of anxiety, and despite some serious technical challenges posed by the nature of the infectious agent, the team has shown a real level of maturity in this unique crisis management.

MANAGEMENT OF CRITICAL CARE PATIENTS IN PANDEMIC- THE ASTER DM EXPERIENCE

1st part under Medcare Hospital

Medcare Hospital partnered with DHA in March 2020 and we started preparing the critical care unit to accommodate and manage such cases by increasing the number of rooms with negative pressure.

As we strongly believe that stop is at the start we immediately took measures to prevent and limit transmissions between the hospital staff, and protect the healthcare workers in accordance to the international and national COVID-19 precautions guidelines. This included the availability of PPE and proper use and disposal of the protective equipment. Continuous education and close communication with the infection control team have been at the core of the initial phases of our plan of facing the pandemic.

We formulated and set up guidelines and protocols derived from the recommendations of surviving sepsis guideline 2020 - special edition for COVID, world health organization

THE LEARNING PHASE

2nd part under Medcare Hospital

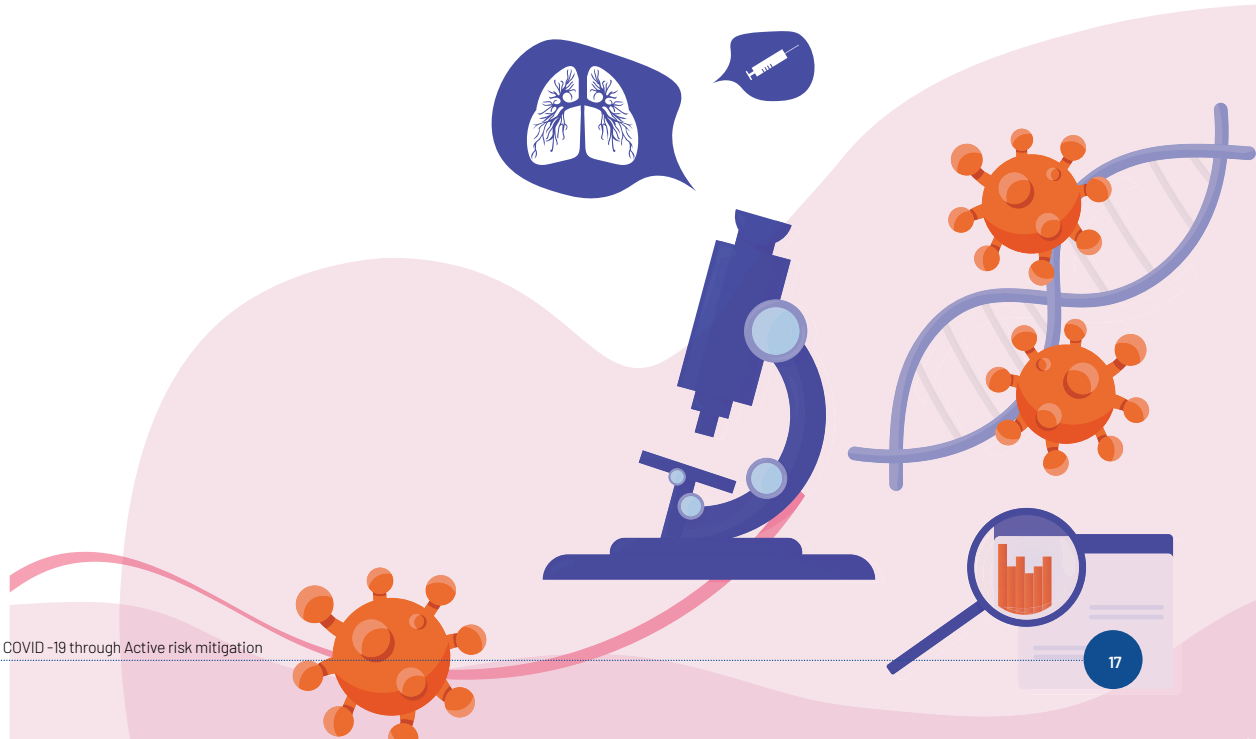
We soon started receiving cases from different nationalities. We have noticed that we have a considerable higher number of male patients compared with female patients, most of them between 30 and 60 years old. But this observations have to be taken in the context of Dubai's special demographic (higher number of male residents, most of them young or middle aged)

Most of the patients presented with complaints of fever and some degree of difficulty in breathing. We observed that a significant number of patients presented with low Levels of PaO2 and SpO2 without clinical signs, symptoms, or visible distress - silent hypoxia.

Most of our patients showed worsening of the symptoms in the second week of disease, many times after a few days of improvement, which can give a false sense that patient is starting the recovery phase. This second phase of the disease is when most of the critical care patients end up on ventilator. A small percentage of those in respiratory failure are improving on NIV, thus we chose to initially give a trial for most of our patients with noninvasive support if tolerated before going for intubation.

Once the patient had an ET tube in place we faced one of our biggest challenges, which was sudden ET tube blocks with large clot and necrotic tissues. Despite daily proper suctioning (closed and opened) on the ET tube, the high majority of patients required ET tube to be frequently changed due to acute blockage with clots (in some cases more than once per day). In our ICU all ventilated patient have been started on heparin nebulization and this therapy seems to offer some decrease in the need for change of ET tubes.

Although all specific ARDS ventilation recommendations have been used, we have soon realized that this is not the "classic" ARDS picture with stiff lung that we are facing, as there was not a requirement for high plateau pressures to obtain satisfactory tidal volumes (6-8 ml/kg), but despite the high volumes, patients remained severely hypoxic even at very high PEEP and hypercapnic, (situation associated more with pulmonary embolism). Prone position offered some relief in patients with refractory hypoxia (it has to alternate with supine every 8 to 10 hours).



For the patient that required prolonged ventilation we opted for percutaneous tracheostomy which made it easier to deal with recurrent tube blockage, and difficult weaning mainly due to hypercapnia.

We have noticed that intensive chest physiotherapy is worsening the patient's ventilation, thus we opted for mild or no chest physiotherapy in the initial phases of the disease in critical patients and to return to usual physiotherapy in the recovery phases.

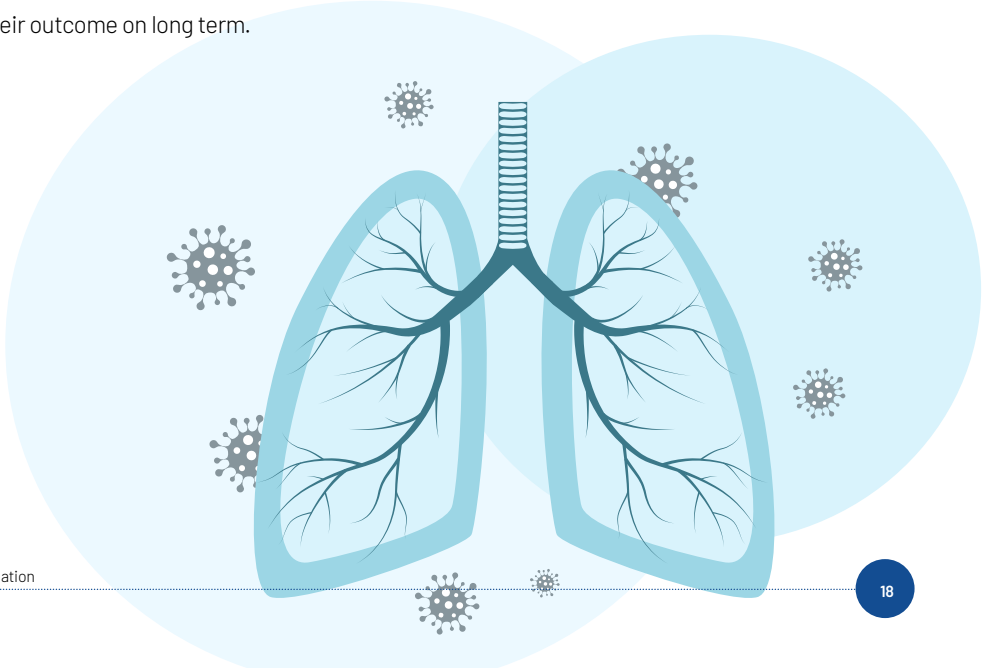
Though this masquerading virus was affecting the oxygenation and ventilation of the patient, it gave us more challenging complications such as thrombotic events like ACS ischemic stroke, acute tubular necrosis and pulmonary embolism. A considerable percentage of our patients were developing myocarditis and acute coronary syndrome pictures. Thus all our patients have been started on enoxaparin therapeutic dose and Aspirin. After this protocol had been put in place it was noticed that there was a decrease in the thrombotic complications. In one case in which Thromboembolisation was required for acute MI, a significant improvement in ventilation was noticed, but unfortunately only for 24 hours after the therapy.

We have also noticed that all patients admitted in ICU have very high levels of D dimers, Ferritin, CRP. The D- dimers levels were found to be between 3000 and more than 30000, and it looks like there is a direct correlation between this lab levels and course of the disease. Trombocytopenia have been also noticed, but only mild to moderate decrease of platelets levels. In one case in which thrombolization have been required for acute MI, it have been also noticed an improvement in ventilation. Among dyselectrolytemias Phosphate levels have been found to be low in almost all critical COVID 19 patients.

OUTCOMES

3rd part under Medcare Hospital

It has been noticed that patients recovering from severe form of the disease are left with Chronic/ permanent lung damage. Most of the patients that have recovered from moderate/ severe ARDS form of COVID 19, have been discharged with radiological images suggestive of lung fibrotic changes from mild to extensive. In one particular case, the changes were accompanied by the presence of emphysema and large bullae which complicated with spontaneous pneumothorax. There is need in following with the patients in the future and asses their outcome on long term.



MANAGING THE CORONA VIRUS INFECTED PATIENT

- In accordance to the surviving sepsis guidelines, we started general management like any other septic patient . Although we were initially following the fluid restriction recommendations, we have soon decided to use the initial fluid resuscitation as per patient needs in hemodynamically unstable patients, using minimally invasive cardiac monitoring and assessing patient's fluid responsiveness, followed by deresuscitaton when patient is out of the shock phase.
- Along with the specific support of functions, we included in our protocols virus specific management which included the use of antivirals as recommended by the national and international protocol. The anti-viral agents that were used included (Lopnavir/ritonavir, Favipiravir). Immunomodulatory drugs such as tocilizumab, have been also used in critical patients which showed some benefit.
- Managing the thrombotic complications of the corona virus was a challenge we faced every day. We used subcutaneous anti-coagulants (LMWH in the therapeutic dose). We used anti-platelets including (Aspirin and Plavix). We used NOACs (rivaroxaban) in stable COVID-19 patients with mild pneumonitis.
- Facing the ET blocks, we used heparin nebulizations with which showed some decrease in the frequency of changing ET tubes.
- Early tracheostomy showed a better outcome in patients on long ventilator time due to refractory hypercapnia.
- We used prone position for the patients with severe ARDS with refractory hypoxia. Some improvement in the oxygenation have been noticed

CONCLUSIONS

There are still many unknown aspects of the infection with SARS-Cov2 virus. This major knowledge gaps makes it dealing with critical patients with Covid 19 a special and unprecedented challenge. There is need in continuous adapting the current guidelines as new managements with a strong evidence base emerge and new therapeutic options are emerging.

B. SANAD HOSPITALS

MANAGEMENT OF THE CASES WAS CONCENTRATED ON THREE MAIN LINES OF TREATMENT:

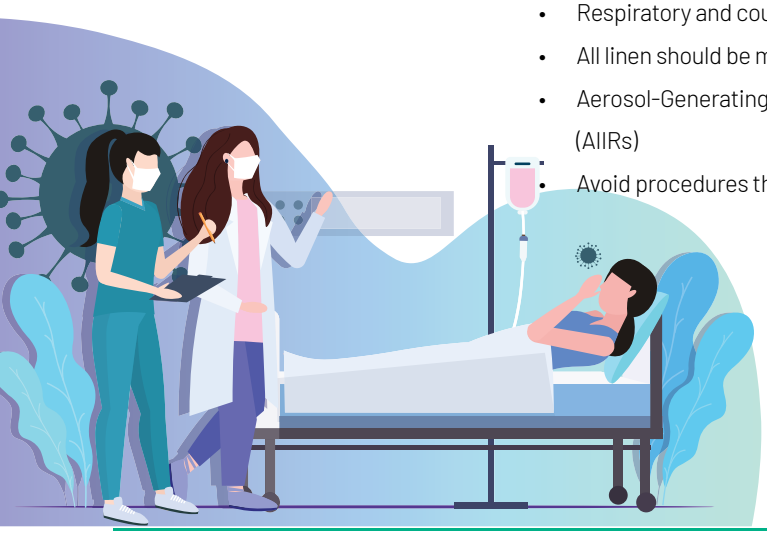
- Anticoagulation especially if D-Dimer is high.
- Anti-inflammatory especially if S. Ferritin and C-Reactive protein are high.
- Azithromycin as a routine antibiotic.
    - Awake active proning considered as a routine to improve oxygenation and even avoidance of intubation.
    - Hydroxychloroquine- was used as a routine initially for few weeks. As there were no changes in results
      (hospital and ICU LOS) subsequent patients who were not treated with Hydroxychloroquine. (Advised by local health authorities and WHO).
    - Treatment regimens needs evaluation on a long term basis to arrive at a conclusion at the ideal management plan.

