Review Article

# COVID-19 management in the emergency ward

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The confirmed and suspected cases of the 2019 novel coronavirus disease (COVID-19) have increased in the entire world. There is still no vaccine or definitive treatment for this virus due to its unknown pathogenesis and proliferation pathways. Optimized supportive care remains the main therapy, and the clinical efficacy for the subsequent agents is still under investigation. Enormous demand for handling the COVID-19 outbreak challenged both the health-care personnel and medical supply system. As outbreaks of COVID-19 develop, prehospital workers, emergency medical services personnel, and other emergency responders are potentially asked to follow specific practice guidelines to mitigate the effects of an escalating pandemic. In this article, we have summarized the current guidance on potential COVID-19 management options. The recent experience with COVID-19 provided lessons on strategy and policymaking that the government and ministry of health should be on the alert and concentrate more on capacity to manage an outbreak like COVID-19. It is important to consider the new data that emerge daily regarding clinical characteristics, treatment options, and outcomes for COVID-19.

**Key words:** COVID-19, disease management, emergency treatment, emergency ward

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## INTRODUCTION

The coronavirus is one of the members of a virus family that may lead to numerous symptoms including fever, pneumonia, lung infection, and breathing difficulty.[1] Although the mentioned family of viruses is more prevalent among animals across the world, very few human cases have been recognized to be affected by these viruses. The term 2019 novel coronavirus was used by the World Health Organization (WHO) to mention a type of coronavirus affecting the lower respiratory tract of Chinese patients with pneumonia in Wuhan on December 29, 2019.[2,3] The 2019 novel coronavirus has been officially announced by the WHO as coronavirus disease (COVID-19).[3] Moreover, severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) is the present reference name for COVID-19. Regarding the mentioned virus, a group of patients who had pneumonia with an unknown cause was in contact with a domestic Seafood Market located in Wuhan, China, in December 2019.[4]

The incidence and mortality rates are still increasing as no verified effective treatment has been offered in this regard. In addition, management experiences regarding similar coronavirus epidemics such as the Middle East respiratory syndrome (MERS) and SARS cannot be applied for the treatment of COVID-19.

The health-care teams of China have been completely involved in the frontline to tackle with COVID-19 epidemic and are vigorously performing numerous systematic studies on the disease pathogenesis triggered by this virus, clinical profiles, transmission mode, disease prevention, and management; however, a limited number of studies have been devoted to address the emergency protocols in this respect. The emergency room is the most critical and important ward in hospitals and regarding the increasing spread of COVID-19, it should be considered the required protocols in emergency rooms of hospitals with attention to the limitations and challenges in this department to manage

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the disease. The objective of the present review was to assess the protocols that can be applied for the management of COVID -19 patients in emergency wards.

## CLINICAL PRESENTATION

COVID-19 and other viral upper respiratory diseases have similar symptoms including fatigue, dyspnea, cough, and fever.[5,6] However, considering the patients' comorbidities and presenting symptoms, a differential diagnosis is required for each COVID-19 patient. In this regard, respiratory syncytial virus, influenza, other viral illnesses, other pulmonary diseases such as pulmonary embolism, and bacterial pneumonia should be taken into consideration. In this respect, obtaining a comprehensive and intensive history, performing physical examinations, and gathering collateral history from the members of the patient's family are of great significance. In addition to pulmonary symptoms, COVID-19 patients may primarily have more ambiguous complaints such as lethargy, diarrhea, nausea, and myalgias.[7] Patients may also experience headache, confusion, vomiting, pleurisy, sore throat, sneezing, rhinorrhea, and nasal congestion.[6,7] The most frequently reported symptoms by 41 COVID-19 patients with the median age of 49.0 years from Wuhan, China, were dyspnea (55%), fever (98%), or cough (76%).[8] Moreover, the mentioned patients reported productive cough (28%), headache (8%), myalgias/fatigue (44%), diarrhea (3%), and hemoptysis (5%).[8] Another nationwide study addressing Chinese COVID-19 cases has reported sputum production (34%), fatigue (38%), shortness of breath (19%), cough (68%), and fever (44%) as the most shared presenting symptoms.[9] Moreover, gastrointestinal (GI) symptoms were observed in 48.5% of 204 patients with confirmed COVID-19.[9] The mentioned symptoms may consist of diarrhea (29.3%), abdominal pain (0.4%), vomiting (0.8%), and anorexia (83.8%). A temperature cutoff of 100°F was recommended by the U. S. Centers for Disease Control (CDC) and prevention to quickly diagnose likely COVID-19 patients and increase sensitivity.[5]

