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Review

Organization of Emergency Departments and Changing Patient Profile During COVID-19 Outbreak: A University Hospital Experience in Turkey

COVID-19 Pandemisinde Türkiye'de Acil Servislerin Organizasyonu ve Değişen Hasta Profili: Bir Üniversite Hastanesi Deneyimi

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Abstract: **Objective**: During the COVID-19 epidemic, emergency departments played an important role in identifying patients, isolating, preventing in-hospital infections, and informing public health authorities. It is necessary to identify the possible patients quickly and isolate them from others.

It was necessary to reorganize the emergency departments, which will be the first place of admission for the majority of patients. Emergency patient care should continue in emergency departments even in disasters, and in many countries, emergency departments operate at maximum capacity in their normal routines. For all these reasons, policies are required to prevent crowding in health centers and to control them, especially identify patients in the emergency departments, before hospital admission if possible.

In this study, we explain how an emergency department of a university hospital was organized during the COVID-19 pandemic, and the organization of care of infected patients, other emergency patients, and forensic cases who admitted to the emergency department.

Keywords: COVID-19, Pandemic, Emergency Department, Organization, Emergency patient, Forensic case

Öz: **Amaç**: COVID-19 salgını sırasında acil servisler hastaların tanımlanması, izolasyonu, hastane içi enfeksiyonları önlenme ve halk sağlığı otoritelerini bilgilendirmede önemli görevler üstlenir. Olası olgunun hızlı tanımlanması ve diğer hastalardan izole edilmesi gereklidir. Acil servisler doğası gereği afet durumlarında dahi hasta alımının devam etmesi gereken bakım alanlarıdır ve birçok ülkede acil servisler normal rutinlerinde maksimum kapasite ile çalışmaktadır. Tüm bu nedenlerle sağlık merkezlerinde yayılmayı önlemek ve kontrol altına almak için, özellikle acil servislerde kalabalıklığın önlenmesi ve mümkünse hastaların hastane başvurusundan önce tanımlanmasına yönelik politikalar gereklidir.

Bu çalışmada COVID-19 Pandemisi ile birlikte bir üniversite hastanesi acil servisinin organizasyonun nasıl düzenlendiği paylaşılmış, acil servise başvuran acil, enfekte hasta ve adli olguların organizasyonu anlatılmıştır.

Anahtar Kelimeler: COVID-19, Pandemi, Acil Servis, Organizasyon, Acil hasta, Adli olgu

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Figure 1 adopted from reference 15 and reproduced with permission of Emergency Medicine Association of Turkey (EMAT). We thank to the Emergency Medicine Association of Turkey.

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Our study has been written in accordance with the Helsinki Declaration, and the ethics committee approval has not been obtained since the current literature has been reviewed.

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Introduction

China National Health Commission announced 27 cases of pneumonia with unknown causes on December 31, 2020.The novel coronavirus (SARS-CoV-2) was isolated approximately a week later (1). In the following weeks, it was confirmed that the disease could transmit human-to-human, and healthcare personnels were reported to be infected (2). By the February 11th, 1716 healthcare providers were infected in China, and five of them (0.3%) died (3). The World Health Organization (WHO) declared a pandemic on March 11, 2020, with the increasing number of cases and deaths outside China (4).

Adequate protective equipment was essential for healthcare providers to safely work in the early period of pandemic (5). It has been reported that 3.5% of patients in China are the healthcare personnels (6). Therefore, the use of appropriate personal protective equipment (PPE) was necessary for the prevention of occupational exposure and infection in healthcare professionals evaluating possible or suspected patients (7). However, the PPEs such as N95 masks, eye protection, and protective clothing were not routinely used in the daily routine of hospitals and many hospitals did not have sufficient equipment (4). At this stage, hospitals needed to plan their logistics in addition to upgrading their prior established plans.

During the COVID-19 epidemic, emergency departments (EDs) played an important role in identifying patients, isolating, preventing in-hospital infections, and informing public health authorities. It is necessary to identify the possible patients quickly and isolate them from others (8). Simultaneously, other patients' medical care should continue in reserved areas (Figure 1). It was necessary to reorganize the ED, which will be the first place of admission for the majority of patients. Emergency patient care should continue in EDs even in disasters, and in many countries, EDs operate at maximum capacity in their normal routines. For all these reasons, policies are required to prevent crowding in health centers and to control them, especially in EDs, identify patients before hospital admission if possible. During the COVID-19 outbreak, it has been reported that identification and follow-up of patients by online visits or methods such as home follow-up before admission to the hospital may prevent overcrowding (9,10).

