

“Virtual Interdisciplinary COVID-19 Team”: A Hospital Pandemic Preparedness Approach

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ABSTRACT

The COVID-19 pandemic continues to move at record speed. Health systems and hospitals worldwide face unprecedented challenges to effectively prepare and respond to this extraordinary health crisis and anticipated surge. Hospitals should confront these unparalleled challenges with a comprehensive, multidisciplinary, coordinated, and organized strategy. We report our experience with the systematic application of the “4S” principle to guide our institutional preparedness plan for COVID-19. We used an innovative “virtual interdisciplinary COVID-19 team” approach to consolidate our hospital readiness.

The coronavirus disease 2019 (COVID-19) pandemic continues to move at record speed. As of 10 May 2020, more than 3.9 million cases of COVID-19 have been reported globally, with more than 274 000 deaths.¹ Oman has recorded 3573 cases with 17 deaths as of 10 May 2020.^{1*}

COVID-19 is a respiratory illness with a broad clinical spectrum. The severe and critical illness categories of the spectrum (about 20% of all infections) have overwhelmed health systems worldwide.² This sequentially has incited health systems and hospitals worldwide to face unprecedented challenges to prepare and respond to this extraordinary health crisis effectively and the anticipated surge.³

Hospitals should confront these unparalleled challenges with a comprehensive, multidisciplinary,

coordinated, and organized strategy. The “4S” theory (staff, stuff, structure, and systems) for surge capacity can guide hospitals to respond to this pandemic.⁴

The Institute of Medicine states that crisis surge as “adaptive spaces, staff, and supplies are not consistent with usual standards of care but provide sufficiency of care in the setting of a catastrophic disaster. Crisis capacity activation, therefore, constitutes a significant adjustment to standards of care.”⁵

We report our experience with the systematic application of the “4S” principle to guide our institutional preparedness plan for COVID-19. We used an innovative “virtual interdisciplinary COVID-19 team” approach to consolidate our hospital readiness.

Sultan Qaboos University Hospital (SQUH) is a 490-bed referral teaching hospital in Muscat, Oman.

The hospital is positioned as the leading academic and research hospital in the country in addition to its role in the provision of quality, safe, patient-centered specialty, and advanced clinical care among the major disciplines.

At the time of writing this report, the hospital has provided care to more than 950 suspected cases of COVID-19, 24 confirmed cases including 16 hospitalizations, of which five were intensive care unit (ICU) admissions and on ventilators. The hospital also had one COVID-19 related death.**

SQUH COVID-19 preparedness plan

The SQUH COVID-19 preparedness plan was informed by the existing scientific literature on pandemic preparedness, surge planning, and disaster management. The plan was also guided by the hospital's own experience during the 2009 influenza pandemic. The SQUH COVID-19 preparedness plan was phase-based, dynamic, and informed by indicators of pandemic progress in the country. It is important to mention that this preparedness plan was initiated two weeks before the first case reported in the country and nearly six weeks before the 100th case. The plan aimed to achieve four main goals:

- a. Safely care for a potential surge (and possibly overwhelming) of patients with COVID-19.
- b. Curtail disruption to essential, urgent, and semi-urgent clinical services, research programs, and academic activities (especially postgraduate training).
- c. Safeguard hospitalized non-COVID-19 patients without compromising their care.
- d. Preserve and protect healthcare workers and other hospital staff and their wellbeing.

Fundamentals of the SQUH COVID-19 preparedness plan

SQUH COVID-19 TASK FORCE

The task force is an operational team of technical experts, chairs of pertinent hospital committees (disaster plan committee, infection prevention and control committee, operating room committee, etc.), representation from frontline clinical and diagnostic departments, bed managers, ward in-charges, medical stores, biomedical department, and hospital top management (with finance, operations, and logistics representations). This team was created before

reporting any cases in Oman. The task force with the hospital administration developed a hospital-wide set of policies and procedures to attain the necessary capacity for continued hospital functioning during the COVID-19 pandemic, to deliver safe care to patients with COVID-19, and to maintain delivery of quality essential clinical care. A subset of the task force team coordinates daily plans and communications with regards to COVID-19 patient management (clinically and administratively).