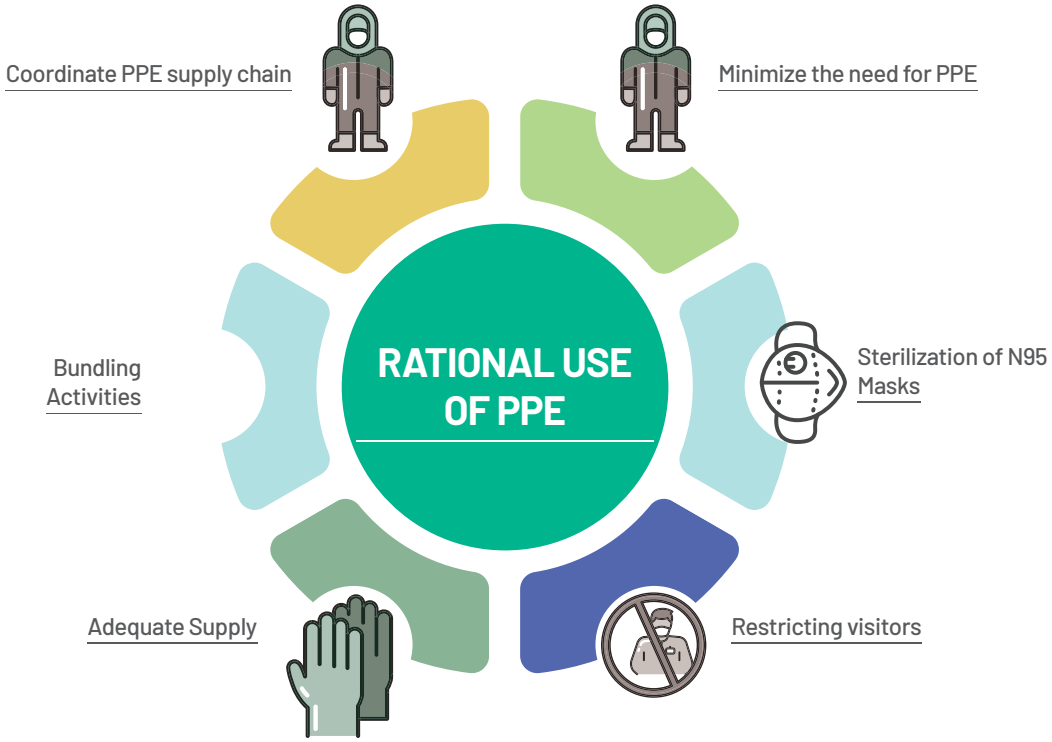
OUTCOMES

- Treatment protocol was determined as per the clinical needs
- No single medication (Anti-viral, hydroxychloroquine, steroids, etc) considered as effective.
- Even with using anti-viral (Lopinavir/Ritonavir) therapy (2 patients), there was no difference in days on a ventilator or even hospital length of stay.
- Thromboembolic incidence and presentation are very high.

GUIDELINES FOR INFECTION CONTROL

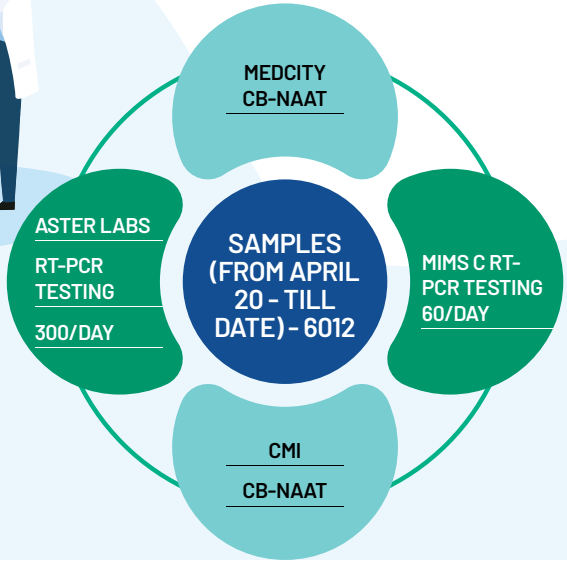
- Every patient to be treated as a potential asymptomatic infected case.
- Use standard precautions according to a risk assessment.
- Education and training to all HCP on the PPE to be used based on the risk of exposure.
- Respiratory and cough hygiene: To be followed by patients and staff.
- All linen should be managed as 'infectious'.
- Aerosol-Generating Procedures (AGPs) performed in Airborne Infection Isolation Rooms (AIIRs)
- Avoid procedures that induce cough





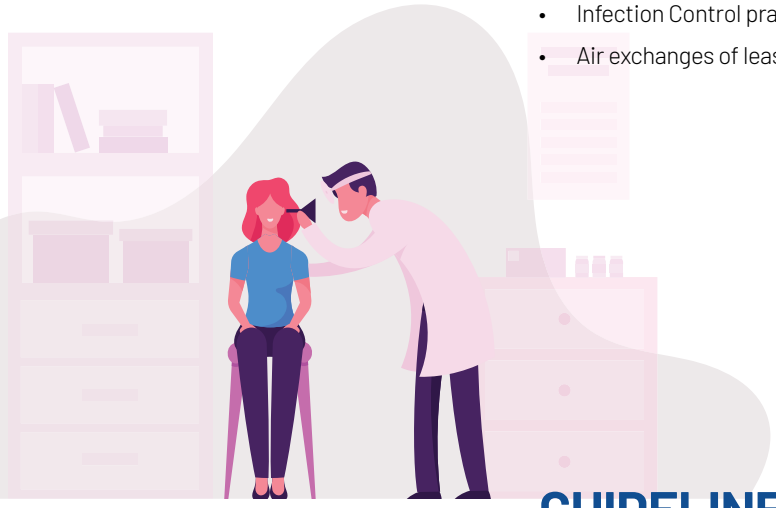
GUIDELINES FOR LABORATORY SERVICES

- All Samples treated with national laboratory standard guideline.
- Aerosol generating procedures - use a Class II Biological Safety Cabinet
- Barrier between the specimen and personnel.
- Inactivation methods before removal of a sample from the BSC.
- Use of sealed centrifuge rotors or sample cups
- Strict disinfection.
- Waste from patient specimens treated as bio hazardous waste



GUIDELINES FOR ENT

- High risk unit
- High number of upper respiratory airway illness
- High AGPs
- Infection Control practices- full PPE including N-95 masks
- Air exchanges of least > 12 per hour with additional HEPA filtration



GUIDELINES FOR RADIOLOGY DEPARTMENT

INFRASTRUCTURE

- Dedicated portable ultrasound scanner & X ray

PROCESS

- Procedures timed after busy hrs.
- Contrast to be loaded & kept ready
- Cleaning and Decontamination protocols – All equipment's
- To avoid masks with metal clips during MRI

STAFF & PATIENTS

- Screening of all patients
- Low risk patients (with any other acute illness) : use surgical mask, face shield plus full-length gown and gloves.
- No risk patients: Surgical masks

GUIDELINES FOR OBS AND GYNECOLOGY

SCREENING OF ANTENATAL PATIENTS

- Screening to be done for all pregnant women.
- High risk pregnant women should be placed in an isolation room.
- Those with mild or asymptomatic COVID-19 infection should delay antenatal visits and routine ultrasound assessments by 14 days.

ANTENATAL VISITS

- Reduce the number of hospital visits after discussing with the obstetric team.
- Tele consultation should be made available.
- The protocol for scanning to be adhered as per schedule

MANAGEMENT OF SUSPECTED CASES/CONFIRMED CASES

- Suspected, probable, and confirmed cases to be managed in a negative-pressure isolation room with minimum human traffic.
- All HCP to don appropriate PPE and follow equipment disinfecting protocols.
- Chest CT scan to be used as a primary tool for the detection of COVID-19.
- Aggressive treatment and support measures are to be given for severe pneumonia.
- For preterm cases requiring delivery, urge caution regarding the use of antenatal steroids for foetal lung maturation in a critically ill patient.

OTHER CONSIDERATIONS IN LABOUR

- Spontaneous onset of labour: protocols to be followed.
- Both regional anaesthesia and general anaesthesia can be considered as per clinical scenario.
- The umbilical cord should be clamped promptly.
- Miscarried embryos/foetuses and placentae of COVID-19-infected pregnant women should be treated as infectious tissues and disposed off appropriately.
- There is no contra-indication to breast feeding.

OPERATIONAL EXCELLENCE

SCREENING TOOL

- COVID screening tools on websites with automated communications
- Employee symptom tracker using Microsoft forms

IMPLEMENTING NEW PROCESS & PROTOCOLS

- Entry, exit were restricted with strict precautionary measures
- Restriction of nonessential programs
- Virtual training
- Up-skilling and cross-functional training
- Rota System-Alternative staffing plans to ensure the availability of workforce
- Strengthened infection prevention and control measures
- Identification of IPC focal points
- COVID-19 IPC training,
- Ensuring the availability of key documents (SOPs, communication materials – visual alerts for screening), visitors' policy, and IPC supplies.
- Rational use & reuse of PPE

STRENGTHENING MEDICAL SUPPLY CHAIN

- Mapping of all available resources and supplies
- Activate secondary supplier relationships
- Identifying countries not affected by export bans to ensure a constant supply.
- Forecasting models based on statistical analysis to determine future demand.
- Building a network of supplies, peer-buyers, and procurement consultants
- Agile procurement, using daily coordination meetings between buyers to review stock levels, quality assessments of supplies & inter-organization stock transfers

ASTER HOSPITAL

- Segregation of cases – "**HOSPITAL WITHIN A HOSPITAL**"
- Screening of all incoming patients/Visitor
- Staff safety and health is paramount
- Going digital is imperative
- Workforce adequacy
- Effective resource management "**DO LESS WITH LESS**"
- Caring, Listening, empathy our priority
- COSMOS – circle of strength, master of self
- Bed management / Transfers
- Real Time Data – Business sustenance
- Leadership – Distributed yet coordinated Authority "**PLANNING CONTINUITY IS VITAL"**

ASTER PRIMARY CARE INITIATIVES

- COVID Helpline
- Community Screening
- Teleconsultations
- Isolation Facilities

OPERATIONAL EXCELLENCE OF COVID MANAGEMENT AT ASTER HOSPITALS

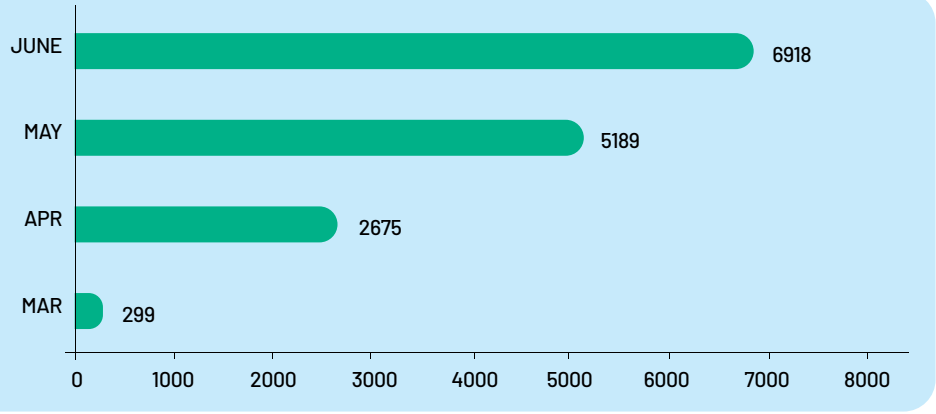
SEGREGATION OF CASES – "HOSPITAL WITHIN A HOSPITAL"

- A dedicated and isolated floor to admit COVID cases.
- Dedicated Flu/Fever Clinic
- Clear pathway from the entrance to reach the isolation floor.
- Dedicated lifts re-engineered, access ONLY for COVID patients.
- Multiple entrances closed; basement restricted ONLY for staff entry.
- Dedicated staff changing rooms fully equipped with PPE supplies, direct entry to COVID zone.
- Barricades placed front of receptions to maintain distancing

SCREENING OF ALL INCOMING PATIENTS/VISITOR

- Single entry to hospital premises for public, control screening and segregation.
- Introduction of Quarantine clinic.
- Screening of all pre-booked appointment patients via digital survey link.