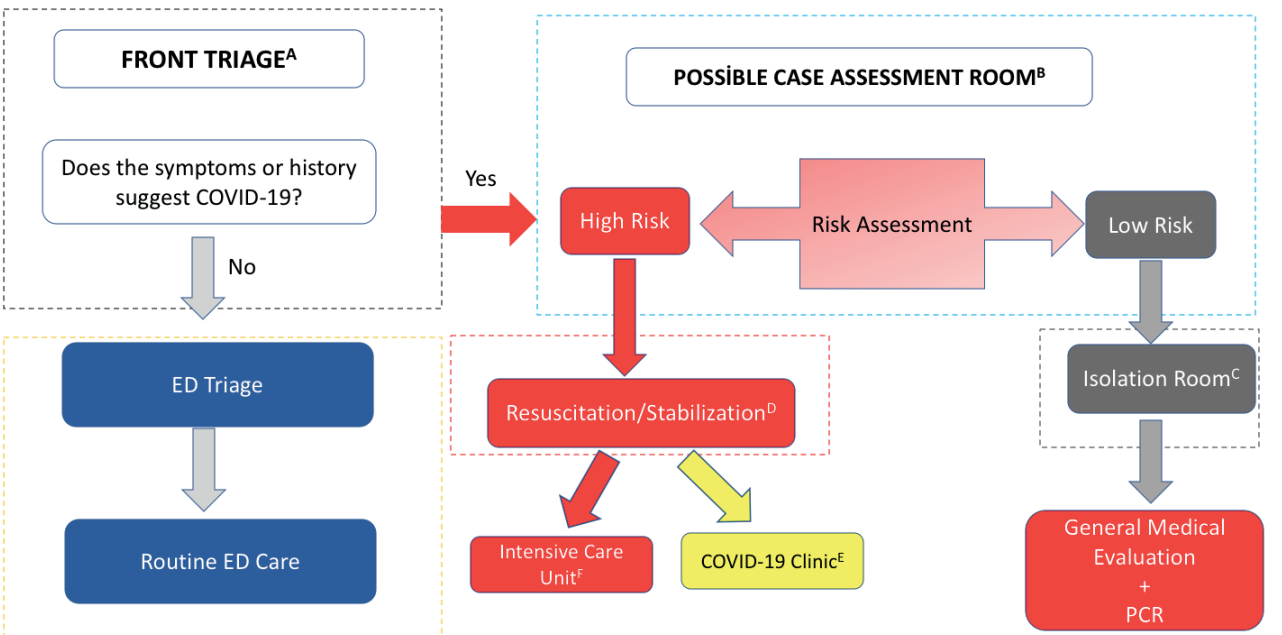

Figure 1. Triage of possible COVID-19 patients in ED and needed care areas*

*Adopted from reference 15 and reproduced with permission of Emergency Medicine Association of Turkey (EMAT).

A. Pre-acceptance area may be outside or inside ER, depending on eligibility, but outside the routine ER triage.

B. Special area for initial and risk assessment of possible COVID-19 patients. Depending on its suitability, this field may be outside or inside ED, but outside the routine ER triage.

C. Isolation area for patients with isolation indication but no need for urgent treatment. Should be outside of ER and preferably away from other clinics

D. Resuscitation area for possible COVID-19 patients who require stabilization or resuscitative intervention in ER

E. Inpatients clinics designated for COVID-19 patients who need inpatient treatment but do not need intensive care unit.

F. Intensive care unit reserved for COVID-19 patients who need follow-up and treatment in intensive care unit.

The probability of the patient surge to EDs was one of the biggest concerns who might not receive adequate care if healthcare system capacity was overloaded. Protecting these patients from infection during hospital admissions is another challange. Also, healthcare providers have an increased risk of infection due to prolonged working hours. (6). During the COVID-19 outbreak, interventions, such as the separation of high-risk and low-risk patients, reducing non-emergency appointments and operations, thereby supporting other staff of the hospital to the ED and the separation of areas, in this way, directing the limited supply to the staff who need the most protection have been shown to reduce cross infections (9).

The first patient with COVID-19 was detected in Turkey on March 11, 2020. Until this date, hospitals had made the necessary preparations in most of the country due to the experiences of China and Italy. The scientific committee, formed by academicians from different specialties by the Republic of Turkey Ministry of Health, and they created a comprehensive guide including many topics related to the management of patients such as patient identification, sampling, triage, hospitalization indications, treatment algorithms and presented. This guide has been constantly updated (12). On 20.03.2020, the Ministry of Health defined some of the hospitals as Pandemic Hospital, which employ at least two of the specialist physicians from the branches of infectious diseases, thoracic diseases, and internal diseases, and have a 3rd level adult intensive care bed (13). In these hospitals, the clinics and intensive care units were separated to follow the patients diagnosed with COVID-19 and other patients. The standards of practices related to the use of PPE equipment, the arrangement of patient rooms, patient transfers by ambulance, and infection control in radiology units have been announced by the scientific committee to prevent the spread of the disease in hospitals (12). Until May 9, 2020, 1.334.411 patients were tested across the country and 137,115 COVID-19 patients were detected. 2.7% of these patients died and 65.3% recovered at the time of writing this article (14).