'VIRTUAL' INTERDISCIPLINARY COVID-19

TEAM

This distinctive component of the COVID-19 preparedness plan is a novel and innovative concept where a "hospital within hospital" model was created. The idea revolves around "virtually" creating a multidisciplinary but interconnected team repurposed from different departments (clinical, diagnostic, and administrative) to serve COVID-19 patients and COVID-19 related plans under one command. This 'virtual' team spans across several departments and is led by the hospital Deputy Director General for Clinical Affairs. This virtual team oversees all COVID-19 related processes of care with a clear command chain to each of the designated COVID-19 activity, allocation, and clinical team members.

INFECTION PREVENTION AND CONTROL

TEAM

The success of hospital preparedness plans for outbreaks, epidemics, and pandemics of infectious diseases is determined, to a large extent, by the presence of a hospital-based functional, comprehensive, and expert-driven infection prevention and control program. With this program, the team can respond promptly to infectious hazards through activation of the hospital outbreak and pandemic plans to safeguard patients, healthcare workers, and other hospital employees. The indispensable role of the infection prevention and control team formed the basis of its inclusion as the third pillar of the hospital preparedness plan for COVID-19. Examples of the most crucial tasks performed by the team as part of the COVID-19 hospital preparedness plan are the development of COVID-19 personal protective equipment (PPE) protocols, provision of PPE training, the performance of N95 fit testing to frontline healthcare

workers, and development of backup plans for anticipated PPE shortages. Infection prevention and control staff were assigned to different COVID-19 units and functioned as the hospital communication links with public health officials for daily reports of COVID-19 cases and contact tracing.

Components (structure) of the SQUH COVID-19 preparedness plan

1. PLATFORMS FOR KNOWLEDGE AND INFORMATION SHARING AND DISSEMINATION

Rapid communication and factual information sharing are critical for the effective pandemic response of any health system. To ensure that all hospital employees, especially healthcare workers, are cognisant of the COVID-19 hospital preparedness plan, a hospital-wide knowledge forum (before reporting any case in the country) was created to share the particulars of the hospital COVID-19 preparedness plan. Additionally, a COVID-19 page was created in the hospital intranet portal to post COVID-19 related protocols, patient pathways, case notification and reporting forms, and hospital and national policies pertinent to COVID-19. The COVID-19 task force and the hospital management created two WhatsApp communication platforms to facilitate communication between the task force team and the hospital leadership, respectively. Moreover, both platforms were used by experts from infectious diseases and other specialties as regular platforms for sharing COVID-19 related scientific knowledge and as means of hospital scrutiny of COVID-19 'infodemic'. In recognition of the hospital pivotal and academic role and as an acknowledgment of its obligations to the community and the public, the hospital social media platform (Twitter and Instagram pages) was used as a portal for sharing evidence-based scientific and research knowledge on COVID-19 in an easy to understand infographics (in Arabic and English). An internal communication system of incident reporting and auditing concerning COVID-19 was created. In addition to the aforementioned communication channels, a communication team was assigned by the hospital director with the director of the virtual interdisciplinary COVID-19 team as the official hospital external communicator and the COVID-19 task force chair as the internal communicator. Frequent updates and briefings to the university

administration and the heads of departments and hospital employees were carried out regularly by the Director General and his team.

2. MEASURES TO ENSURE SAFETY AND WELLBEING OF FRONTLINE HEALTHCARE WORKERS

Healthcare workers are at the forefront in the fight against COVID-19, and it is of utmost importance that adequate measures are taken to ensure their safety, mental wellbeing, and guard them against burnout.⁶

A plan ensuring the safety of healthcare workers with an intensified program led by the hospital infection prevention and control team was developed with a focus on training and education of healthcare workers, especially those designated to COVID-19 clinical areas and those at the hospital points of entry, such as the emergency department, daycare unit, and the radiology department among others, on proper donning and doffing of PPEs, fit testing of N95 masks, use of powered air-purifying respirators, and standard protocols of infection prevention and control.