SCREENINGS - ASTER HOSPITALS



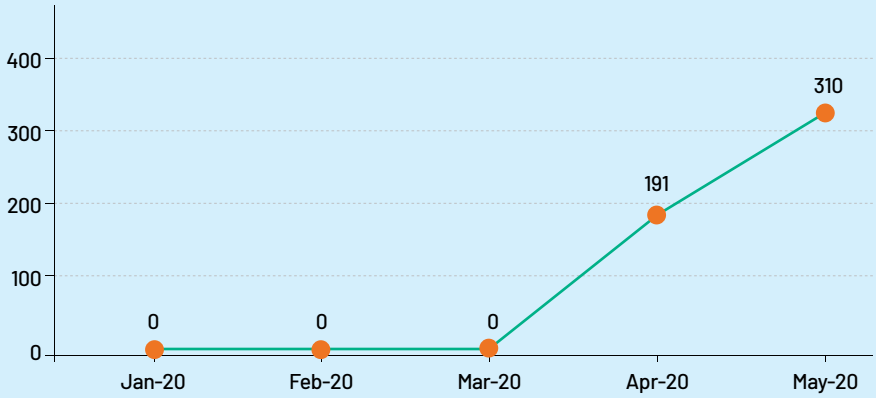
STAFF SAFETY AND HEALTH IS PARAMOUNT

- Remote working for all back-office personnel.
- Training of clinical and non-clinical personnel including security, housekeeping, front office etc. on use of PPE/Infection control practices/social distancing.
- High protein, Vitamin C rich special meals for frontline fighters.
- Separate Hostel arranged for COVID ward nurses.
- Reduced working days/ hours for frontline warriors.
- Quarantine facility for staff in Cedars hospital.
- Additional transportation arrangement for staff during lock-down.

GOING DIGITAL IS IMPERATIVE-

- Use of remote monitoring devices for critical patients, limiting staff exposure.
- Self-administration of nebulization videos displayed in patient rooms, education rendered by nurses upon admission, limiting exposure to aerosol generating procedures.
- Teleconsultation scaled up for all specialties.

NUMBER OF TELECONSULTATIONS



WORKFORCE ADEQUACY

- Dedicated rosters for clinicians covering COVID wards.
- Up-skilling of non-critical area nurses to handle critical care patients.
- Temporary Internal deployment of primary care nurses/doctors over to hospital.
- Control on resignations, reinforcement of DHA circular
- Local hiring of nurses/doctors

EFFECTIVE RESOURCE MANAGEMENT "DO LESS WITH LESS"

- Re-use of N95 masks & Goggles after sterilization.
- Use of FFP2 masks in Non-COVID Influx zones.
- Daily PPE utilization tracker submitted to Stores/Purchase
- PCR swab kits, dedicated supply agreement.
- Ensuring back-up ventilator inventory.

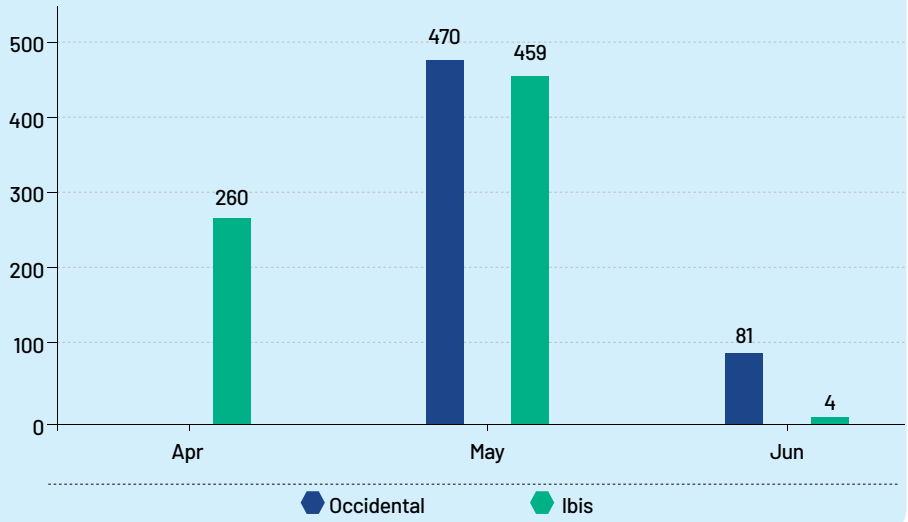
CARING, LISTENING, EMPATHY OUR PRIORITY

- Senior management motivation and encouragement to frontline staffs.
- Constant wellbeing calls to quarantine staffs by CEO himself.

BED MANAGEMENT / TRANSFERS

- Transfer out of stable cases to Warsan.
- Institutionalized hotel facility organized to offload stable cases from hospital "IBIS Hotel & Occidental Hotel
- Effective coordination with DHA command center, DCAS, APC for employees requiring hospitalization.
- Dedicated Ambulance for transfer of COVID cases.

QUARANTINE LOCATIONS



REAL TIME DATA – BUSINESS SUSTENANCE

- Submission of real time data to DHA/CHQ under the leadership of MD.
- Constant analysis on Billing /Insurance status.
- Live Audits on medical documentation.
- Rapid kit test for PCR negative cases for future claims and validation.

LEADERSHIP – DISTRIBUTED YET COORDINATED AUTHORITY PLANNING CONTINUITY IS VITAL

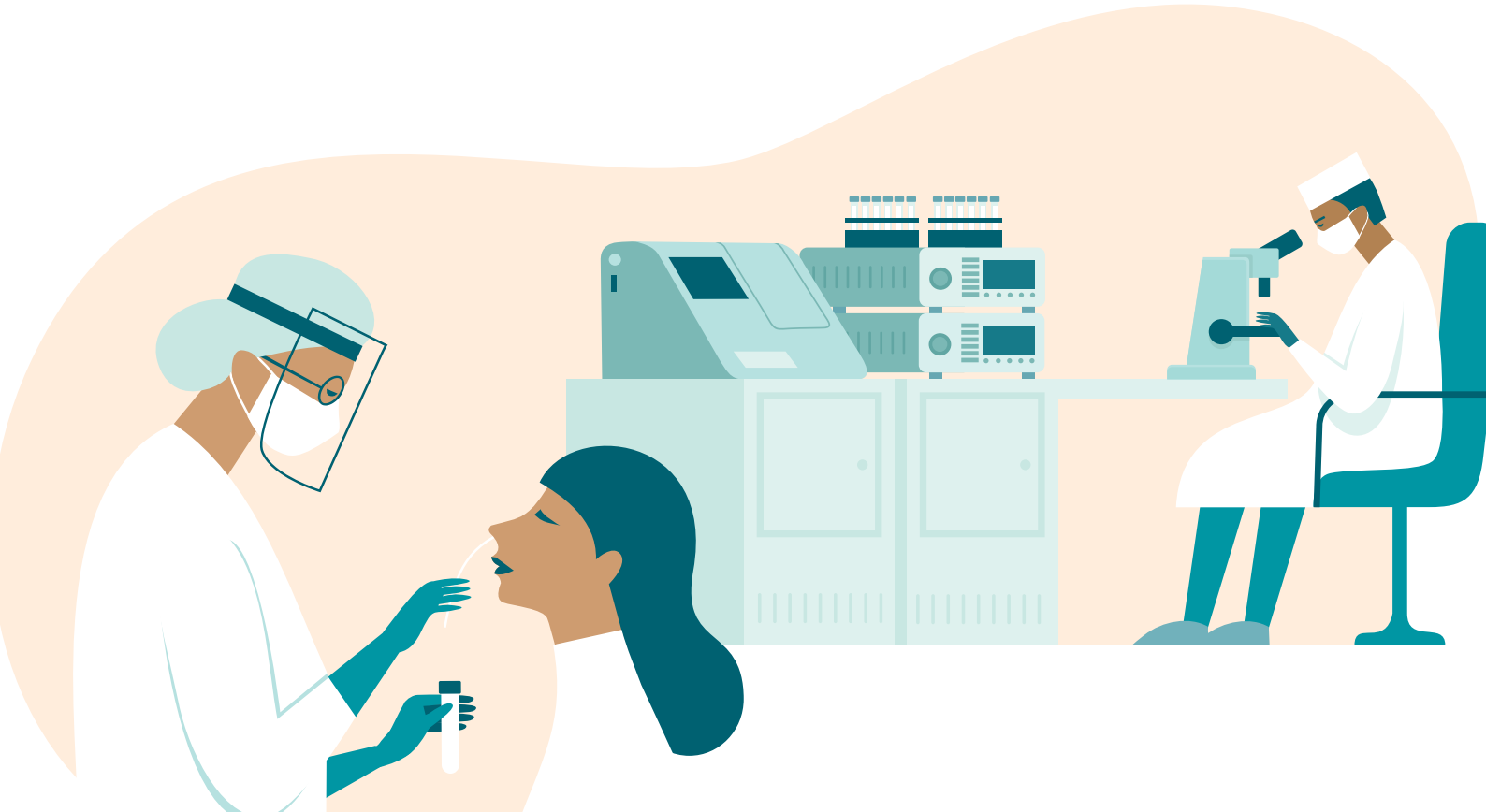
- Formation of **Task Force** led by CEO to brainstorm, discuss and plan way forward and tackle day to day challenges.
- Agile decision making, improvising as we go on.
- Accelerated execution of strategies decided.
- Knowledge sharing and updates on DHA circulars for seamless compliance led by medical director.
- Open forum welcoming smart inputs from COOs, CNO, ACNOs, Cluster champion of critical units cum OT manager.

FEVER CLINIC

STRUCTURE	PROCESS	PROTOCOL
• Physical separations that: • Prevent mixing of patients between general OP and Fever OP. • The waiting room and the Clinic Rooms with high air exchange rates (> 12 per hour)	• Serves as primary Triage centers for all OPs • Patients screened for Acute Respiratory Illness	• Full PPE. • Review by the doctors to identify s "suspect COVID" and other cases. • Suspect COVID cases are managed as per respective Government guidelines. • Other fever cases are referred to appropriate Consultants.

WAY FORWARD

- Commissioning of Dedicated facility to treat critical cases.

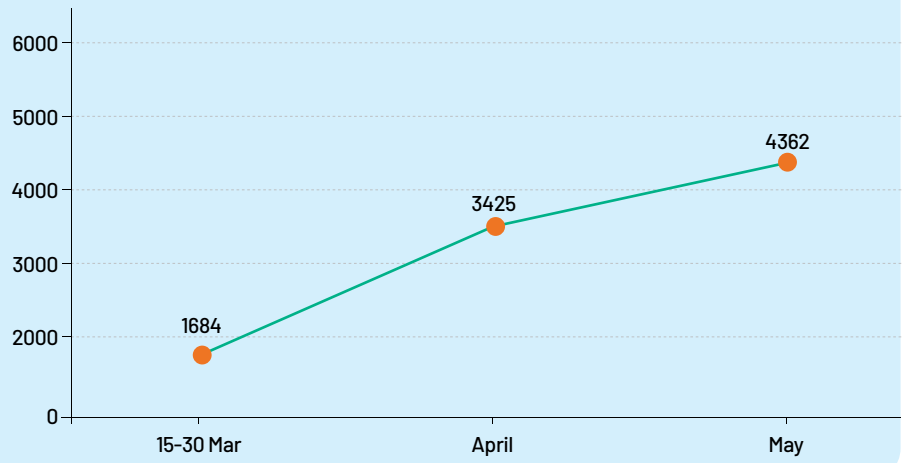


OPERATIONAL EXCELLENCE OF COVID MANAGEMENT AT ASTER PRIMARY CARE

COVID HELPLINE

- Started on 15th March 2020
- Manned by doctors helped patients staying at home with quarantine and precautionary steps to be taken
- To cater to queries of people on COVID.
- To minimize the exposure of healthy people to the healthcare environment

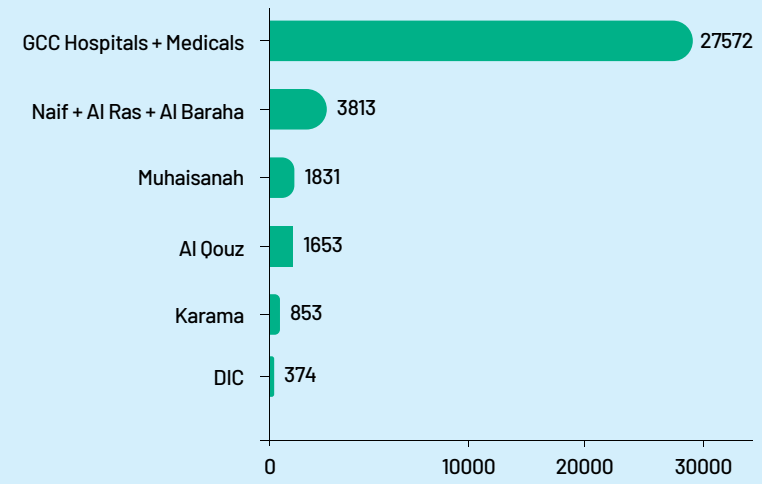
COVID HELPLINE - NO OF CALLS



COMMUNITY SCREENING

- The collaboration of DHA and Aster Primary care for mass screenings at hot spot areas in Dubai.
- The patients that were suspected were quarantined and further on being positive were isolated in isolation facilities on the advice of Dubai Police and Dubai Health Authorities.