Secondary bacterial infection, cardiac injury, septic shock, ventilator-associated pneumonia, and acute kidney injury are among the other complications of COVID-19.[8] Table 1 demonstrates the clinical features and epidemiological risks for the evaluations of individuals suspected of having COVID-19.[10]

## DIAGNOSIS

Molecular assays of respiratory specimens are performed at WHO-designated regional referral laboratories to diagnose COVID-19.[11] The test kits were distributed by the CDC on February 7 to perform regional testing. It is expected to rapidly provide more generally available testing. Testing by the CDC is the single option for institutions in which testing cannot be performed. It must be mentioned that COVID-19 testing should not be delayed due to the approval of another viral respiratory illness in a person under investigation (PUI).

Real-time reverse-transcription–polymerase chain reaction (rRT-PCR), reverse transcription loop-mediated isothermal amplification (RT-LAMP), and RT-PCR are the present coronavirus diagnostic tests.[12] RT-LAMP is highly specific, has a sensitivity similar to that of rRT-PCR, and is employed to detect MERS-CoV.[8] Two one-step quantitative RT-PCR (qRT-PCR) assays were developed to identify the patients earlier by detecting two distinct regions (ORF1b and N) of the SARS-CoV-2 genome.[13] Three new RT-PCR assays that target spike (S), RNA-dependent RNA polymerase (RdRp)/helicase (Hel), and nucleocapsid (N) genes of SARS-CoV-2 have been developed.

The COVID-19-RdRp/Hel assay had the minimum limit of diagnosis *in vitro* among the mentioned three new assays. Highly specific and sensitive assays may contribute to the improvement of the laboratory diagnosis of COVID-19.[14] The SARS-CoV E gene assay was found to have higher sensitivity in comparison with the RdRp gene assay in combination with the one-step RT-PCR system.[15] Although the E-gene PCR was adequate for the diagnosis of SARS-CoV-2 infection, the RdRp protocol was suggested to be used for approval of positive results.[16,17] The present laboratory test takes too much time, and deficiency of commercial kits leads to delayed diagnosis. Despite negative RT-PCR results, typical chest computerized tomography (CT) characteristics should be used for the diagnosis of COVID-19 infection for patients with coughing, fatigue, sore throat, fever, or dyspnea that is coupled with recent exposure although according to the studies, inflammatory markers increase in patients with COVID-19 and can be a good indicator to find patients.[11]

## INITIAL APPROACH TO COVID-19 IN THE EMERGENCY DEPARTMENTS

Identification and isolation of patients at risk for COVID-19 infection, proclamation of local public health and hospital infection prevention authorities, and early engagement of infectious disease as well as other specialists should be followed in an emergency medicine approach to COVID-19. Contact and case definitions for COVID-19 have been established by the WHO to standardize global surveillance [Table 2].[18] Majority of confirmed cases of COVID-19 have had symptoms of acute respiratory illness such as difficulty breathing difficulties and cough and/or a confirmed or subjective fever.[19]

In combination with clinician judgment with respect to patients' presentations that are compatible with COVID-19, the guidelines provided by CDC assign a priority to

**Table 1: Clinical features and epidemiological risks of coronavirus disease-2019**

| Clinical features | AND | Epidemiologic risk |
|---|---|---|
| Fever* or signs/symptoms of lower respiratory illness (e.g., cough or shortness of breath) | AND | Any person, including healthcare workers, who has had close contact* with a laboratory-confirmed* 2019-nCoV patient* within 14 days of symptom onset |
| Fever* and signs/symptoms of a lower respiratory illness (e.g., cough or shortness of breath) | AND | A history of travel* within 14 days of symptom onset |
| Fever* and signs/symptoms of a lower respiratory illness (e.g., cough or shortness of breath) requiring hospitalization | AND | A history of travel* within 14 days of symptom onset |

*For explanation of use of the terms, fever, close contact, laboratory-confirmed, 2019-nCoV patient, and China, view the source at: https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-criteria. html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fclinical-criteria.html#foot1

**Table 2: Initial approach to coronavirus disease-2019 according to the World Health Organization in the emergency departments**

**WHO case and contact definitions for global surveillance of COVID-19**

**https://www.who.int/publications-detail/global-surveillance-human-infection-with-novel-coronavirous-(2019-nCoV)**

Suspected case

A. A patient with acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath). And a history of travel to or residence in a location reporting community transmission of COVID-19 disease during 14 days prior to symptom onset