Healthcare workers are the most valuable asset for any health care system, and their access to appropriate PPEs during the care of patients with COVID-19 is their basic right. In recognition of this, a hospital committee for safeguarding continuous availability of PPEs was formed with the following mandates: real-time stock assessment, monitoring rate of use, ensuring adequate supply, suggesting strategies on conservative use of PPEs (including extended use and reuse), and communication about PPE preservation. A policy on PPE use was generated, and a plan for emergency provision of PPE was formed.

During pandemics, healthcare workers suffer adverse psychological reactions. Hence, the preservation of mental wellbeing was a crucial component of the hospital COVID-19 preparedness plan. Managing healthcare workers' stress associated with COVID-19 was addressed through a dedicated helpline created by hospital experts in psychology and behavioral medicine and via educational videos on mental wellbeing prepared by the hospital and posted through the hospital social media platform.

3. PROCEDURES FOR PROMPT RECOGNITION OF 'SUSPECTED' COVID-19 CASE AT THE

HOSPITAL ENTRY

The hospital implemented a symptom-based screening and travel history during the initial phase of the pandemic for patients, their attendants, and visitors at hospital entry to detect 'suspected' COVID-19 cases to limit inadvertent exposures and protect patients, healthcare workers, and other hospital employees. The screening procedure was carried out by trained nursing staff. Furthermore, the registration clerks carried out additional symptom screening at points of clinical encounters (emergency medicine department (EMD), outpatient clinics, daycare unit, radiology department, etc.) to check those coming in for symptoms that could be related to COVID-19 infection. Thermal scanners were introduced later during the pandemic and placed at the main hospital entrance. Alert signs and posters on symptoms of COVID-19 were placed in several strategic places throughout the hospital. A visitor restriction policy was adopted, and its implementation was regularly monitored.

4. BED CAPACITY BUILDING AND SURGE CONTINGENCY

In response to the potential impact of COVID-19 on the health system in Oman, the hospital prepared for an anticipated influx of patients with COVID-19 of different severities. The cumulative global data suggest that up to 20% of patients with COVID-19 require hospitalization, of which 5% require intensive care.⁷ This knowledge was critical for our proportionate allocation of beds and linked staffing and resources. It is essential to highlight that the hospital typically operates with an 85% bed capacity. The hospital-bed capacity building plan aims to escalate bed capacity over two phases with 20% in the first phase (capacity building) and an extra 10% in the second phase (surge contingency) if required.

Reconfiguration of several clinical areas was performed to keep the care of COVID-19 patients centralized and in the same geographical location as much as possible. Bed capacity for critically ill COVID-19 patients (ICU and high dependency beds) was increased by 40%, and a designated ICU for patients with COVID-19 was allocated. Additionally, a contingency plan for a surge of ICU requiring COVID-19 patients was also developed and included the use of the new extension of the emergency medicine building for the critically ill, and the use of the cardiac ICU if required.

Non-ICU COVID-19 inpatient areas were selected based on the availability of airborne isolation rooms and single rooms and were geographically contained and physically allocated within the same proximity. This accounted for a full isolation ward. Similarly, two wards in the same proximity of the current COVID-19 wards for non-critically ill patients were designated for non-ICU COVID-19 patients as a surge contingency plan when required. Several isolation rooms, including two negative pressure rooms (for patients requiring non-invasive ventilation) in the same proximity of non-ICU COVID-19 area, were assigned as intermediary high dependency care areas for patients with suspected COVID-19 awaiting their infection status.

All COVID-19 suspected cases are admitted to isolation rooms with allocation depending on the nature of their disease and clinical status at admission until their status is known. The testing capacity was maximized with a turnaround time of fewer than 12 hours to optimize utilization of isolation rooms.