In Turkey, the majority of EDs are overcrowded ordinarily and It is reported approximately 130 million ED visits in 2019. The Ministry of Health Public Hospitals Authority reported that 28.4% of all applications to all hospitals were made through EDs in 2017 (16). As a result, EDs were probably the primary admission places for pandemic patients. The experience of Italy showed that the EDs encountered a large number of patients with respiratory distress shortly after the onset of the outbreak, and flowcharts had to be developed for the management of patients (17). In this period, it was important to prepare the EDs for new patient applications besides routine patient care. The increase in the number of patients could lead to more PPE needs than expected and exhaustion of the healthcare providers.

While the preparation was underway around the country, in mid-March 2020, 80% of the suspicious patients who were evaluated in the ED in Italy were hospitalized and the fatality rate of the disease was reported as 8.37% (17). During this period, preparation was made for long-term care of critical patients when many EDs were needed. Interventions such as endotracheal intubation, aspiration, cardiopulmonary resuscitation, non-invasive ventilation causing high aerosol formation frequently performed in the EDs. Additionally, necessary equipment for special operations such as video laryngoscope, helmet type mask, closed suction sets were not available in many EDs. In this period, besides accumulation of materials not used frequently in daily practice, it was necessary to create areas where high-risk interventions would be made. The World Health Organization suggested that procedures with a high risk of aerosol generation should be carried out in rooms with adequate ventilation or negative pressure. At this stage, hospitals without negative pressure rooms had to create alternative solutions.

EDs in Turkey created triage and patient care areas where possible COVID-19 patients will be evaluated in line with the facilities of the hospitals during the early outbreak in our hospital, with the first case in the country, the central endoscopy unit next to the ED and the operating room complex where the operations were performed without hospitalization were reserved for the care of pandemic patients. Apart from the emergency circulation to this area, a second triage section, a quick view area where patients will be evaluated quickly, and an intermediate intensive care unit with 5 beds for critical patients were created. This intensive care unit had all the necessary equipment for mechanical ventilation, non-invasive ventilation, as well as equipment such as video laryngoscope, helmet type mask, which are important in interventions for COVID-19 patients. In addition, three operating room modules in this area were prepared for intubation and noninvasive ventilation. Although PCR is used for the diagnosis of COVID-19, it is known that the rate of false negativity is high. Therefore, it is recommended to use a highly sensitive computed tomography (CT) (18). However, CT is one of the frequently used tests in the ED, and patients who are examined in the ED also need to be protected from infection. For this reason, the radiology unit belonging to our ED was used for the examinations of possible COVID-19 patients, and the CT in the radiology department was used for emergency patients.

During the pandemic period to avoid excessive virus load personnel's' working time periods are reduced. Since it was not possible to operate a second area with only emergency personnel and short shifts, administration decided that all physicians who were not working inpatient care services in the medical faculty would work in this area. Thus, together with the emergency medicine residents and experts, approximately 240 physicians from the medical faculty started working in the COVID-19 outpatient clinic for up to 8 hours of shifts. In addition, a sufficient number of nurses and assistant personnel were assigned to each shift.

At this stage, patients with all fever and/ or respiratory symptoms began to be evaluated at the COVID-19 outpatient clinic and taken to the ED if needed. Patients who were evaluated in the ED and identified as possible cases in the follow-up were started to be taken to areas appropriate for their condition (Figure 2).

It is recommended to separate the waiting areas of different risk groups to reduce in-hospital infections (19). Accordingly, COVID-19 patients were followed up in areas appropriate for their condition after risk assessment. However, effective triage of patients is an important problem. COVID-19 is a disease that can be presented with different clinical findings and cases presenting with conjunctivitis, delirium or abdominal pain have been reported (20,21). Atypical admissions can be seen in patients with special features such as elderly and immunosuppressed patients (22). Therefore, infection rates of the healthcare professionals working outside the areas reserved for infected patients are higher than expected. Working with insufficient protection measures may be the cause of infections seen in healthcare workers in the early period of the epidemic (23). Likewise, after the establishment of the ED and COVID-19 outpatient clinics, the first contamination in our healthcare personnel occurred while working in the ED, which was considered as a 'clean area'. Even though the PPEs were determined differently in the dirty and clean area at the beginning, it was decided the full PPE should be used in both areas. After this arrangement, there was no healthcare personnel infected in both areas, and there were no infected from doctors and nurses working in the pandemic outpatient clinic throughout the entire process.