OR

B. A patient with any acute respiratory illness AND having been in contact with a confirmed or probable COVID-19 case (see definition of contact) in the last 14 days prior to symptom onset

OR

C. A patient with severe acute respiratory illness (fever and at least one sign/symptom of respiratory disease, e.g., cough, shortness of breath; AND requiring hospitalization) AND in the absence of an alternative diagnosis that fully explains the clinical presentation

Probable case

A. A suspect case for whom testing for the COVID-19 virus is inconclusive.

OR

B. A suspect case for whom testing could not be performed for any reason

Confirmed case

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

See laboratory guidance for details: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/laboratory-guidance

Contact

A contact is a person who experienced any one of the following exposures during the 2 days before and the 14 days after the onset of symptoms of a probable or confirmed case

Face-to-face contact with a probable or confirmed case within 1 m and for more than 15 min

Direct physical contact with a probable or confirmed case

Direct care for a patient with probable or confirmed COVID-19 disease without using proper personal protective equipment; OR

Other situations as indicated by local risk assessments

For confirmed asymptomatic cases, the period of contact is measured as the 2 days before through the 14 days after the date on which the sample was taken which led to confirmation. WHO=World Health Organization; COVID-19=Coronavirus disease-2019; nCoV=Novel coronavirus

**Table 3: Prioritization of patients based on signs and symptoms for evaluation of coronavirus disease-2019**

**Patients' populations that should be prioritized for evaluation of COVID-19 in the setting of compatible signs and symptoms. https://www.cdc.gov/conavirus/2019-nCoV/hcp/clinical-crtiteria.html**

1. Hospitalized patients who have signs and symptoms compatible with COVID 19 in order to inform decisions related to infection control
2. Other symptomatic individuals such as, older adults and individuals with chronic medical conditions and/or an immunocompromised state that may put them at higher risk for poor outcomes (e.g., diabetes, heart disease, receiving immunosuppressive medications, chronic lung disease, chronic kidney disease)
3. Any persons including health-care personnel, who within 14 days of symptom onset had close contact[a] with a suspect or laboratory-confirmed COVID-19 patient, or who have a history of travel from affected geographic areas[b] within 14 days of their symptom onset

For healthcare personnel, testing may be considered if there has been exposure to a person with suspected COVID-19 without laboratory confirmation. Because of their often extensive and close contact with vulnerable patients in healthcare setting, even mild signs and symptoms (e.g., sore throat) of COVID-19 evaluated among potentially exposed healthcare personnel. Additional information is available in CDC's Interim U.S. Guidance for Risk Assessment and Public Health Management of Healthcare Personnel with Potential Exposure in a Healthcare Setting to Patients with Coronavirus Disease 2019, [a]Close contact is defined as-(I) Being within approximately 6 feet (2 m of a COVID-19 case for a prolonged period of time; close contact occur while caring for, living with, visiting, or sharing a healthcare waiting area or room with a COVID-19 case - or - (II) Having direct contact with infectious secretions of a COVID-19 case (e.g., being coughed on). If such contact occurs while not wearing recommended personal protective equipment or PPE (e.g., gowns, gloves, NISH-certified disposable N95 respirator, eye protection), criteria for PUI consideration are met. Documentation of laboratory-confirmation of COVID-19 may not be possible for travelers or persons caring for COVID-19 patients in other countries, [b]Affected areas are defined as geographic regions where sustained community transmission has been identified. For a list of relevant affected areas, see CDC's Coronavirus Disease 2019 information for travel. COVID-19=Coronavirus disease-2019; nCoV=Novel coronavirus; CDC's=Centers for disease controls; PPE=Personal protective equipment; PUI=Persons under investigation; NISH=National institute of speech and hearing

patients from defined populations for additional testing and evaluations as PUI [Table 3].[18]

As the presented criteria are not comprehensive, additional testing on an individual basis should be performed for patients with an equivocal history of exposure or an unestablished etiology.[19] The threshold for additional COVID-19 examination in the emergency departments (ED) should be reduced for cases with confirmed local COVID-19 in the locations of acknowledged community transmission. It is strongly suggested to cooperate with state and local public health departments.[20,21] A PUI should be requested to put on a facemask to decrease the risk of virus transmission to other individuals in the surrounding area [Figure 1].[22]

## PREHOSPITAL SETTING

Authorities of public health and directors of emergency medical services (EMS) working cooperatively with the CDC will require to revise the strategies of emergency preparedness to approach COVID-19.[21] Emergency medical dispatchers should take into consideration whether