Each of these COVID-19 designated clinical areas is cared for by designated medical and nursing teams in addition to infection prevention and control staff, housekeeping staff, and other support services. Clinical schedules and leadership roles in each team were established, intensive training on PPE use was carried out, and drills were conducted, including cardiopulmonary resuscitation drills.

5. STAFF (HEALTHCARE WORKERS) CAPACITY BUILDING AND SURGE CONTINGENCY

Infectious disease specialists, infection control practitioners, pulmonologists, intensivists, emergency medicine specialists, obstetricians, and nursing staff constituted the 'virtual' COVID-19 core team. This 'virtual' COVID-19 core team of frontline healthcare workers was further reinforced and expanded through repurposing and reallocation of other healthcare workers all under the 'virtual' COVID-19 team and a single leadership. These add-on healthcare workers were provided with training and education on the care of patients with COVID-19, standard protocols of infection prevention and control, appropriate use of PPEs, and were fit tested for N95 respirators. Parallel to the surge and contingency plan for hospital-bed capacity, a similar surge contingency plan for further expanding the virtual COVID-19 team was put in place. This plan entails mobilization and deployment

of healthcare workers from all specialties across the hospital.

6. MANAGEMENT OF ESSENTIAL MEDICAL EQUIPMENT AND PHARMACEUTICALS

Potential shortages of essential and indispensable medical equipment were anticipated at the commencement of the preparation, specifically PPEs, ventilators, oxygen delivery points, and essential pharmaceuticals such as ICU formulary and potential COVID-19 therapeutics. A register of all essential medical equipment and pharmaceuticals, their stock availability, average consumption, predicted supply, the potential for reuse, and need for repair (when applicable) was produced. A hospital committee for ensuring the continuous availability of PPEs was formed. Biomedical engineers repaired and fixed defective ventilators. Oxygen delivery points were created with the installation of medical air in COVID-19 repurposed wards. Urgent tenders for purchasing of new ventilators and stockpiling of essential pharmaceuticals were projected.

7. ENABLING SUSTAINABILITY OF ESSENTIAL CLINICAL CARE AND REORGANIZATION OF ELECTIVE CARE

Preparing for the COVID-19 pandemic has placed unparalleled demands on health care delivery systems with a risk that essential clinical care for non-COVID-19 patients would be subsequently compromised. The hospital realizes that sustaining the delivery of essential clinical care during the COVID-19 pandemic is paramount to counteract the morbidity and mortality from these critical non-COVID-19 medical conditions. Services such as cancer care, care of the immunocompromised, bone marrow transplant service, obstetric and pediatric care, urgent and semi-urgent medical, surgical, and dental care were uninterrupted and were carried out in safe locations and with safe staffing. Symptom screen for all patients at the point of hospital entry was implemented, and patients with symptoms compatible with COVID-19 were identified, isolated, and tested.

Restructuring of elective and non-essential medical and surgical care was a key component of the COVID-19 hospital preparedness plan to optimize scarce medical resources, curbing the nosocomial spread of severe acute respiratory syndrome coronavirus (SARS-CoV-2; the strain responsible

for COVID-19), and enhancing social distancing in clinical areas. Accordingly, plans for postponement and cancellations of elective and non-urgent inpatient and ambulatory care services in consultation with heads of clinical departments were developed and executed with consensus. Concomitantly, alternative care pathways were adopted. These included implementation of a WhatsApp prescription service and phone consultation for non-urgent referrals, among others.

8. ESTABLISHING COVID-19 CLINIC LINKED TO TRIAGING AND SYMPTOM SCREENING AT HOSPITAL ENTRY POINTS

In line with the hospital procedures for prompt recognition of 'suspected' COVID-19 cases at the hospital entry points, a dedicated and geographically standalone clinic in the ambulatory care area was created to cater to patients, their attendants, and visitors presenting to the hospital on a scheduled appointment or otherwise who may be found to have respiratory symptoms as part of the routine entrance or registration screening. In such an event, the patients, his/her attendant(s), or a visitor is immediately given a mask to wear and directed to this clinic by the nurse or registration clerk for consultation and testing by the COVID-19 clinic team. A similar arrangement was made for healthcare workers and other hospital staff in a different vicinity.

