CHAPTER 3

THE ORGANIZATION AND TRIAGE OF COVID-19 PATIENTS APPLYING TO EMERGENCY SERVICE

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INTRODUCTION

Cases of coronavirus disease 2019 (COVID-19) have emerged in Hubei, Wuhan, and many parts of China since December 2019. The disease spread rapidly to other countries, and the World Health Organization (WHO) reported the infection as a global pandemic. Despite the implementation of comprehensive control measures, the impact of COVID-19 has gradually increased. According to the data of the World Health Organization, 108,006,680 confirmed cases and 2,378,115 deaths occurred all over the world as of February 14, 2021. Despite the progress in vaccination studies, these numbers are increasing day by day.

COVID-19 has placed an unexpected and unforeseen burden on emergency services and health care systems that are at the forefront of any pandemic. Emergency services that are already crowded outside of pandemic conditions were overwhelmed. The organization was greatly disrupted by the
devastating epidemic. While other departments can regulate patient flow and volume with scheduled interviews and operating room allocations, emergency services must respond efficiently and effectively to any patient fluctuations.

Critical and supportive care of patients with suspected COVID-19 should focus on early detection and forthwith isolation, as well as convenient infection prevention. Limiting the dissemination of the infection, determining whole cases, and predicting the seriousness of the disease are very important in the emergency room management of COVID-19.

INFECTION PREVENTION AND CONTROL MEASURES

Apart from patients affected by this epidemic, emergency services are usually full of other patients seeking care for other diseases. If an infected person comes to a busy emergency room, they are likely to spread the virus and potentially contaminate others. Telling people not to come to the emergency room unless they are very sick definitely reduces emergency room visits. However, this method can cause an increase in morbidity and mortality rates in the period. Limiting the number of face-to-face interactions in the emergency room can be achieved by the use of telehealth and teletriage.

Telehealth and Teletriage

Telehealth is generally defined as the usage of electronic data and telecommunication technologies to support health care services. While telehealth services can be used in a counseling model where clinicians communicate with each other using digital health tools, it is more commonly used to support communication between clinicians and patients through both live video and remote monitoring devices and mobile technology.

The least complex and most cost-effective platforms are required to quickly and successfully implement a teletriage program during the pandemic. Platforms that are already in use in your hospital and familiar to the staff for teleconferencing, such as Apple, Facebook Messenger video chat, Zoom, and Skype can be preferred.

Doctors who do not have experience in telehealth, especially those who can not work actively for medical reasons, can be trained (eg quarantined but asymptomatic, immunocompromised, pregnant, elderly doctors, or those with underlying medical conditions). They can continue working with minimal or no exposure in this way. Thus, the impact on personal problems during this
critical period can be minimized. Many patients with COVID-19 signs and symptoms can be managed from home via telehealth and they do not need to go to healthcare. This model could potentially eliminate face-to-face interactions as long as evaluations are made by an experienced provider. Besides, it can reduce the usage of personal protective equipment (PPE) and other risks to hospital functioning and hospital staff.

In the United Kingdom, pre-existing emergency phone lines have been used to reduce emergency room visits or ambulance dispatches. An online clinic was set up to ease patient triage in a study conducted in China. Hospitals first decided on the urgency of treatment through free online consultation and recommended that non-urgent patients postpone their hospital appointments or refer to non-epidemic hospitals. They gave treatment instructions to low-suspect patients by isolating themselves at home and invited patients with highly suspicions to the fever clinic. The online clinic effectively alleviated the workload of the emergency department and eased the early determination of possible cases.

**Prehospital Evaluation**

Patients can be transferred by the pre-hospital emergency medical service or come immediately to the emergency room. The case, acquaintances, or medical practitioner can call the emergency number to indicate that a possible case of COVID-19 infection with symptoms is seeking care. In this case, the pre-hospital team will meet with the patient by wearing PPE and assess the clinical condition. They analyze whether family individuals or other people in contact are likely contaminated and organize the transport to the hospital or the isolation of whole likely infected people at home. This suggested way to assist the health care system may prevent the dangerous passage of an infected patient into the public space of the emergency room. If the patient is brought to the hospital by ambulance, emergency medical services (EMS) staff should inform the emergency department of the hospital to prepare the treatment center for the infected patient. In this context, a protocol should be designed between EMS and hospital emergency service.