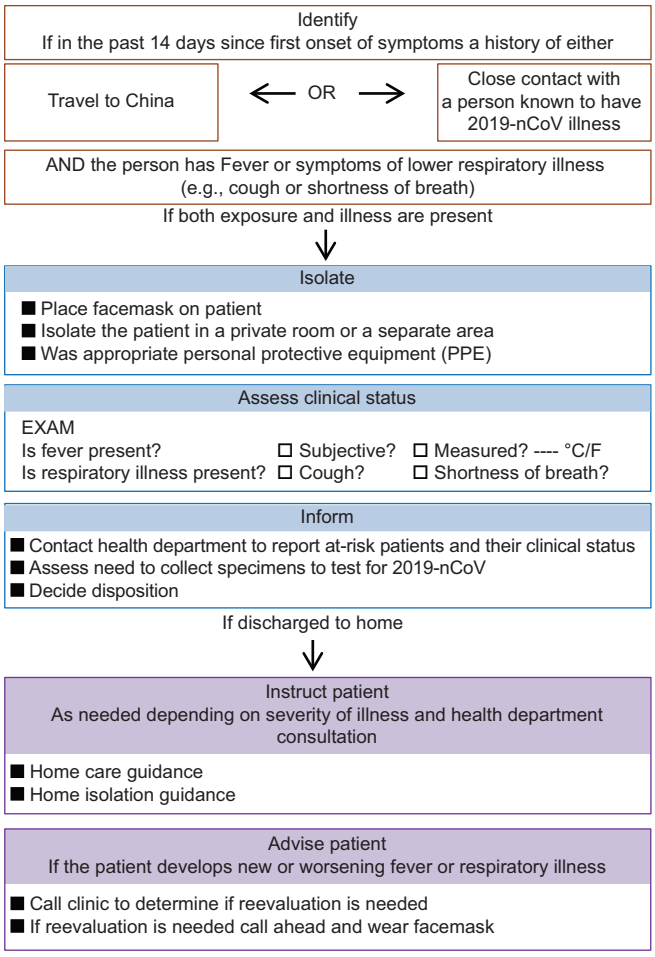


**Figure 1:** Flowchart to identify and assess 2019 novel coronavirus from the CDC: https://stacks.cdc.gov/view/cdc/84758

visitors explaining symptoms and risk factors regarding COVID-19 should be recognized as a potential PUI.[21,23] If so, EMS personnel who arrive on the scene and health-care professionals (HCPs) who work at the receiving hospitals must be instantaneously informed to make sure to use appropriate personal protective equipment (PPE). Moreover, it must be approved that suitable isolation facilities are provided.[23] When there is an interaction with the patient, initial assessment and triage should be performed at least 2 m or 6 ft away and can only be reduced whenever the PUI puts on a facemask.[23] In addition to restricting the EMS personnel number in the patient section, those personnel offering any direct patient care should follow standard, contact (gloves and gown), and droplet (surgical mask) precautions along with putting on eye protection equipment (goggles or face shield).[23] Moreover, if an aerosol-generating procedure is expected in the process of patient transport and/or if the patient is severely ill, airborne precautions (N95 respirator) should be used. Ideally, transport vehicles equipped with high-efficiency particulate air (HEPA) filtration or isolated compartments should be employed, and the patient must be directly transferred to a treatment room when they arrive at the receiving health-care facilities including hospitals.[23] Patient compartment doors must be left open to permit suitable ventilation after transporting the patient and completing EMS documentation.[23] Gloves, disposable gown, face shield, and surgical mask should be put on while cleaning the patient transport vehicle.[23] Routine cleaning must be pursued by applying a hospital-grade disinfectant, which is preferably verified by the U. S. Environmental Protection Agency (EPA) to be used against emerging viral pathogens such as SARSCoV-2.[23]

## EMERGENCY DEPARTMENT SETTINGS

Preferably, stable COVID-19 PUIs should be recognized at the time of triage or check-in and then should be directed to an isolated room with a closed door.[5,23] An airborne infection isolation room (AIIR), recognized as a negative pressure isolation room, which has HEPA filtration of the re-circulated air should be employed for patients needing aerosol-generating procedures or for critically ill ones.[23,24] In case of identifying a PUI, the appropriate institutional personnel as well as the relevant health department or agency should be informed in a speedy manner.[19,20] Merely important HCPs that are engaged in patient care should be allowed to move into and out of the patient's treatment room.[24] Although the PUIs may take off their facemask in the room,[24] they should be required to put on a facemask while interacting with HCPs in the room as their coughs may contain respiratory droplets.