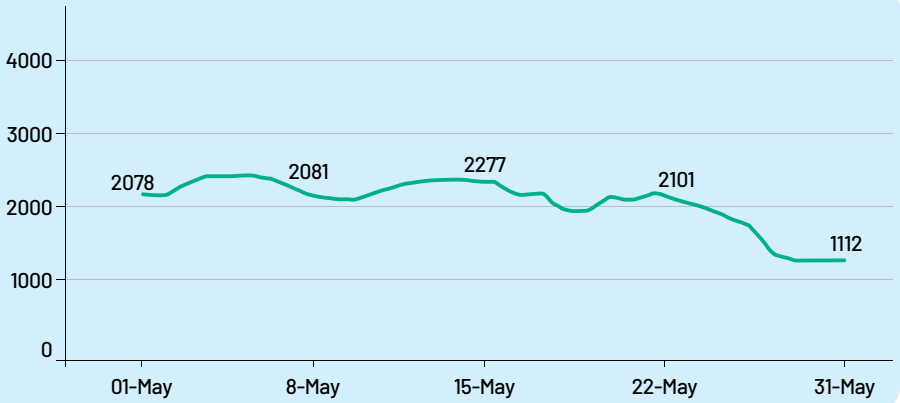
COVID HELPLINE - NO OF CALLS

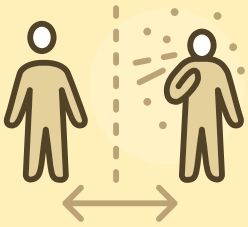


ISOLATION & OTHER FACILITIES

- To reduce the stress on hospital isolation beds.
- APC with Govt. authorities managed isolation centers at designated areas outside the city.
- Medical support was jointly managed by APC, Medcare, Aster Hospital, Indian consulate, and supervised by the DHA.

ACCOMMODATION - PATIENTS & EMPLOYEES (SUSPECTED & POSITIVES)

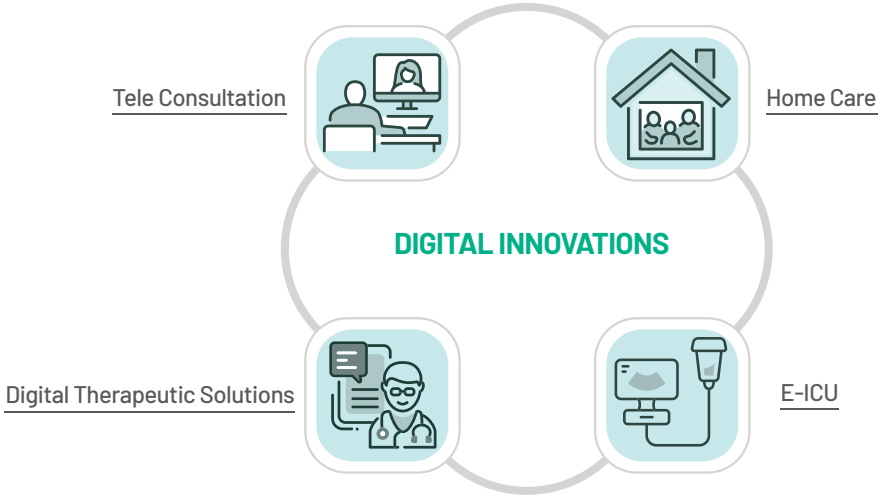




QUARANTINE & ISOLATION FACILITIES - Aster has extended its care by taking multiple isolation facilities in UAE to serve as a quarantine locations for both patients & employees. This has helped to control the spread of the disease among other non-infected patients and staff.

SAFE & ACCESSIBLE CARE TO ALL THROUGH DIGITAL INNOVATIONS

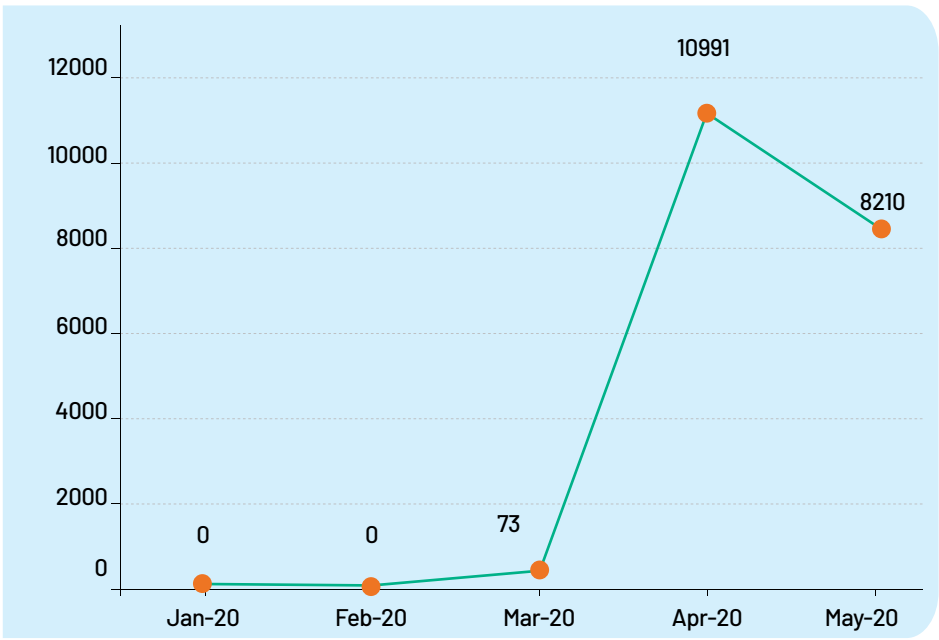
As we found that the public and patients are equally not able to access our services, we have introduced new innovative ways to reach them through our digital platforms such as:



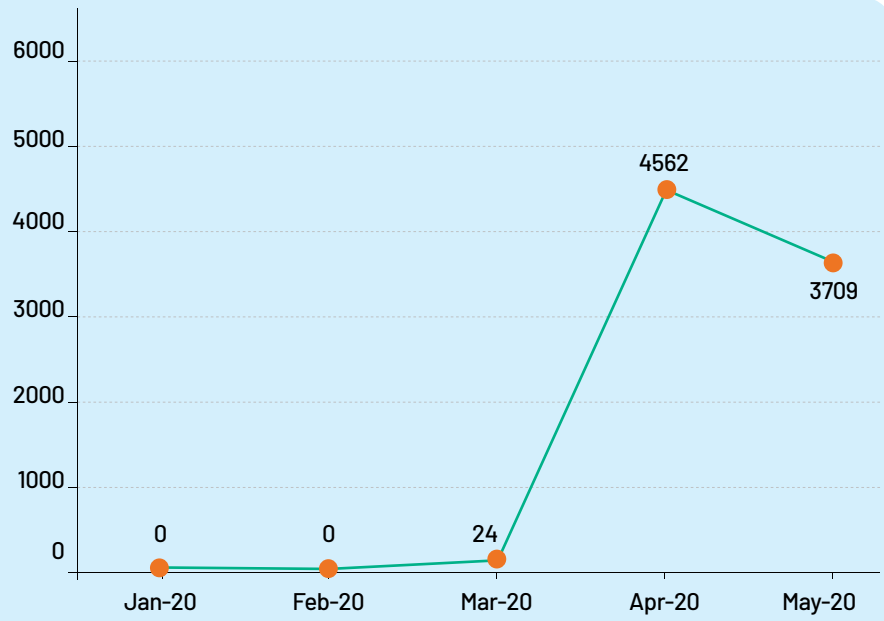
TELECONSULTATION

- "Aster Covid-19 Tele triage" - started on March 2020 across the group with 24 /7 dedicated hotline.
- "Aster COVID Self-assessment tool"- was built in 48 hrs. to assesses the risk profile & monitor patients during quarantine.
- "Virtual OPD" –Started in mid-March 2020.For patients who seek non-emergency and follow-up care. -Nearly 850 expert doctors across various specializations were made available for consultation for the comfort of their homes.
- "Aster eConsult"- Mobile App launched within 15 days from the "Virtual OPD" services,
- Continuum of care through Aster Labs services & other services by 'Aster@Home'
- Augmented delivery of drugs & consumables through its chain of Aster Pharmacy and Hospitals.

TELECONSULTATIONS - INDIA



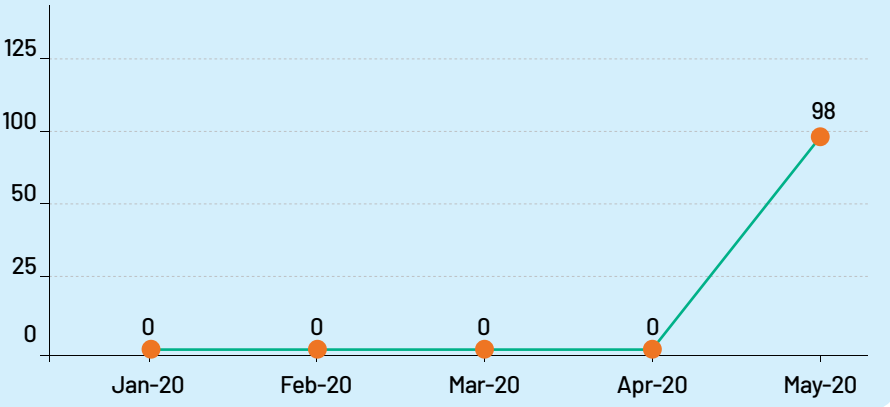
TELECONSULTATIONS - GCC



E –ICU

- Remote ICU
- Automation system for continuous monitoring of ICU patients.
- Data of (Ventilators, Infusion Pumps, Bedside Monitoring Devices) pushed into a central system for continuous capture and alert.
- Remote monitoring with least physical attendance
- Virtual environment.
- Monitoring multiple locations through a single platform for close monitoring

E-ICU CASES



HOME CARE

We made sure that we deliver quality home care services which include Doctor on Call, the nurse on call, phlebotomy, physiotherapy, pharmacy, and even Home care ICU to everyone in our community in India & GCC.