**Organization of Emergency Department**

When a patient directly admits to the emergency room, the patient’s rapid triage is mandatory. All patients admitted to the emergency department should be screened for symptoms of COVID-19. Efforts should be made to place patients with suspected COVID-19 in single examination rooms as soon as possible, and these rooms should be disinfected after each visit.
each visit. If an examination room is not immediately available, such patients should not wait among other patients. It is more appropriate to keep these patients in a personal vehicle or in a well-ventilated area where they can easily access respiratory hygiene materials and be separated by at least six feet. If there is not enough space in the hospital for this, tents can be used for this purpose (Figure 1).

Immediate recognition of cases with COVID-19 presenting with asymptomatic or atypical complaints is a challenge. Therefore, general practices to control infection throughout an epidemic are even more critical. Hand and respiratory hygiene, and contact prevention precautions are essential. The Center for Disease Control and Prevention (CDC) recommends installing ample non-contact hand sanitizer stations and easy-to-dispense face mask boxes at the entrances of the emergency room and hospital. Besides, everyone entering the facility should immediately wear a mask and not take it off as long as they are in the facility, cover their mouth/nose when coughing or sneezing, use and dispose of tissue paper carefully and do hand hygiene after contact with secretions. Banners should be placed suggesting all these protective measures.

Suspected cases of COVID-19 should be isolated by minimizing movement in the emergency room, x-ray unit, toilets, or other parts. Combining plural potentially infected patients into one group is an appropriate precaution. Keeping these in mind, facility changes are inevitable for emergency services. Creating staging areas such as tents, split flow and split cohort models may be preferred to safely reduce and manage the number of patient spikes and minimize infection in the hospital. The purpose here is to separate low, medium, and high-risk areas in the emergency department. These areas should have physical barriers (Figure 2) between the mand have visual cues.
appropri-ate to the levels of attention needed. If the building permits, adequate ventila-tion should be provided in all areas. A plan of the emergency department is shown in Figure 3

**Clean area (Lower risk):**

It is the area that hosts patients other than COVID-19. These patients have no history, suspected exposures, signs, or symptoms related to COVID-19. Since asymptomatic carriers can also be found in this space, suitable protection measures and guidance should be followed.

![Physical barriers between the different risk areas](image)

**Figure 2.** Physical barriers between the different risk areas

**Figure 3:** The scheme showing the rearrangement of the emergency department of our hospital after Covid 19.
Area with suspicion (Moderate risk):

It is the area that hosts clinically stable patients with suspected or confirmed COVID-19, such as screening and triage clinics. Patients in this category are those with a respiratory rate of <20 breaths per minute with ≥90% oxygen saturation at room air. If the disease is not suspected to be related to COVID-19, higher levels of care, including resuscitation, may be offered at this position.

Contaminated area (High risk):

All patients in this area are highly susceptible to COVID-19. These patients appear sick. They respond positively to one or more disease triage questions. These patients are tachypneic (RR> 20), tachycardic (HR> 120), or hypotensive (BP <90/60) with an oxygen saturation of <90% in room air. These patients need additional evaluation and stabilization. There is a high risk of exposure to aerosolized viral particles in this area. This area should be equipped for high levels of care, have negative pressure rooms, and optimally have rooms split by walls and doors. If possible, negative pressure chambers should be used for procedures that cause aerosol generation.

Work Safety and PPE Use

Providing health care personnel with qualified PPE plays an important role in avoiding occupational exposure and infection. The U.S. CDC recommends gowns, gloves, surgical masks, and eye protection as standard PPE to health care professionals for COVID-19 infection control. While PPE provides some protection, CDC recommends the use of plexiglass physical barriers in the field of office workers and triage as the best protection method against droplets.

In cases where the patient undergoes aerosol-generating processes such as cardiopulmonary resuscitation, manual ventilation before intubation, tracheal intubation, open aspiration of airways, bronchoscopy, tracheotomy, non-invasive ventilation, high-flow oxygen, and nebulizer treatments, airborne precautions (apron, gloves, N-95 and eye protection) are recommended. The PPE box is a barrier made of transparent material that can be disinfected quickly. The PPE box, with cutouts for the neck used for the patient's neck, is placed on the head of an unconscious patient. There are two holes on one side of the box for access to intubation or aspiration (Figure 4).