Alcohol-based hand sanitizer or soap and water should be used by HCPs before and after interactions with a COVID-19

PUI.[20] HCPs should use airborne precautions along with wearing a fitted N95 respirator instead of a surgical mask if there is a critically ill PUI or it is necessary to perform an aerosol-generating procedure such suctioning of the airway, endotracheal intubation, and sputum induction.[20,25] Furthermore, it is allowed to use reusable respirators including powered air-purifying respirators (PAPRs) only if they are disinfected and upheld suitably. Merely adhering to standard precautions is sufficient in case of evaluating and treating patients who had a history of COVID-19 exposure and present with noninfectious symptoms.[26] Moreover, proper PPE should be employed by HCPs if they have to transport the patient by stretcher or wheelchair within the ED or hospital or if portable studies such as plain radiography cannot be performed within the patient's room.[25,26] Likewise, suitable PPE must be donned at the receiving or destination location by HCPs that are informed of the patient's arrival.[26] Regarding the patients, a facemask and a clean hospital gown should be worn in case of leaving the treatment room.[27] As there may be infectious particles, contact, droplet, and standard precautions along with eye protection should be used by personnel that clean the empty PUI rooms facemask and a clean hospital gown.[28] How long SARS-CoV-2 remains in the air is ambiguous; however, pertinent evidence regarding former airborne diseases like tuberculosis can be of great value in this respect, especially by performing an aerosol-generating procedure.[28] In addition, standard institutional cleaning procedures should be employed to clean the commonly used surfaces at least twice a day.[28]

## CONSIDERATIONS FOR AIRWAY MANAGEMENT

Intubation can be considered as a high-risk procedure given the aerosolization of respiratory droplets.[23,29] As comprehensive obedience of PPE might be insufficient in a time-sensitive serious condition, rescue intubations should be evaded on every possible occasion.[29] COVID-19 guidelines presented by the Society of Critical Care Medicine Surviving Sepsis suggest carrying out endotracheal intubation following airborne precautions, which include the patient stay in an AIIR and a fitted N95 respirator use.[25] A number of specialists suggest the utilization of a PAPR based on previous cases of HCPs that were infected with SARS-CoV-1 during the use of N95 respirators, but intubation should be performed by the most knowledgeable provider.[25,29] In case of not using a PAPR, it is recommended to use a headcover as well as a full face shield to minimize the degree of unintentional contamination that may be caused by touching one's hair or face.[23,29] In addition, vertically taping gloves to the gown or longer-sleeved gloves can be used to reduce wrist exposure.[23] Utilization of tape circumferentially leads to more problematic removal of PPE and does not have any additional advantage.[23]

As shoe covers can cause unintended self-contamination, they should be avoided, and impermeable shoes, which could be suitably decontaminated, must be worn instead.[23] In case of availability, it is recommended to wear coveralls with or without a hood; however, it is suggested to establish procedures and preparation in safe doffing in advance as HCPs may have less experience in the utilization of PPE ensembles.[23] To restrict contact and/or droplet transmission while securing contaminated devices for reprocessing or disposal, HCPs should take into consideration double gloving as well as positioning waste and other transport receptacles nearby.[29] Nonaerosol-generating approaches which consist of jaw thrust, head of bed elevation, and utilization of positive end-expiratory pressure valves should be employed to optimize preoxygenation. Furthermore, fiberoptic laryngoscopy is recommended not to be used unless it is unquestionably required because atomization of anesthetic will lead the virus to turn into aerosolized.[29]

Prior to performing rapid sequence intubation, preoxygenation might be used for at least 5 min with a nasal cannula with 100% oxygen although its utilization may increase the risk of contamination.[23,29] A surgical mask could be positioned on the infected patient over the device to decrease the mentioned risk. The risk of aerosolization might be increased using noninvasive positive pressure ventilation, as a result of which it is not suggested for preoxygenation.[23,29]

A hydrophobic filter with a high efficiency is recommended to be employed between the facemask and the remaining respiratory circuit.[29] In comparison with direct laryngoscopy, video laryngoscopy is favored to increase the distance between the patient and the intubator.[23,25] The laryngoscope and all other equipment that are used for intubation should be instantly placed in the outer glove and a double zip-locked plastic bag by the emergency physician after completing the intubation.[29] Before the patient's use, a HEPA filter should be available in the expiratory limb of the mechanical ventilator.