QUALITY

- Professional quality of services offered
- Trained Staff

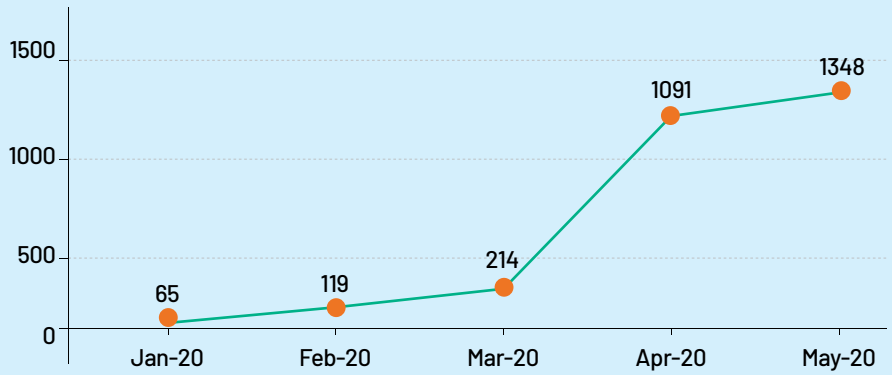
RELIABILITY

- Being available through on call
- Backed up by Hospital

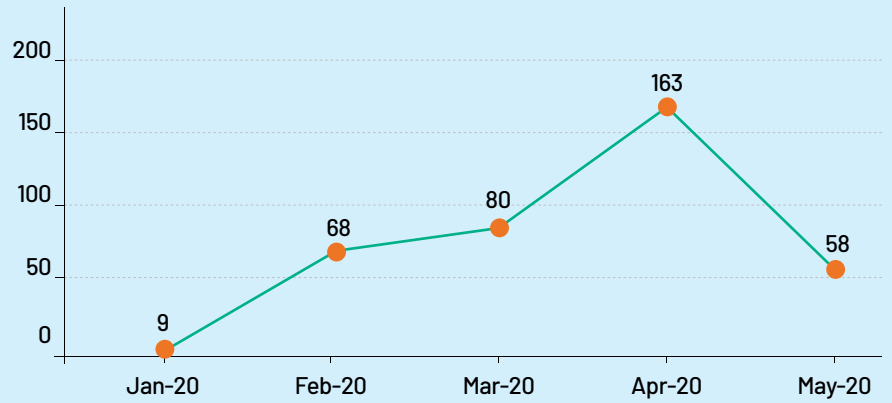
SERVICES

- Doctor/ Nursing/ Physio/ Lab Equipments - Sales/Rental

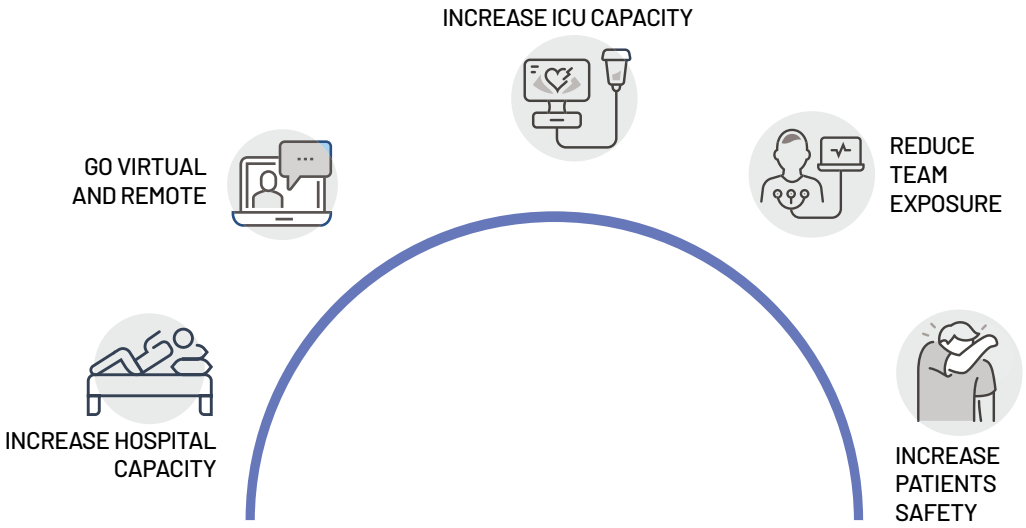
HOME CARE PATIENTS - INDIA



HOME CARE PATIENTS - GCC



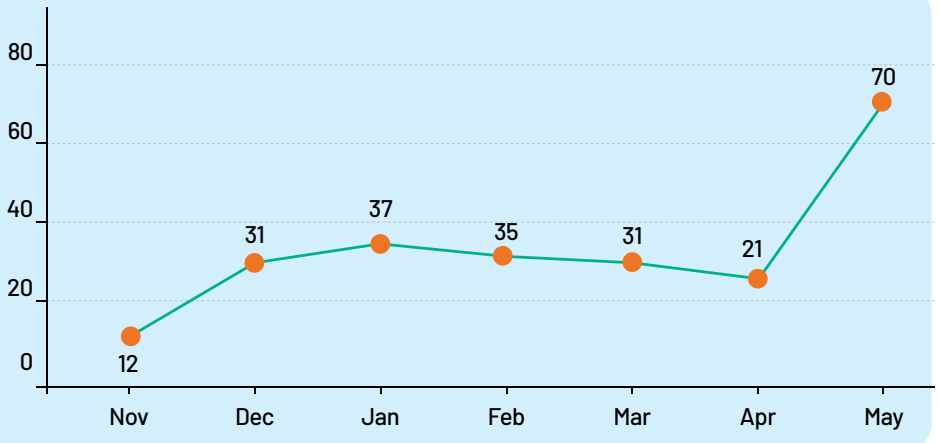
DIGITAL THERAPEUTIC SOLUTIONS



REMOTE ECG MONITORING OF COVID PATIENTS

- Pocket ECG
- Easy to use, Patient control
- Improved patient compliance
- Reduced the risk of infection and visits with a healthcare provider

POCKET ECG - NUMBER OF PATIENTS



PEOPLE EXCELLENCE

Aster is an established people-centric organization. Come March 2020, the Pandemic lock down made us think of ways about how we could maintain connections with patients & staff; to balance their fear with tender loving care which was not easy

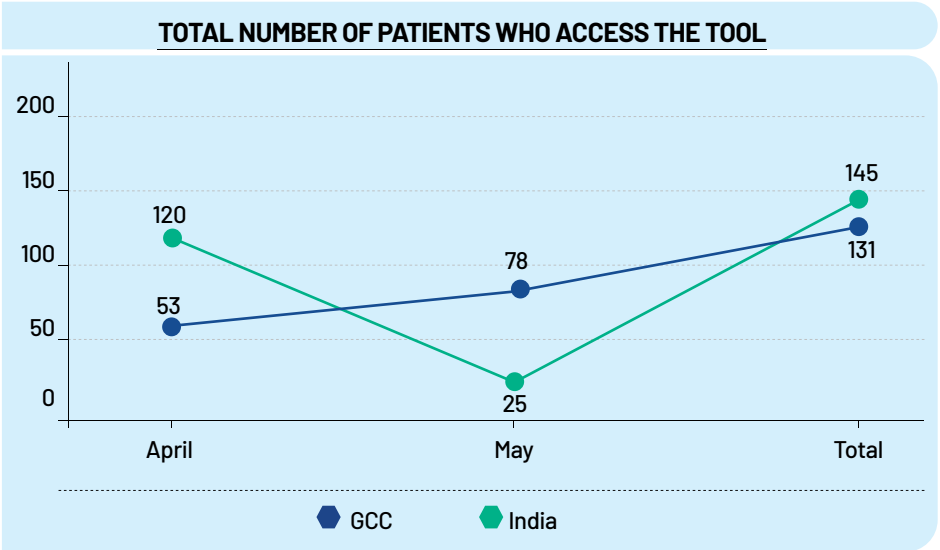
EMPLOYEE | PATIENTS

PATIENTS

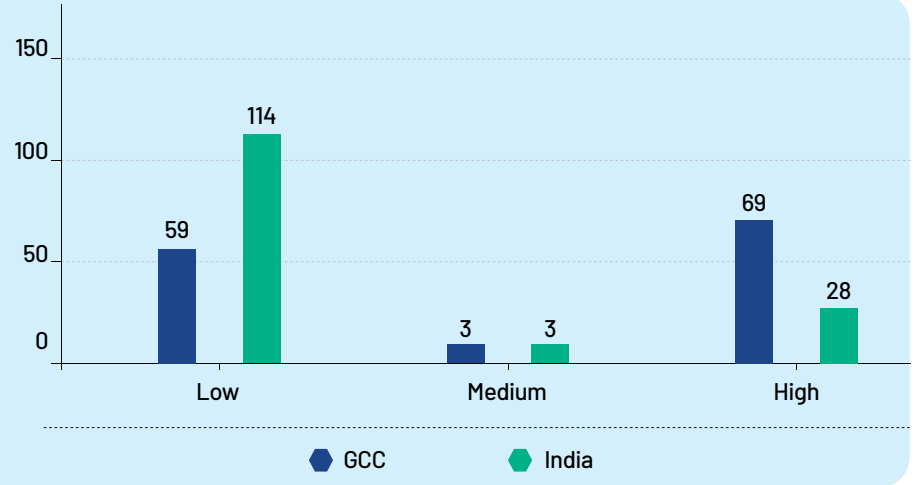
ONLINE SCREENING TOOL

In order to make the screening of patients easy and accessible and to reduce the possibility of contact, Aster COVID screening tool was designed and patients were guided as per the symptoms identified in the tool.

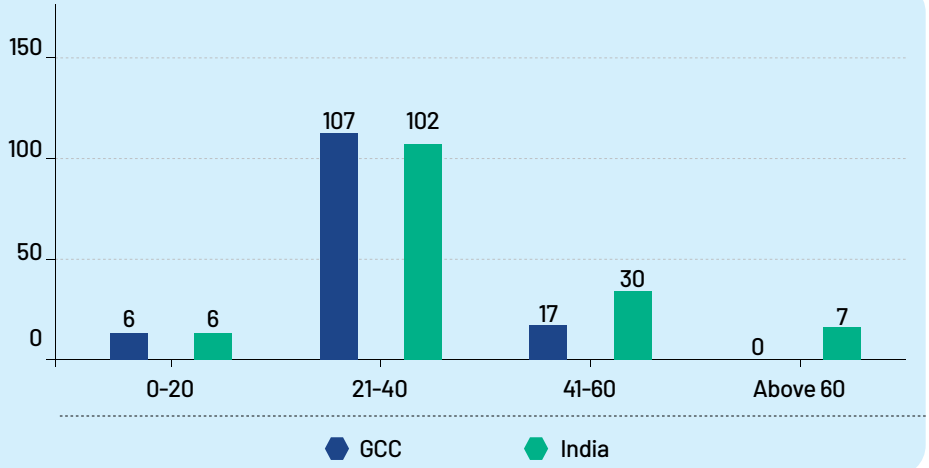
- Number of patients who accessed the tool
- Based upon the symptoms, patients were prioritized High, medium & low risk
- Age wise classification
- Feedback analysis



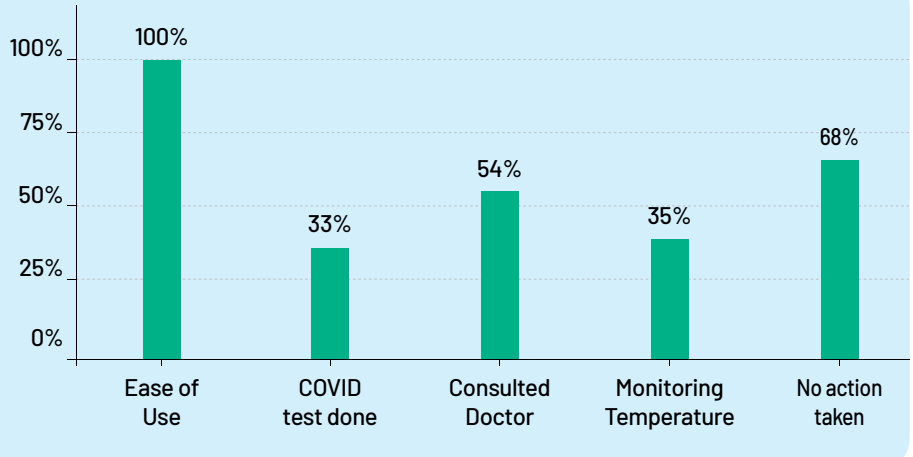
PRIORITY WISE RISK CLASSIFICATION



AGE WISE CLASSIFICATION



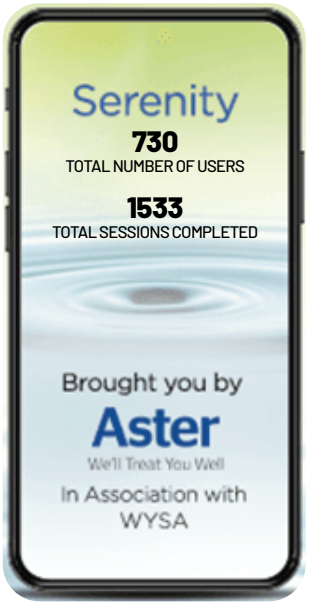
FEEDBACK ANALYSIS



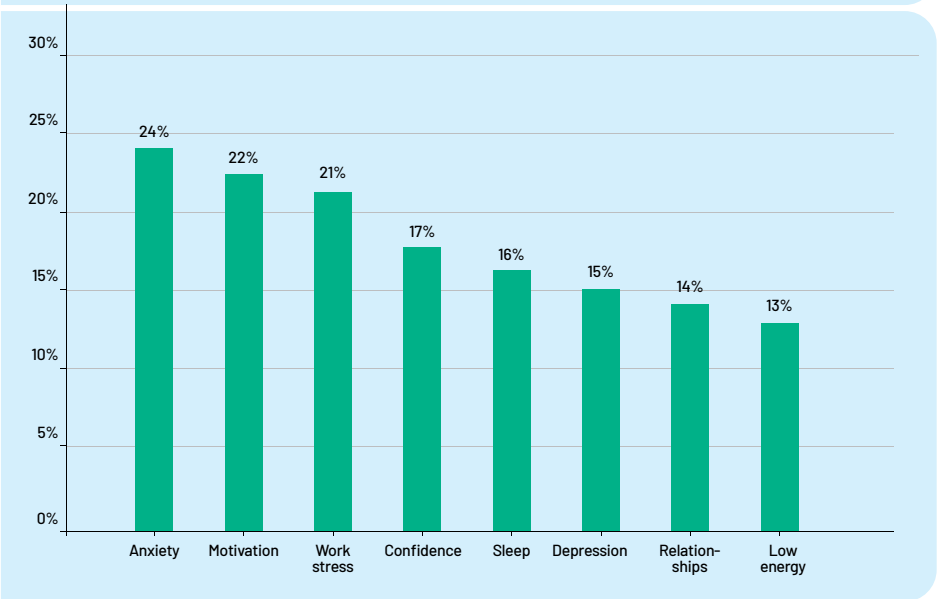
PATIENTS WELLBEING

WELLNESS APP

At Aster DM Healthcare, we took the concern of burnouts and stress-related absenteeism with utmost priority and launched "Serenity".



CONCERNS ADDRESSED USING SERENITY APP FOR PATIENTS



COMMUNITY TRAININGS WERE IMPARTED ON 'HOW TO PREVENT INFECTIONS AT HOME, DIAGNOSIS AND TREATMENT OF COVID 19, PREGNANCY & COVID 19 ETC.