Endotracheal intubation of patients with COVID-19 should be applied by health care professionals experienced in airway management to minimize
number of attempts and the risk of transmission. Video laryngoscopy with a C-MAC (Karl Storz SE and Co. KG, Tuttlingen, Germany) or a GlideScope (Verathon, Inc., Bothell, WA) device is suggested as the first choice for endotracheal intubation. Viral and bacterial filters are placed in the circuit after intubation. The use of automatic CPR devices for patients requiring cardiopulmonary resuscitation is beneficial in reducing the number of staff in the resuscitation room.

**Triage of COVID-19 Patients**

Rapid diagnosis and effective triage are necessary for the emergency department, to prevent the spread of the virus among patients and health care professionals, delays in guiding patients to other services or intensive care, and if necessary, to provide rational and efficient use of the limited resources. To make effective and appropriate triage of patients with COVID-19, it is necessary to recognize the symptoms of the disease, determine the severity of the disease, and identify the risk factors for rapid deterioration in the clinical condition of the patient, severe disease, and/or increased mortality.

**Screening and diagnosis of COVID-19 patients**

Signs and symptoms of COVID-19 may vary. Most patients experience one or more of the following:
- Fever or chills
- Cough (with or without sputum production)
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle aches
- Headache
- New loss of taste or smell
- Congestion or runny nose
- Nausea or vomiting
- Abdominal pain/diarrhea

Anorexia, sore throat, confusion, chest pain, dizziness, syncope, and hemoptysis, ocular manifestations such as conjunctival hyperemia, chemosis, epiphora, or increased secretions have also been indicated. Elderly people and immunosuppressed patients especially may present with atypical symptoms such as fatigue, reduced alertness, diarrhea, loss of appetite, and absence of fever.

Adverse pregnancy events such as shortness of breath, fever, fatigue, and gastrointestinal (GI) symptoms due to physiological adaptations in pregnant women, or other regional disease symptoms may overlap with the symptoms of COVID-19. There are no specific clinical features that dependable distinguish COVID-19 from other respiratory viral infections. Dyspnea that develops a few days after the onset of the first symptoms is thought-provoking in terms of COVID-19. A definitive diagnosis can not be made without microbiological tests.

Whom to test

- People with symptoms of COVID-19.
- People in close contact with someone with confirmed COVID-19 (15 minutes or more within 6 feet).
- People who participate in activities that pose a higher risk to COVID-19, where social distancing can not be maintained, such as traveling, attending large mass gatherings, or being in crowded interiors.

Limited capacity may prevent all patients with suspected COVID-19 from being tested in some locations. Local health departments can set specific criteria for testing.
In some patients, the baseline test may be negative, false-negative nucleic acid amplification tests (eg RT-PCR) taken from upper respiratory tract samples are well documented. If a patient appears to have COVID-19 disease, they should be treated like COVID-19 in isolation and a second test performed within 3 days. When the two tests are negative and there is a high suspicion for COVID-19 (for example, a patient with consistent clinical symptoms and a history of contact with a person with known or suspected COVID-19), infection control measures should be continued. If possible such patients should be managed with an infectious disease specialist to assist in the evaluation of alternative etiologies. For screening purposes, patients with fever should be tested according to routine protocols in areas with other endemic infections such as malaria, dengue fever, and tuberculosis (TB) that cause fever. These infections may coexist with COVID-19. Throughout the influenza season, whole patients with acute respiratory symptoms in hospitals and other health care settings should be tested for SARS-CoV-2 and influenza in parallel to monitor incidence and trends over time.

Due to the probability of false-negative test results for SARS-CoV-2 RNA, chest CT is of great importance in the screening and diagnosis of patients who do not have an exact epidemiological history or who may have a history of occult contact in the epidemic region. Lung CT shows multiple small irregular shadows and changes, especially in the peripheral lungs at an early stage, followed by multiple ground-glass opacities in both lungs. Serious patients may present with signs of pulmonary consolidation, but pleural effusions are infrequent. Lung ultrasound is very useful in the initial evaluation of patients in the emergency room. It is more sensitive than a chest X-ray with a diffuse B-line pattern and is associated with a good response to PEEP. (For detailed information, see Chapter 16 the imaging and radiological diagnosis methods in a patient with COVID-19).