## EVALUATION AND DIAGNOSIS IN THE EMERGENCY DEPARTMENTS

A high level of suspicion should be maintained by the ED personnel in the process of assessing patients, who have any signs related to a lower respiratory tract disease and have recently had an interaction with a recent traveler or have traveled to endemic zones. According to the CDC, travel warnings as well as epidemiological risks were primarily focused on individuals who had a recent contact with a traveler or had traveled to countries contracting COVID-19, as a result of which the interaction with China was increasingly decreased.

Remarkable information on the laboratory trends and clinical presentation for patients infected with novel coronavirus-infected pneumonia (NCIP) was provided by a single-center retrospective case series focusing on 138 patients. The mentioned study reported a number of significant demographics as follows: interquartile range of 42–68 years, ICU patients favoring higher ages, and a median age of 56 years. It is of great significance to consider that 40 (29%) and 17 (12.3%) patients with confirmed NCIP were active health professionals and hospitalized patients, respectively, which indicates the rate of 41% for nosocomial spread. Underlying comorbidities were more likely to be observed among infected patients who require intensive care unit (ICU) level care.[30] Significant laboratory findings presented according to JAMA are as follows: lymphopenia in 70.3% of patients, prolonged prothrombin time in 58% of patients, and elevated lactate dehydrogenase in 39.9% of patients. Moreover, higher lactate dehydrogenase levels as well as higher white blood cell counts with $P = 0.03$ were reported for patients who required ICU-level care ($P < 0.001$). In addition, all SARS-CoV, MERS-CoV, and COVID-19 outbreaks had indicated similar findings on chest imaging. All but one of the 41 COVID-19 patients presented bilateral lung involvement in a recently conducted cohort analysis.[8] Furthermore, 21%, 57%, 29%, and 14% of COVID-19 patients indicated normal CT scans, ground-glass opacity only, ground-glass opacity and consolidation at presentation, and normal scans at diagnosis in a study examining the CT scans of 21 COVID-19 patients, respectively. In addition, 76% and 71% of the mentioned patients had bilateral and two or more lobes involved disease, respectively.[31] All and 12 of 18 patients with positive findings on chest CT had the presence of ground-glass opacities and concomitant lobar consolidations, respectively.[31]

## HEMODYNAMICS

In general, the hemodynamic recommendations are analogous to the formerly published ones in the Surviving Sepsis Campaign: International Guidelines for Management of Sepsis and Septic Shock: 2016. It can be concluded that identical treatment and management processes followed for patients with septic shock should be pursued for patients with COVID-19 who have a need of hemodynamic management of shock or fluid resuscitation.[32]

Septic shock should be managed and treated in COVID-19 patients requiring hemodynamic management of shock or fluid resuscitation following other published guidelines though with subsequent exceptions.

Utilization of dynamic parameters, capillary refilling time, skin temperature, and/or lactate over static parameters are recommended by the COVID-19 Treatment Guidelines Panel (the Panel) for adult patients with shock and COVID-19 to evaluate fluid responsiveness.

Pulse pressure variation (PPV), stroke volume variation (SVV), and stroke volume change with a fluid challenge or passive leg raise were the dynamic parameters that should be employed. Fluid responsiveness is appeared to be predicted with the maximum accuracy by passive leg raising, which was followed by PPV and SVV.[33]

A systematic meta-analysis addressing seven randomized clinical trials ($n = 1,301$) has summarized the resuscitation of non-COVID-19 patients with shock on the basis of serum lactate levels. In comparison with central venous oxygen saturation (ScVO2)-guided therapy, early lactate clearance-directed therapy was linked to a decrease of mortality (relative ratio [OR]: 0.68; 95% confidence interval [CI]: 0.56–0.82), a shorter duration of mechanical ventilation (mean difference −10.22 h; 95% CI: −15.94 to −4.50), and a shorter length of ICU stay (mean difference −1.64 days; 95% CI: −3.23 to −0.05).[34]

Buffered/balanced crystalloids over unbalanced crystalloids have been recommended by the Panel to be used for the acute resuscitation of adults with shock and COVID-19. The initial utilization of albumin for resuscitation was recommended against by the Panel for the acute resuscitation of adults with shock and COVID-19.

The use of fresh-frozen plasma or albumin was compared with the use of crystalloids in critically ill patients in a meta-analysis addressing 20 non-COVID-19 randomized controlled trials ($n = 13,047$). The findings revealed that there was not any difference in all-cause mortality;[35] however, the mortality rate (OR 0.82; 95% CI: 0.67–1.0; $P = 0.047$) decreased in another meta-analysis that focused on 17 non-COVID-19 randomized controlled trials ($n = 1,977$) and compared the utilization of albumin with the use of crystalloids in patients with sepsis.[27] The use of albumin was suggested by the Panel to be avoided for initial routine resuscitation of shock and COVID-19 patients due to its lack of decisive clinical advantage as well as its higher costs.