ASTER PATIENTS EXPERIENCE

PATIENT CENTRICITY

VIRTUAL CONNECT
Patients connected through virtual media to provide psychological support

ASTER GEM (GO THE EXTRA MILE)
Celebrating patients special occasions in wards. Aster GEM was started to acknowledge employees contributions

VOICE OF ASTER PATIENTS
Listening to patients & addressing their needs on EQ Thus, living up to our promise of "We will treat yo well"

PATIENT EXPERIENCE EXCELLENCE
Established a virtual infrastructure for patients to have a strong voice on operations and improvement

COSMOS CIRCLE OF STRENGTH, MASTER OF SELF
Psychological counseling & recreational activities, virtual interactive sessions with healthcare team to address anxiety & fear

EMPLOYEES

i. Work from Home: Strategy for working from home was Implemented by providing all support from the management, thereby reducing the risk of exposure.

ii. Employee Wellness addressed through '**Serenity**' app for anxiety & burn out

iii. Learning & Development

- CCTV surveillance to monitor behavior changes for social distancing, wearing of mandatory mask and PPE in critical care area.
- Upskilling and upscaling of skills of healthcare workers
  - Training of junior nursing staff in critical care, followed by online assessment.
  - Training of OT and anesthesia doctors by the Lead Consultant Anesthesia within the OT complex, as a part of sharing best clinical practices.
- Cross functional training of Non ICU Drs.

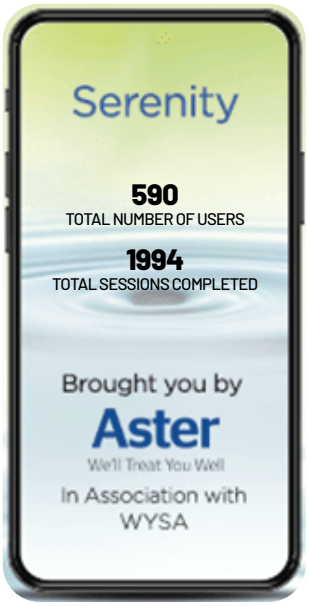
iv. Digital Learning

- The Knowledge Hub Series
- eBook on Telecommuting Guidelines
- "Post COVID 19, New Rules of Engagement at Work" module

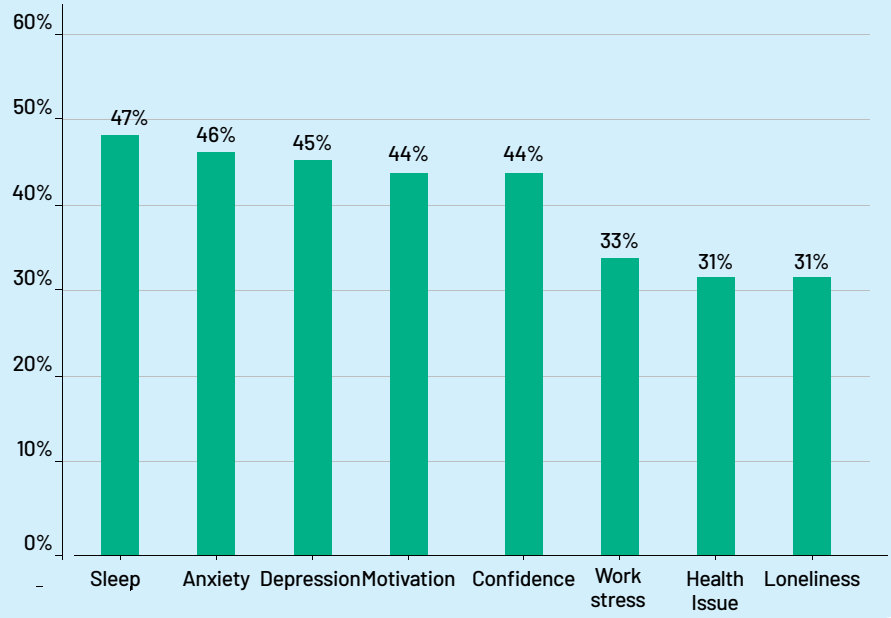
v. Aster Salutes Everyday Heroes- In the fight against COVID-19 ,. Aster now takes care of large number of COVID positive cases in our hospitals, hotels and accommodations. Our healthcare workers are exposing themselves to personal risk and sometimes staying away from their families. All of them are courageous in their conviction and fight the battle bravely. We recognize, appreciate & celebrate their commitment by motivating the frontline COVID warriors across the group.

vi. Insights by Dr. Azad Moopen- As the war against COVID-19 progresses, various Governments, Scientists, and Healthcare Workers are exploring numerous ways to combat the current situation, the insights of our Chairman on various high level matters related to COVID-19 captured through videos and circulated for awareness & knowledge on various measures to combat COVID.

vii. Private-public Partnership - Support to the Dubai Field Hospital-skilled nurses from India



CONCERNS ADDRESSED USING SERENITY APP FOR PATIENTS



ASTER DM COMMUNITY INITIATIVES

The ASTER Volunteer Program has been at the forefront of conducting and reaching out to the community. The "ABCD of activities" are:

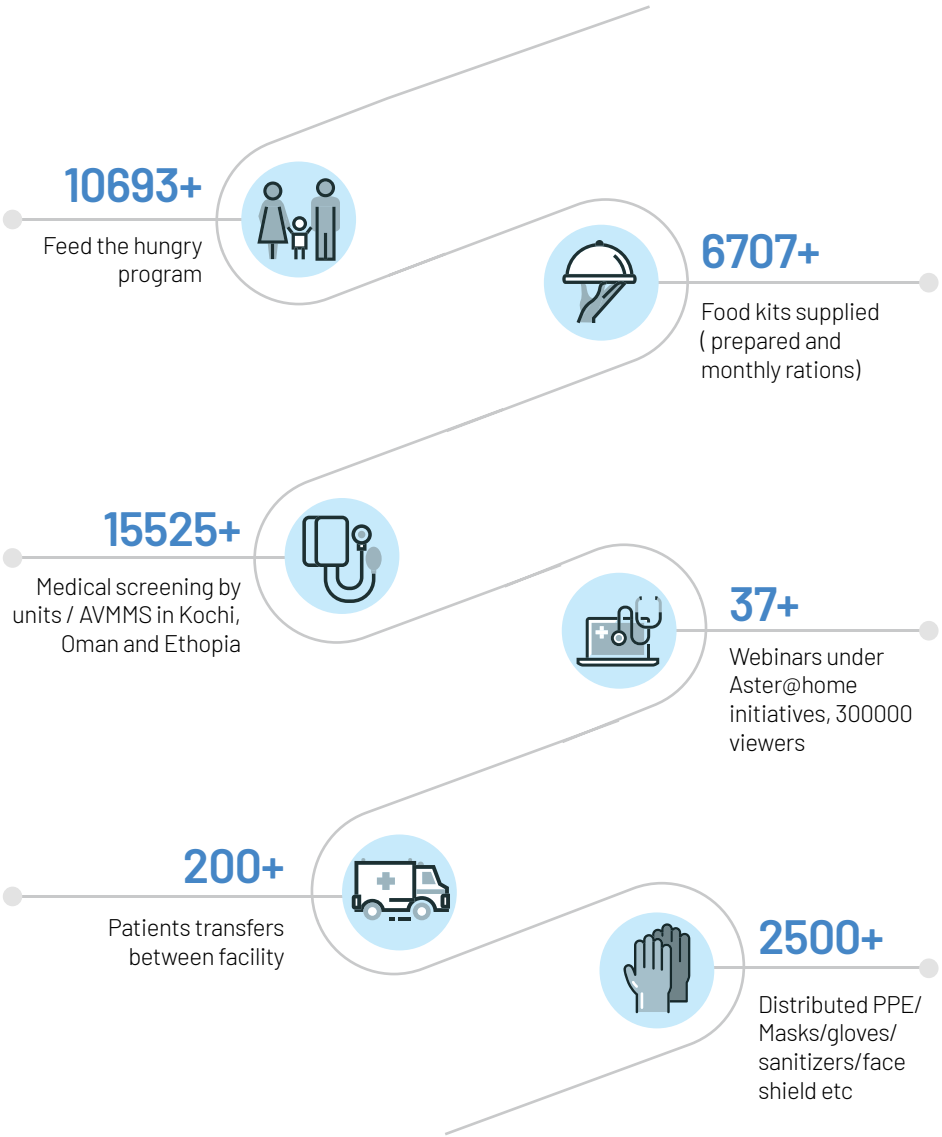
A – Aiding the community with resources and services

B – Belong with the community by helping with screening

C – Coaching the community by instituting medical and non-medical awareness programs

D – Disaster management

Various activities have been conducted by the volunteer program, some of which are ongoing:

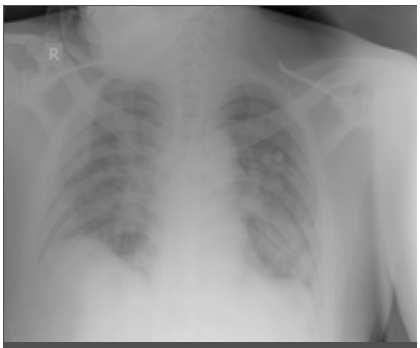


CASE STUDIES

CASE STUDY 1. SANAD HOSPITAL

60 yr old Syrian male smoker presented to our ER by Acute Coronary Syndrome typical chest pain, dyspnea, orthopnea & palpitations with awareness of fast irregular heartbeats with suspected covid19 infection Score 5,O/E BP 150/100mmHg patient had tachycardia, HR 160 b/m irregular, tachypnea RR 38 c/m ,congested and desaturated SpO2 77% with Frank pulmonary edema ,initial ECG showed extensive anterior wall STEMI with ST elevation ,all over chest leads from V1 to V6 and I &aVL ,STEMI code activated and the patient shifted immediately to CATH LAB which was provided by HEPA filter ,all Cath lab team were protected by full PPEs , ,the patient electively hooked to mechanical ventilation diagnostic angiography started that showed proximal totally occluded Left Anterior Descending Coronary Artery (LAD) with heavily calcific atheromatous lesion, PCI started where the lesion crossed by pilot 50 wire predilated by mini trek balloon 2mm which was upgraded to 2.5 mm then three Drug Eluting Stents (DES) were deployed with optimum overlap and post dilation with successful good distal run off ,procedure done safely and the patient shifted to CCU in isolation room to continue plan of care and management.

CASE STUDY 2. MEDCARE HOSPITAL



Chest x-ray: Mr. AR, dated 14th April 2020

Case presentation: COVID-19 infection with severe pneumonia and type 1 respiratory failure complicated by critical ARDS

Mr. AR is a 50 years old Indian gentleman who presented to Medcare hospital on 14th April 2020 with acute respiratory distress. He reported complaints of fever and progressively worsening shortness of breath for 4 days. He tests himself for the COVID-19 test on 11th April which was reported positive on 13th April. After knowing the result, he then isolated himself in his car to avoid contact with his colleagues. Unfortunately, his condition got worse and he was brought to the emergency department.

On arrival to ER, he was conscious and oriented but appeared in respiratory distress. His vitals were HR 111/min, BP 118/70mmHg, Temp 37.9C, SpO2 85% on room air, RR 38/min. Chest examination showed bilateral crackles. The critical care team was alerted and he was immediately transferred to ICU for further management. On arrival to ICU, he was started on NIV support, antibiotics and anti-viral therapy for COVID-19 infection. Stat CXR showed bilateral ill-defined peripheral patchy opacities more predominant in the left basal lung zone. He was started on IV antibiotics and oral anti-viral therapy (Hydroxychloroquine and Kaletra) for the COVID-19 infection.

Chest x-ray: Mr. AR, dated 19th April 2020


Chest x-ray: Mr. AR, dated 24th April 2020

His clinical condition initially improved but on 18th April, despite being on NIV support, he suddenly deteriorated, having tachypnea and desaturation. He was immediately intubated and mechanical ventilation was initiated Serial CXR showed progressive parenchymal disease in the form of extensive non-homogenous opacities

Following endotracheal intubation, the ICU team faced many challenges in supporting his ventilation as he required high PEEP, inverse ratio ventilation, prone position ventilation alternating with supine. Also, the patient required a repeated change of endotracheal tube as it was frequently blocked with large blood clots causing severe airway obstruction with sudden severe desaturation. Serial D-Dimer levels showed extremely high values (8620 ng/ml) for which he was kept on a therapeutic dose of low molecular weight heparin.

ETT ONE DAY OLD INPATIENT WITH COVID-19 INFECTION

Mr. AR's clinical condition started to gradually improved and trials of weaning off mechanical ventilation were initiated for him. Serial acute inflammatory markers, D-dimers levels, and Ferritin showed a declining trend, but the patient's condition remains critical even after all his labs were close to normal values.

On 27th April he was extubated. Post extubation he still required intermittent NIV support, due to his extensive myopathy. Post extubation Mr. AR showed a very slow recovery as he had developed confusion, delirium, critical illness myopathy, and lung fibrosis. He required extensive pulmonary rehabilitation and limb physiotherapy. His CXR on 18th May 2020 showed a good resolution of the opacities. Inhomogeneous haziness and reticulations are seen involving both lung fields, partially sparing the left apex. On 7th May 2020, Mr. AR was then transferred to the general medical ward to continue physiotherapy and rehabilitation. He was discharged on 23rd May 2020 in a stable condition, but with X-ray image suggestive of lung fibrosis

OUR MESSAGE: IT IS GOING TO BE HARD, BUT HARD IS NOT IMPOSSIBLE!