9. INTRODUCING TESTING FOR COVID-19 WITH A SCALE-UP CAPACITY BUILDING

The clinical virology laboratory section of the department of microbiology and immunology at SQUH is a resource-rich in molecular testing. The hospital realized from the beginning that the preparedness plan for COVID-19 would not fully achieve its objectives without ensuring in house testing capability for SARS-CoV-2. As a result, the SARS-CoV-2 polymerase chain reaction testing was rapidly introduced to the laboratory, and a plan for scaling up testing capacity was set off.

10. REORGANIZING PATIENT FLOW FOR RADIOLOGICAL IMAGING AND PROCEDURES

Suspected COVID-19 related to lower respiratory tract infection (pneumonia) often warrants imaging.⁸ The hospital COVID-19 preparedness plan identified healthcare workers in radiology (especially radiology technicians) as frontline personnel with

regards to the COVID-19 preparedness plan. The plan enforced the implementation of operational changes and alterations in the workflow to ensure continued radiology services and safeguarding of patients and staff.

The department of radiology and molecular imaging developed standard operating procedures for safe imaging of patients with suspected or known COVID-19. Outpatients scheduled for imaging examinations are symptom screened at the front desk, followed by patients either progressing to scheduled imaging examinations or directed to the COVID-19 clinic. After establishing community spread of COVID-19 in Oman, the need to perform the scheduled imaging examinations was determined by the relative urgency of the examination with postponement or cancellation of all elective and non-essential imaging. For inpatients and patients from the EMD, patients had usually already been identified as known or suspected COVID-19 cases; hence imaging examinations were clinically warranted with precautions taken as per hospital infection control standards. Portable X-ray machines were solely designated for confirmed COVID-19 patients in the EMD, COVID-19 ICU, and COVID-19 wards.

11. MAINTAINING SAFE MATERNITY CARE

Maternity care, especially intrapartum care, is a core non-elective clinical service and should not be compromised during COVID-19 pandemic readiness plans.⁹

Nevertheless, providing such care during the COVID-19 pandemic should occur in a safe and responsive clinical setting. The hospital COVID-19 preparedness plan for antenatal care included departmental revision of service provision with consideration of alterations in workflows, spaced visit scheduling, and triaging with symptom screen for COVID-19 at the entrance of the antenatal clinic. Negative pressure rooms in the obstetrics and gynecology ward were allocated to care for confirmed COVID-19 pregnant women with advanced gestational age. All other admissions requiring pregnant women with confirmed COVID-19 and did not require urgent obstetric care were admitted to the designated adult COVID-19 clinical areas. Likewise, the hospital COVID-19 preparedness plan for labor and delivery included heightened symptom screen with the aim of prompt identification of pregnant women suspected to have

COVID-19 before or at the arrival to the delivery ward, and provision of training to all midwives on the appropriate use of PPEs including N95 respirator fit testing. The hospital recommended midwives to precautionary use of N95 respirators during the second stage of labor when attending a COVID-19 confirmed case.

12. RESTRUCTURING OF THE OPERATING THEATRE WORKFLOW AND PATHWAYS

Operating theatres are high-risk areas for transmission of respiratory infections given the involvement of multiple staff and the need for high transmission-risk activities such as airway management.¹⁰

The COVID-19 preparedness plan demanded the hospital operating theatre committee to liaise with surgical teams to postpone or cancel electively scheduled operations to optimize limited resources and curtail the nosocomial spread of SARS-CoV-2. Urgent and emergency surgeries were allowed to continue with major modifications in the operating theatre workflow augmented by heightened personal protection and engineering controls (negative pressure operating room).