**SEVERITY OF DISEASE**

While most people develop the mild and moderate disease (80%), approximately 15% develop severe disease, and 5% have critical disease. According to the classification of the world health organization;

- Mild disease: symptomatic disease matching COVID-19 case definition without evidence of pneumonia or hypoxia.
- Moderate disease: clinical signs of pneumonia (fever, cough, dyspnoea, rapid breathing) but no sign of severe pneumonia, with SpO2 ≥90% in room air
- Severe disease: clinical signs of pneumonia (fever, cough, dyspnœa, rapid breathing) plus one of the following: respiratory rate > 30 breaths/minute; severe respiratory distress; or SpO2 < 90% in room air
- Critical disease: complications such as respiratory failure, acute respiratory distress syndrome (ARDS), sepsis and septic shock, thromboembolism, and/or multiorgan failure, including acute kidney injury and cardiac injury.

**RISK FACTORS FOR SEVERE DISEASE AND MORTALITY**

Patients with the following conditions are at risk of serious sickness and increased mortality; age more than 60 years, cancer, chronic kidney disease, chronic obstructive pulmonary disease, down syndrome, immunodeficiency condition due to organ transplant, obesity (body mass index [BMI] ≥ 30 kg/m²), severe cardiovascular disease (eg, heart failure, coronary artery disease, cardiomyopathy), smoking, sickle cell anemia, type 2 diabetes mellitus, pregnancy.

Patients with the following conditions may be at high risk for serious sickness and increased mortality; asthma (moderate to severe), cerebrovascular disease, cystic fibrosis, hypertension, immunodeficiency condition (eg, from hematopoietic cell transplant, HIV infection, use of corticosteroids, or other immunosuppressants, other immunodeficiencies), liver disease, neurologic conditions (eg, dementia), overweight (BMI ≥ 25 but < 30 kg/m²), pulmonary fibrosis, thalassemia and type I diabetes mellitus.

Some patients with mild to moderate sickness may be discharged home directly by the physician in the triage. However, isolation is required for whole suspected or confirmed cases, and follow-up care and monitoring should be arranged. The decision to monitor a suspected case in a health care facility, community facility, or home should be made on a case-by-case basis. This decision will depend on clinical presentation, the need for supportive care, potential risk factors for severe illness, and conditions in the home. This may also apply to pregnant and postpartum women with pre-existing or pregnancy-related comorbidities (eg pregnancy-induced hypertension, gestational diabetes).
Patients without risk factors for severe sickness (identified or probable) and shortness of breath are discharged to home self-care. They receive instructions to contact their clinicians with any worsening symptoms. Patients with one or more known risk factors for severe disease should be closely monitored for deterioration (outpatient pulse oximeters, close telehealth follow-up, outpatient clinic, and calling EMS if any worsening of clinical status). The use of home oximetry monitoring is being evaluated for patients seen in the emergency room setting and discharged home. However, there is no high-quality evidence that patient outcomes are improved using this approach. In the outpatient setting, patients are asked to check their oximeters twice a day and inform their doctor if the value falls below 95 percent.

Critters for transfer to the emergency department are:

- Patients appear toxic and in distress
- Resting O2 saturation <94% on room air
- Desaturation on ambulation or requires bronchodilator treatment or any following criteria
- Change in mentation (eg, confusion, change in behavior, difficulty in rousing) or other signs and symptoms of hypoperfusion or hypoxia (eg, falls, cyanosis, hypotension, anuria, chest pain suggestive of an acute coronary syndrome)
- RR >20/min
- Pulse>120 bpm or
- Systolic BP< 90 mm Hg and diastolic BP<60 mm Hg.
- Criters for hospitalization and likely admission are; Having <94% oxygen saturation in room air, > 30 breaths/minute respiratory rate, PaO2/FiO2 <300 mmHg or >50% lung infiltration.

Triage algorithm of Covid-19 patients applied to the emergency department
CONCLUSIONS

Emergency services, which are at the forefront of the health care system in any pandemic, have to identify and manage patients with suspected COVID-19 and continue to provide emergency health care to other patients who present with emergencies other than COVID-19, as in non-pandemic periods. Emergency services should play a main role not only in patient management but also in the rapid identification of COVID-19 by helping with surveillance and spread control. This situation required a massive reorganization of emergency services to face the significant increase in patients with suspected COVID-19 around the world. Emergency services should be prepared to separate the “clean” flow from the “dirty” flow, adjusting areas and resources to the flow of incoming patients. Fast and effective triage is essential for early
diagnosis of patients, preventing delays in treatment, ensuring rational and efficient use of limited resources, and protecting health care personnel and patients from contamination.

REFERENCES


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