The year 2020 has given the world so much of uncertainty because of a pandemic that has nearly engulfed the world with despair and sorrow. But when we work together and join hands we do see a ray of hope and success.

One such patient is Mr. AR whom we received in ICU in a very critical condition. Despite immediate resuscitation with non-invasive ventilatory support, his condition worsened requiring intubation to secure his airway and mechanical ventilation to support his respiratory

function. We faced a lot of uphill struggle in stabilizing his condition but with hard work, perseverance, and excellent team cooperation from ICU doctors and nurses, Mr. AR recovered from the severe COVID-19 infection. He is now doing well and looks forward to being with his family soon.

It gives us immense pleasure and happiness to see such great outcomes. No matter how tough times we face, we as front-liners will put our best efforts to combat any critical situation. I hope to see more of such great outcomes and recoveries.

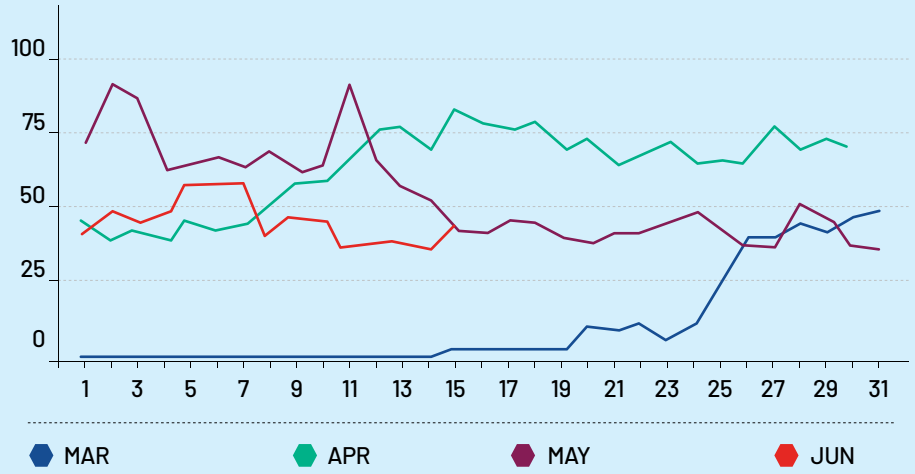
CASE STUDY 3. SANAD HOSPITAL

46 Year old male patient- Previously healthy was admitted via ER to the wards with Fever, Cough and shortness of breath, O2 sat was 90 %- his temperature was 38 - CRP= 80 - ASt=68 - Alt=92. We applied our risk scoring system for COVID 19 which takes into consideration age, comorbidities, O2 sat, temperature, WBC count, CRP, Liver Enzymes, CXR findings. A CT scan and restratification is considered in case of a high score. This patient was scoring high and the CXR was Not Clear-bilateral ill-defined heterogeneous opacity seen in both middle and lower lung zones with the peripheral distribution. A High-resolution CT -Chest was done and we discovered that he has pneumothorax. Under all precautions, we inserted a chest tube urgently and the patient was treated as per guidelines under constant monitoring. The recovery was good and the patient was discharged in good health.

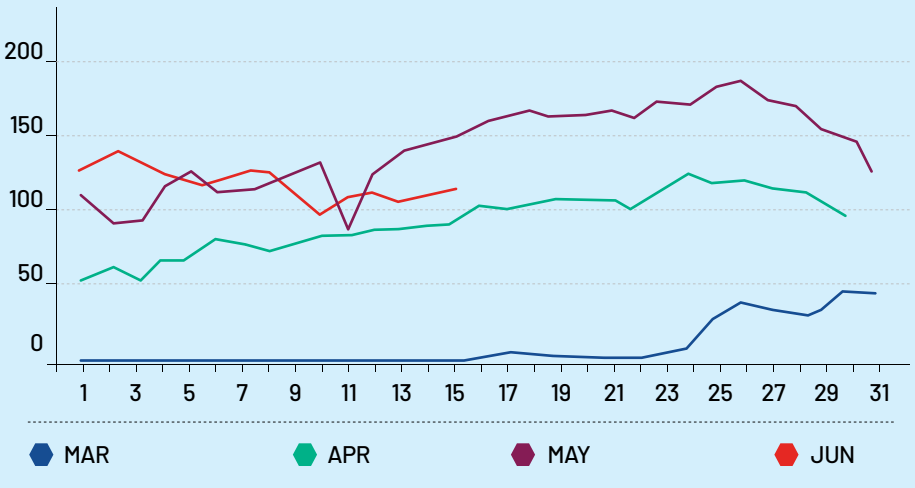
OUTCOME & MONITORING

In this case series, we describe the clinical presentation, characteristics, and outcomes of cases of COVID-19 admitted to the intensive care unit (ICU) and COVID ward of Aster DM healthcare units .Objective outcome measurements provides insight into the care of COVID cases and to monitor improvements.

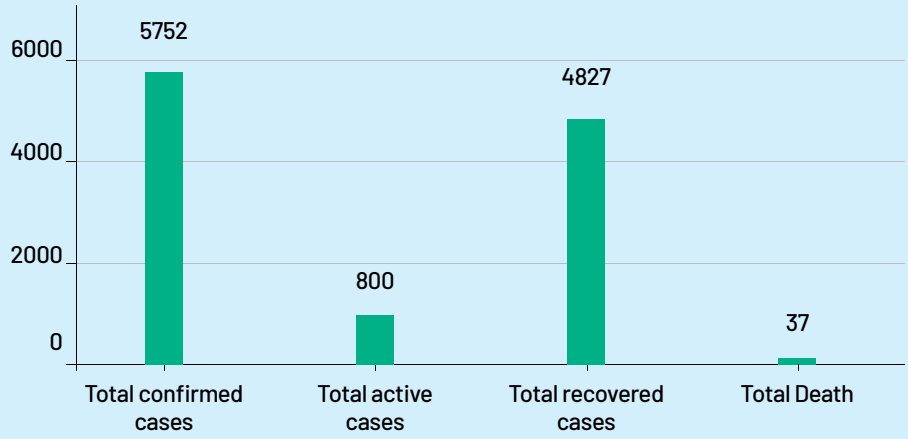
SUSPECTED ADMITTED CASES



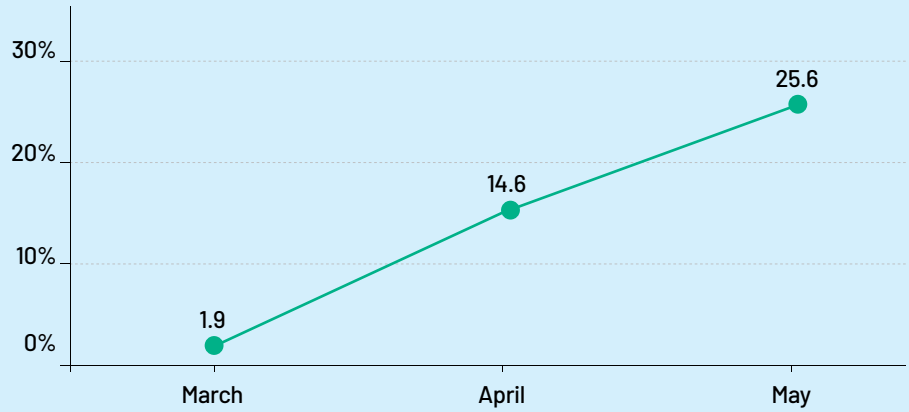
POSITIVE ADMITTED CASES



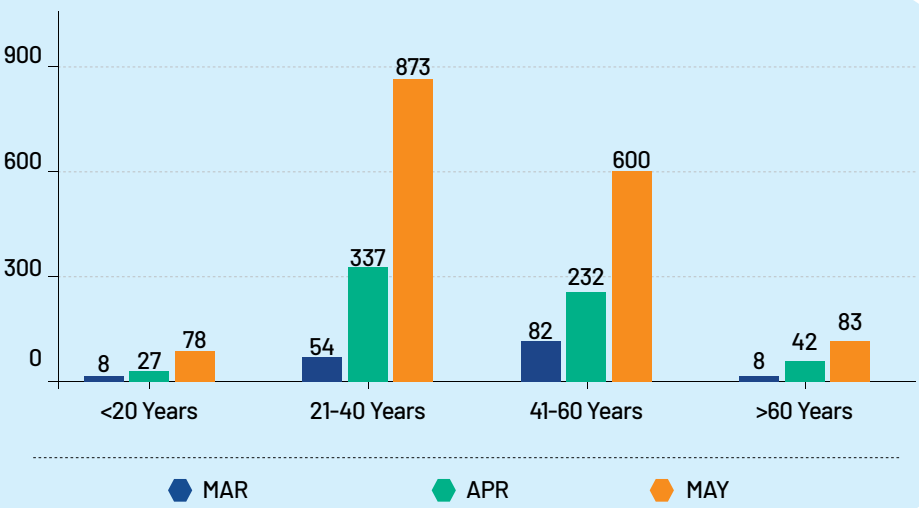
COVID-19 POSITIVE CASES



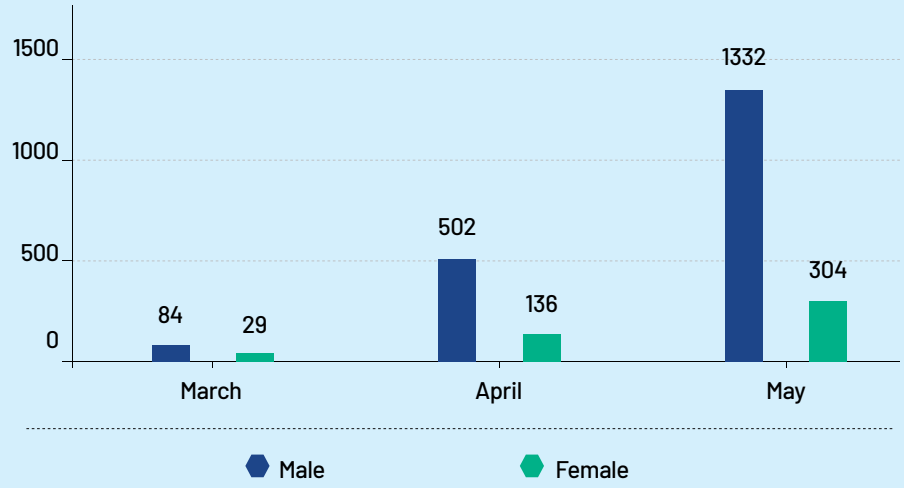
GCC HOSPITALIZATION RATE FOR COVID-19



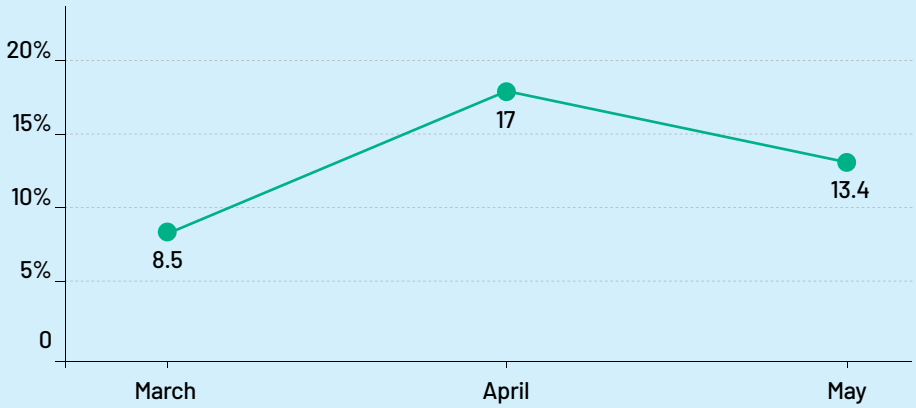
AGE WISE DISTRIBUTION OF COVID PATIENTS



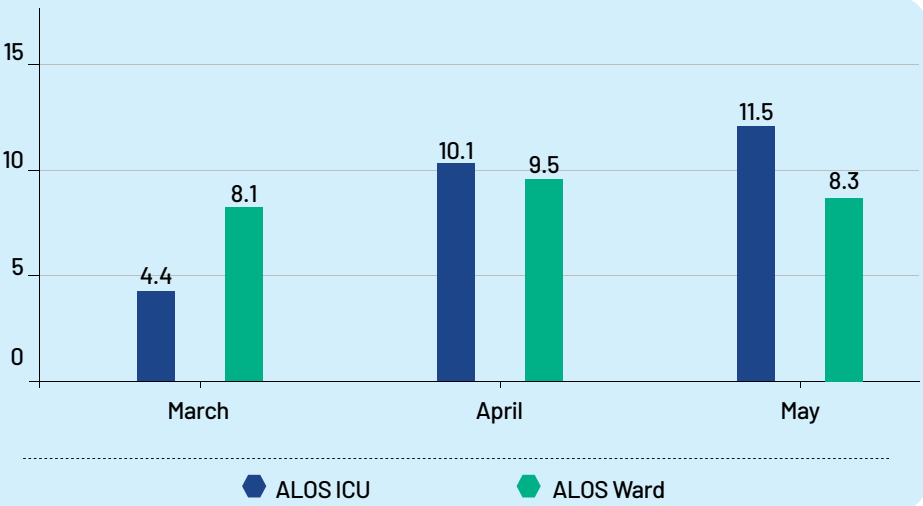
GENDER WISE DISTRIBUTION OF COVID PATIENTS