Urgent and emergency surgeries of confirmed and suspected COVID-19 patients, when results of testing for SARS-CoV-2 are delayed, were assigned to be performed in a dedicated negative pressure operating room (minor operating theatre) located away from the main operating theatre complex and near the EMD and COVID-19 ICU. Operating on COVID-19 confirmed cases are restricted to a pre-assigned surgical/anesthesia COVID-19 team (part of the virtual COVID-19 team) trained on the use of full protective gear, including fit-tested N95 respirator or air-purifying respirator systems.

13. REORGANIZING EMD STRUCTURE AND WORKFLOW TO ENHANCE SURGE CAPACITY AND SEGREGATE COVID-19 CASES FROM OTHERS

The hospital COVID-19 preparedness plan perceived the EMD as the hospital's front door and recognized its pivotal role in the prompt identification of suspected COVID-19 patients on entry to the hospital. This is achieved through a stringent triaging system where a standardized screening questionnaire, based on national case definition of suspected COVID-19, is applied to all patients attending the EMD for care.

The structural layout of the EMD was reorganized with the aim of physically and completely segregating suspected COVID-19 cases from all other patients. A designated suspect COVID-19 clinical area within the EMD was created and subdivided into 'cold' and 'critical' zones. The preparedness plan demanded that all suspected COVID-19 patients who require hospitalization are fast-tracked for admission with minimal stay in the EMD. Admission privilege orders were given to the EMD consultant to accelerate the patient mobilization process and dismissal from the ward. A surge plan (staff and bed capacity building) was set forth. A tentative contingency surge plan comprises the opening of the new EMD building for a surge of COVID-19 patients and repositioning healthcare workers from the surgical department to work in the extended EMD building when required.

All healthcare workers in the EMD were provided with intensified training on standard protocols of infection prevention and control, appropriate use of PPEs, and were fit tested for N95 respirators.

14. MITIGATING RISK IN DIALYSIS UNIT

Patients on dialysis are at heightened risk for COVID-19 infection and, if infected, pose significant risk and challenge to dialysis units (staff and patients).¹¹ The hospital COVID-19 preparedness plan entails implementing preventive measures to minimize the risk of COVID-19 infection spread in the dialysis unit. Healthcare workers in the dialysis unit received education and training on infection prevention and control standards and the appropriate use of PPEs, donning and doffing, and N95 respirator fit testing. The unit adapted pre-dialysis symptom screening (phone calls) with linked patient instructions. A designated, geographically distant, dialysis isolation room for patients who tested positive for COVID-19 was mobilized with assigned COVID-19 dialysis staff trained on the proper use of PPE and N95 respirator fit-tested. Suspected COVID-19 patients were deferred until test results were available (within 24 hours).

15. MITIGATING RISK IN CATHETERIZATION LABORATORY

COVID-19 has placed an enormous strain on the health care systems with specific implications of the disease on practice in the catheterization laboratory.¹² In an effort to minimize patient's exposure to the hospital environment and to preserve resources (i.e.,

PPE), the hospital COVID-19 preparedness plan called for postponing elective procedures, including those applicable to the catheterization laboratory. As a result, workflow and patient care pathways in the catheterization laboratory were substantially modified with the ultimate goal of safeguarding healthcare workers and patients. Protocols on patient selection were developed and pathways for patients with suspected and confirmed COVID-19 based on balancing staff exposure risk and patient benefits were created. It is important to mention that all patients undergo a symptom screen before arrival to the catheterization laboratory. Suspected COVID-19 patients were tested before undergoing catheterization unless deemed urgent. A subset of the catheterization laboratory personnel were fit-tested for N95 respirator, trained on proper donning and doffing of PPE, and use of air-purifying respirator systems. Specific settings for the use of each PPE were delineated.