## FURTHER RECOMMENDATIONS BASED ON GENERAL PRINCIPLES OF CRITICAL CARE

The use of hydroxyethyl starches for intravascular volume replacement in patients with septic shock or sepsis.

Norepinephrine has been recommended as the first-choice vasopressor by the Panel as well as the addition of either epinephrine or vasopressin (up to 0.03 U/min) to norepinephrine to increase the mean arterial pressure to target or the addition of vasopressin (up to 0.03 U/min) to reduce norepinephrine dosage.

The use of dopamine as an alternative vasopressor agent to norepinephrine has been recommended merely in specific patients, for instance, patients with absolute or relative bradycardia and low risk of tachyarrhythmias.

## THE USE OF LOW-DOSE DOPAMINE FOR RENAL PROTECTION

The use of dobutamine in patients showing evidence of persistent hypoperfusion in spite of using vasopressor agents and adequate fluid loading has been recommended.

If resources are presented, all patients requiring vasopressors have been recommended to place an arterial catheter as soon as possible.

The use of low-dose corticosteroid therapy ("shock-reversal") over no corticosteroid has been recommended for adults with refractory shock and COVID-19.

Intravenous hydrocortisone 200 mg daily that is administered either as intermittent doses or an infusion is the usual corticosteroid regimen in septic shock. A clinical decision should be usually made regarding the duration of hydrocortisone therapy.

## NUTRITIONAL RECOMMENDATIONS FOR COVID–19 PATIENTS

In case of the necessity of NG feeding, the following measures can be pursued to reduce the risks and facilitate NG feeding:

Silicone dressings can be worn to minimize the risk of pressure injury to the skin as well as air leakage for patients wearing tight fitting masks.[36]

A fine bore 8Fr NG feeding tube can be used in case of necessity.

Reduced tolerance of the feed and impairment of diaphragmatic function can be caused by the stomach distension. Prioritization of enteral feeding pumps should be considered for patients on Non-invasive ventilation/ Continuous positive airway pressure; hence, continuous infusion of feed with an accurate amount can be met. In case of lack of any enteral feeding pumps, gravity drip feeding can be used. However, it is not recommended to use bolus feeding considering the potential increase in the risk of aspiration.

Gastric decompression devices including ENFit Gastric Decompression System (Medicina) and Farrell Valve (Avanos) can be used. The stomach can be decompressed during feeding using the mentioned devices.

The upright position of the patient with an angle of 30–40° should be ensured during feeding. Prone position is not advised to perform NG feeding of patients on NIV/CPAP.

Regular use of prokinetics can promote gastric emptying and consequently facilitate gastric distension. Alone or combination use of erythromycin and metoclopramide is supported by NICE CG32.[37] Prokinetic doses of erythromycin (100–250 mg TDS) and metoclopramide (10 mg TDS) are recommended.[38]

In case of the failure of the mentioned measures, the stomach aspiration and the gastric residual volume (GRV) check are suggested for stomach decompression as well as absorption of the feed examination. A GRV of <500 ml/6 h, which is repeated after 6 h if >500 ml, is regarded to be acceptable.[38]

If facilities are provided for safe placement of nasojejunal tubes, they can overwhelm difficulties with GI intolerance.

In cases of unsuccessful enteral and oral feeding, parenteral nutrition (PN) can be used. Moreover, PN is of great significance in patients with preexisting malnutrition. A multidisciplinary nutrition support team is recommended to supervise PN given the risk of line sepsis as well as metabolic complications.[37] It is suggested to administer PN using a novel dedicated central venous catheter such as a peripherally inserted central catheter. As PN, in comparison with enteral feeding, is associated with a higher hyperglycemia risk, blood glucose should be closely monitored and controlled in COVID-19 treatment.[39,40]

It is not suggested to consider peripheral PN (<850 mOsm/l) as a first option as it has a high fluid volume and low nutrient density. Considering that peripheral PN can cause loss of access for medications and is so irritant to veins, it requires cautious surveillance for thrombophlebitis. If an infusion is probable to last more than 6 days, a peripheral midline is suggested.[41] In case of using short peripheral cannulas, their dedication to PN and rotation every 24–48 h are recommended.