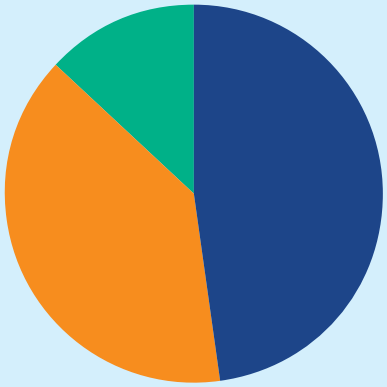
PERCENTAGE OF COVID-19 PATIENTS ADMITTED IN ICU



ALOS-ICU & WARD



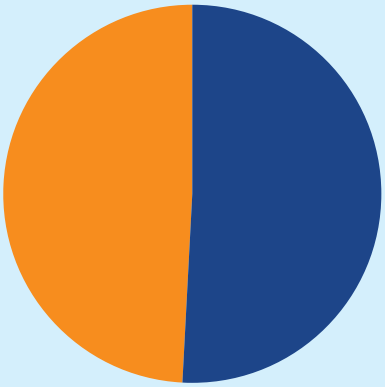
ASSAY OF FERRITIN (ASTER DM HEALTHCARE)



- Normal: 1261 - 48%
- Above: 1039 - 39%
- Below:333 - 13%

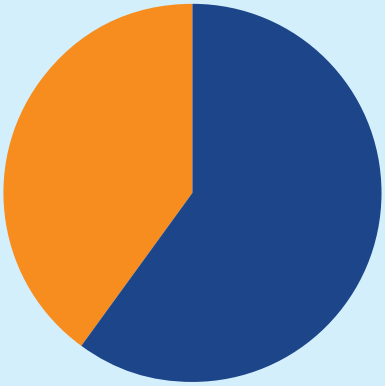
Normal range:
Female 13-150 ng/mL
Male 30-400 ng/mL

C-REACTIVE PROTEIN ASTER DM HEALTHCARE)



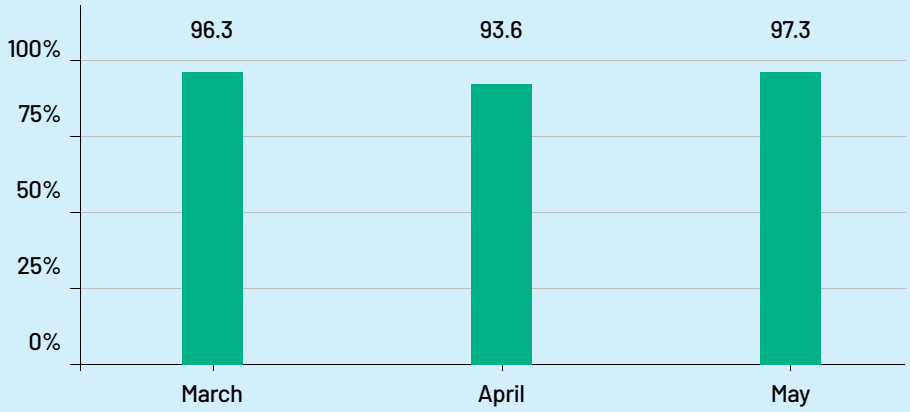
- Normal: 4376 - 51%
- Above: 4194 - 49%
- Critical: 1 - 0%

D-DIMER (QUANTITATIVE) (ASTER DM HEALTHCARE)

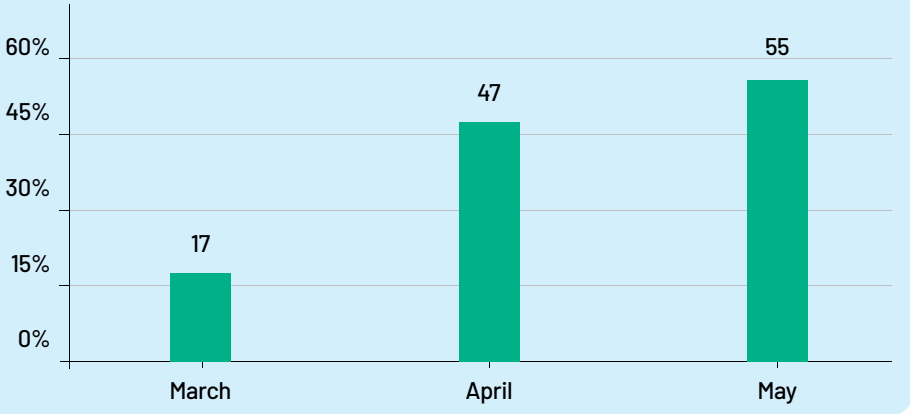


- Normal: 905 - 40%
- Above: 1338 - 60%

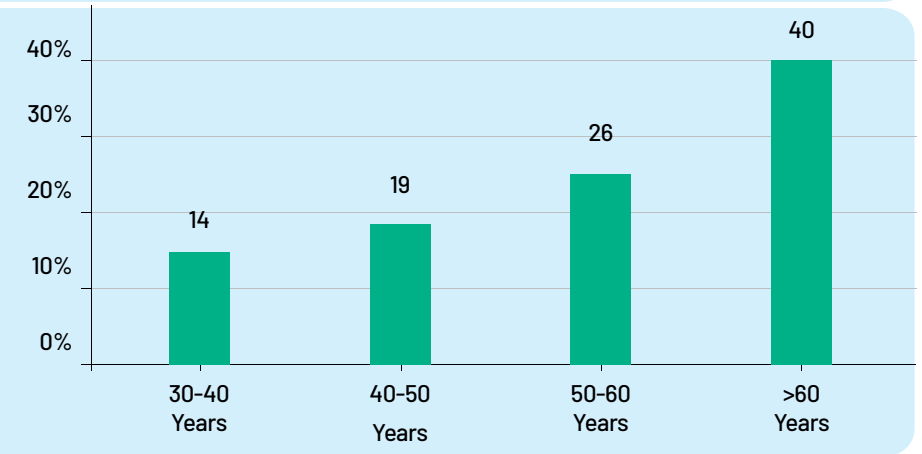
RECOVERY RATE OF COVID PATIENTS



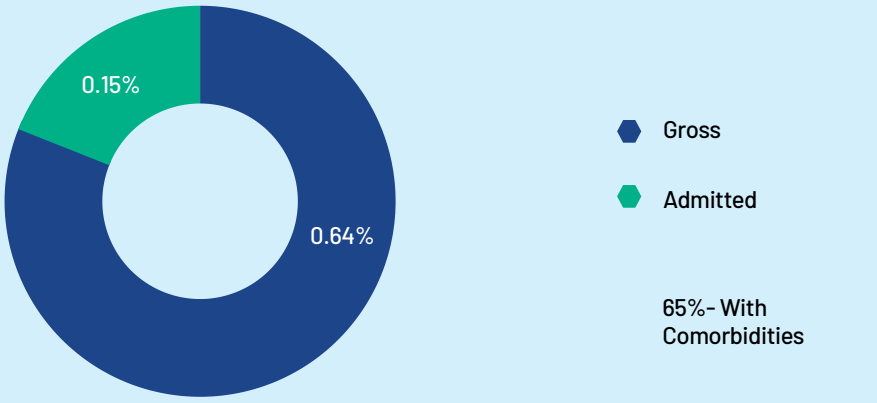
PERCENTAGE OF COVID PATIENTS ADMITTED WITH COMORBIDITIES



MORTALITY AGE CLASSIFICATION



MORTALITY ANALYSIS



LEARNING OUTCOMES & WAY FORWARD

1. **A patient that is admitted to ICU come to stay!**

- Prolonged Ventilation time.
- The shortest ventilation period so far for a COVID 19 positive patient has been 9 days.
- Complications and challenges result from prolonged ventilation and sedation.
- Clinical conditions and the negative viral test may not always correlate.
- The negative viral test can be associated with a decline in clinical profile, coagulation & ventilator status.
- Spikes of remissions and exacerbations are seen thereby giving a false sense of patient entering the recovery phase (Second phase).
- Patients become more critical and need ventilation in the second phase.
- Slow recovery results in the non-availability of beds.

2. **Silent hypoxemia**- Many patients present with low Levels of PaO2 and SpO2 without clinical signs, symptoms, or visible distress.

3. **A small percentage of the patients will improve with the NIV.**

- Most patients with very low PaO2 required intubation,
- Hypoxemia associated with fatigability & tachypnea should be considered.

4. **ET Tube blocked frequently-**

- Clots and necrotic tissue.
- The tracheal secretions with large clots
- Unusual complications in All COVID patients on mechanical ventilation -Bleeding from the respiratory tract, recurrent tube blockage by clots leading to near arrest situations.
- Heparin nebulization in ventilated patients decreases ET tubes blocks.
- The early decision for tracheostomy in long term ventilated patients helps to deal with recurrent tube blockage.

5. **Correlation between D dimers**, ferritin levels, and the disease form. Other lab changes common in COVID -19- A

- In patients admitted to ICU have very high levels of D dimers, Ferritin, CRP.
- The D- dimers levels were found to be between 3000 and more than 30000,
- Appears that there is a direct correlation between these lab levels and the course of the disease.
- Mild to the moderate Thrombocytopenia is noticed,
- Ventilation improved in one case in which thrombolisation was required for acute MI.
- Among dyselectrolytemias , Phosphate levels are low in almost all critical COVID 19 patients.

6. **Steroids might help in critical patients**- We used a low dose of Hydrocortisone in our patients with severe ARDS. We did not have a witness group but we noticed a small improvement in oxygenation for some patients after starting the infusion.

7. **Prone position**- We used prone position for the patients with severe ARDS with refractory hypoxia. A small improvement in the oxygenation has been noticed.

8. **No considerable improvement with some antivirals and antimalarial treatment**-We did not observe an obvious improvement

- From Hydroxychloroquine or Lopinavir/ ritonavir combination in any of the critical patients.
- The combination of Lopinavir /Ritonavir and Favipiravir has been associated with slightly better outcomes.

9. **The challenge of ventilating patients with COPD in the ARDS**-

- One challenge we faced with ARDS patients (not only COVID positive), was ventilating a COPD patient with severe ARDS.
- The best ventilation management for this type of patient proved to be one in which we used the patient's auto-PEEP to reach the required end-expiratory pressure.
- Aimed for a reduction in I: E ratio but not inverse ratio, lowest possible FiO2 with permissive hypoxia and hypercapnia.

10. **Advantages of Lung ultrasound as a useful tool in critical care**-

- To evaluate the lungs and also the fluid needs of critical patients.
- A reliable tool to diagnose intra-lung fluid, consolidation, pneumothorax, pleural effusion.
- It can be routinely used for placing central lines for patients ventilated with high PEEP to avoid complications.
- Reduces the exposure of the radiology staff and it's easy to use and offers information fast and whenever needed.

11. **Even after the inflammatory markers are lowering, the lung damage might still take time to improve** -

- The prolonged recovery period from the lung damage even after inflammatory markers are coming down close to normal values.

12. Cardiac events in COVID 19 critical patients-

- A considerable percentage of our patients developed myocarditis or acute coronary syndrome pictures.
- Patients started on enoxaparin therapeutic dose and Aspirin.
- The decrease in cardiac complications following enoxaparin therapeutic dose and Aspirin.

13. Chronic/ permanent lung damage for patients recovering from a severe form of the disease-

- Recovery from moderate/severe ARDS form of COVID 19 discharged with radiological images suggestive of lung fibrotic changes from mild to extensive.
- In one particular case, the changes were accompanied by the presence of emphysema and bullae which complicated with spontaneous pneumothorax.

CONCLUSIONS

Our journey to navigate the COVID-19 pandemic has provided a unique experience and challenge- to deliver the best of patient care in a rapidly evolving situation without making any compromises to patient or staff safety. We addressed the difficulty in containing the virus through rapid risk assessment and effective actions, to understand and then use strategies to contain the risks facing us.

One key contributing factor has been the frequent audits by not only our internal team of clinicians but also external regulatory bodies in India & GCC (DHA, MOH). The audit outcomes in turn paved the way to our learning and constant endeavor to provide the best evidence-based care to our patients.

Our dashboard provides a measure of success and shows beyond doubt that the provisions made for patient safety, and staff to self-isolate and avoid infection, helped us to avoid what could have been a runaway situation and achieve optimal outcomes for our patients. COVID-19 continues to challenge and test us but we will continue to take the lead in bringing quality care to our patients. As our motto says: "We'll treat you well".

*Disclaimer: The situation regarding COVID-19 is rapidly evolving and changes daily. Although timely policies should be implemented to facilitate objective decision-making, such directives will inevitably need to adapt to this fluid environment. This document content stands as on date.