16. MITIGATING RISK IN ENDOSCOPY SUITE

Endoscopy is a potentially high-risk procedure for the transmission of COVID-19 infection.¹³ Provision of guidance to enhance patient safety, avert hospital transmission, protect healthcare workers, and ensure proper and rational use of PPEs are key to the hospital COVID-19 preparedness plan. The endoscopy suite setup, its workflow, and patient care pathways were revised and restructured with the creation of 'clean' and 'dirty' zones. Non-urgent cases were canceled, symptom screen and risk stratification were applied, and preprocedural testing for SARS-CoV-2 was implemented for suspected, non-urgent COVID-19 cases. A negative pressure procedure room was allocated and designated for confirmed COVID-19 cases, and an additional negative pressure room in COVID-19 wards was repurposed for hospitalized COVID-19 patients requiring endoscopy. Endoscopy suite staff received formal training in the use of donning and doffing PPEs, appropriate use of air-purifying respirator systems (selected staff), and fit-tested for N95 respirator.

17. ENSURING THE SAFETY OF THE CLINICAL LABORATORIES

Clinical laboratories are expected to continue functioning during pandemics, albeit the anticipated downsizing of their routine work. Laboratory staff

typically work in relatively small spaces heralding the practice of social distancing. The hospital COVID-19 preparedness plan for the clinical laboratories largely focused on staff safety, enabling measures for continuity of service, employing a risk-based approach to handling and processing of biological samples from patients with suspected or confirmed COVID-19, and prioritizing laboratory testing as a contingency strategy. The preparedness plan emphasis on safety of laboratory staff was further augmented through calls for use of standard operating procedures, use of standard safety precautions, and education and training on basic infection prevention protocols and proper use of PPEs (based on risk assessment). This safety concern was further addressed through a system-generated notification alert introduced to inform laboratory staff when receiving samples from suspected or confirmed COVID-19 patients. This alert system is accessible by clinical teams providing care to these patients.

18. ESCALATION OF HOSPITAL ENVIRONMENTAL CLEANING AND DISINFECTION

COVID-19 can survive on surfaces for several hours but is readily inactivated by cleaning and disinfection.¹⁴ The hospital preparedness plan views housekeeping staff as frontline workers, and their safety was addressed through the delivery of intensified education and training on basic standards of infection prevention, including PPE use. The plan entails restricted mobility of housekeeping staff and cleaning/disinfecting equipment between clinical areas. Designated housekeeping staff were allocated to each of the COVID-19 clinical areas. All housekeeping staff underwent daily symptom screen upon reporting to work.

Likewise, the cleaning and disinfection of the hospital environment, clinical care areas, especially COVID-19 designated areas, is crucial for mitigating the transmission of SARS-CoV-2 in the hospital. Protocols for cleaning and disinfection were revised with scaling up of the hospital cleaning and disinfection procedures. Finally, the plan anticipated surge in medical waste during the COVID-19 pandemic resulting from the disposal of PPEs. A procedure of safe discard of used PPE in the same way as regular medical waste was applied.

CONCLUSION

An effective and prompt response of hospitals to the COVID-19 pandemic is critical for preserving healthcare services. We described our hospital preparedness plan for COVID-19 for hospitals worldwide who share the common goal of providing quality care and safety in the preparedness of a highly dynamic and extraordinary health crisis scenario such as COVID-19, emphasizing its comprehensiveness, multifaceted nature, and its functional 'virtual' performance and governance. We believe that 'virtual' cross-departmental command accelerated its operational outcome and speeded its execution. Furthermore, the phase-based nature of this plan allowed the hospital to continue care delivery for all essential services with a negligible impact from COVID-19. Finally, the approach we described herein is centered around protecting and safeguarding healthcare workers and patients.

**Updated numbers at time of publication: as of 28 September 2020, more than 32 million cases of COVID-19 have been reported globally, with more than 991 000 deaths.¹ Oman has recorded 95 907 cases with 885 deaths as of 28 September 2020.*

***At the time of publication, the number of cases of COVID-19 related hospitalizations increased to 651 of which 123 were ICU admissions and on ventilators. The hospital also had 75 COVID-19 related deaths.*

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