## MANAGEMENT

ED is the first available place to patients that is based on the type, level, and volume of required services. In an epidemic situation, the place of triage and isolated rooms is one of the vital areas of the hospital, and the security staff of the hospital must constantly monitor this place to maintain its security.[42]

The triage room should have only one entrance and be separate from the main entrance of outpatients. Signs should be evaluated at the entrance of the hospital and in the triage

room with instructions to individuals with symptoms of a respiratory infection to notify the triage staff immediately to take the necessary precautions.[43]

The waiting room should be well ventilated (at least 12 times/h air circulation or having natural ventilation), low traffic, and safety. If there is no waiting room, an area in the main waiting room can be separated by physical barriers to separate patients with symptoms and restricted the contact between the patients. Furthermore, the presence of family members should be limited. In waiting rooms, chairs or benches should be placed at a distance of 1 m.[44]

The triage room must be equipped with negative pressure ventilation. Common areas and equipment should be regularly cleaned based on hospital protocols and guidelines. Ultraviolet and air disinfectants must disinfect the triage room at regular intervals.[45]

Tissues and no-touch receptacles should be available for disposal of tissues, masks, and other disposable items in waiting rooms and common areas. A glass or plastic cover should be used to minimize contact of the medical staff with the patients and reception desk in the triage room should be separated from the patients.[46]

All the triage steps should be monitored by a supervisor as well as the continuous monitoring of personal protective measures by medical staff. Triage personnel should be trained on appropriate processes (questions to be asked and actions to be taken) to quickly identify and isolate suspicious cases.[44] It is important to use eye protection (face shield or goggles) when hospital staff are in close contact with the patient with respiratory symptoms as there is a risk of contact with the patient's respiratory secretions.[47] Emergency staff must also be aware of the clinical and exposure screening criteria and be updated as needed regarding case definition and screening for travel.[48]

Patient admission and triage criteria (e.g., location of triage and entry/exit route) should be communicated to hospital staff, prehospital networks, and prehospital medical staff in accordance with hospital/national protocols. The purpose of early detection of infectious patients is the prevention of transmission of infection to other patients and health-care workers.[49] Employees of each hospital must use the hospital triage protocol. Our hospitals during this pandemic are implementing the hospital's strategy for admission, inter-hospital movements, and referral and discharge of patients with acute respiratory distress syndrome according to the local health authorities and relevant criteria and protocols. Furthermore, it is essential to create a process for rapid guidance of patients to the place of triage, early diagnosis, and separation of patients with respiratory disease from other patients.[50] The hospital can also provide a system for patients to wait in their personal vehicles or outside the hospital (if medically appropriate) and be notified through phone or other remote methods when it is their turn to be evaluated.[45] All COVID-19-suspected patients in the first line of contact with the health-care system should be scanned and isolated. For suspected individuals, an accurate history and physical examination should be performed.[46] All patients who are cared for outside the hospital (e.g., at home) should be instructed to manage themselves in accordance with local/regional public health protocols to separate themselves at home and if the condition gets serious, they visit a dedicated hospital for COVID-1915.[51] In patients who deteriorate and require ICU-level care, treatment should consider noninvasive ventilation, mechanical ventilation, or extracorporeal life support if necessary. In patients with poor outcomes, the development of ARDS and respiratory decompensation plays a central role in pathogenesis.[52] In our country, all the nonessential areas of the hospital are identified and their functions are restricted, with the staff being diverted to the emergency. The extra pool created is trained in basic triaging skills and administrative work as the EPs can focus on the resuscitation and patient management.

## CONCLUSION

Beyond supportive care, there are no proven alternative treatments for coronavirus infections, although in limited settings several potential therapies have been suggested and tested. However, there are concerning elements to this emerging infectious agent, including hemodynamic management, with vasopressor support if necessary, nutritional support, expeditious evaluation and drug treatment, and proper patient positioning to aid oxygenation and ventilation. Although data remain limited, it is important that emergency clinicians understand the dynamics of this emerging epidemic at both the individual- and population-based levels, learn how to detect those patients at risk or suffering from COVID-19, and prepare to treat these patients in their clinical practice. As the ED is the front line of contact with patients of contagious infectious diseases having an efficient system can be effective in quickly diagnosing and isolating patients with corona, which leads to their rapid quarantine; and prevents the transmission of the disease to other patients and staff members. In conclusion, the hospital emergency management plan could decrease the ED workload, protect health-care personnel, and control the cross-infection during the COVID-19 epidemic. It is advocated that every hospital should create the contingency plan suited to their conditions.

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