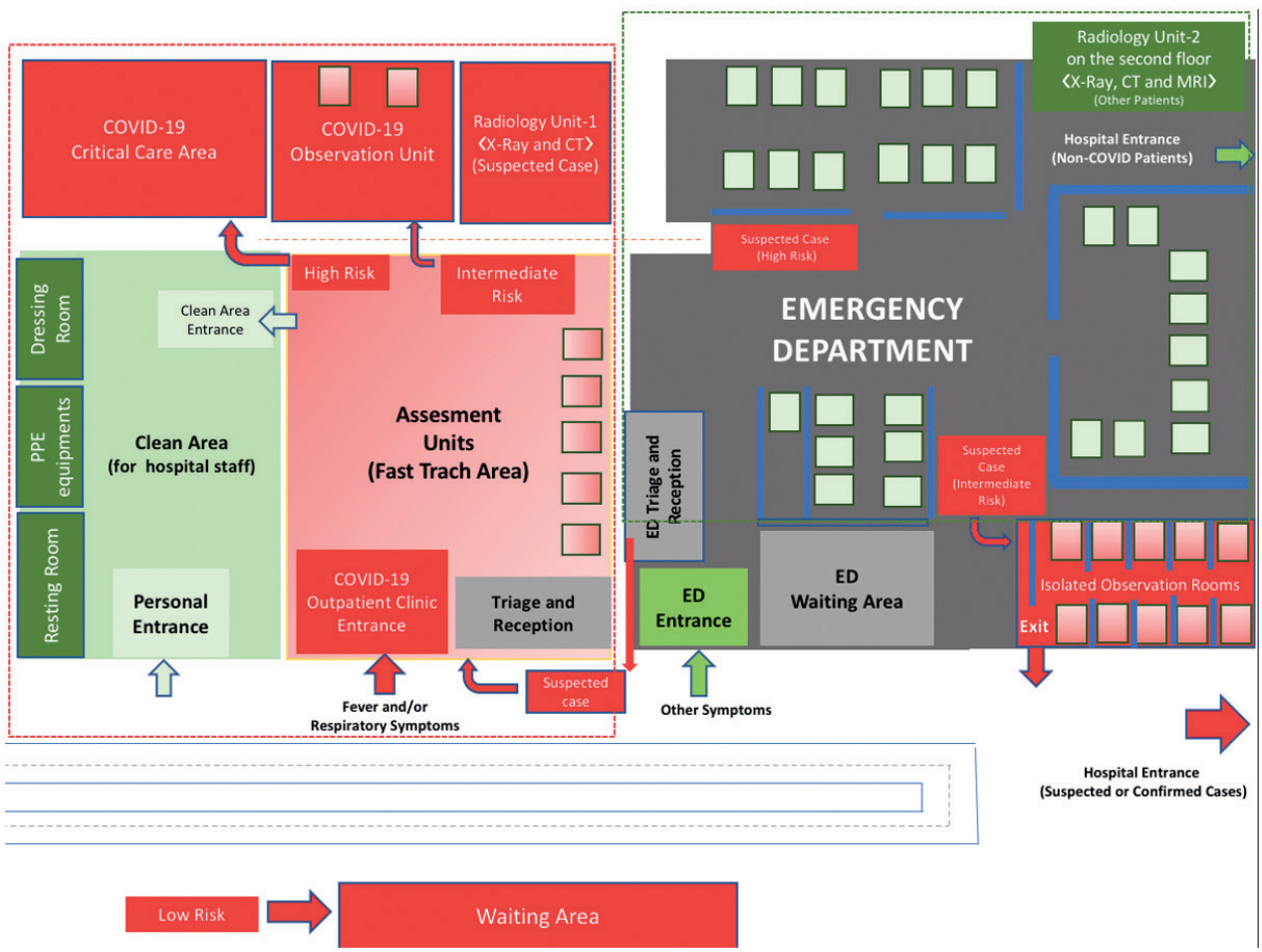

Figure 2. COVID-19 Outpatient Clinic and ED Organization Scheme in our instutition.

Changes in patient visits to EDs

After the onset of the pandemic, the increase in the number of emergency patients in many countries was, therefore, the most important concern in the care of other patients and the excessive workload of the staff. However, contrary to expectations, it was reported that the number of ER patients decreased in some countries. It has been reported that ED patient admissions in China have decreased to 30-40% (9). In a study examining the effect of the pandemic on emergency applications in Cuneo, Italy, it was reported that after the date of 21 February 2020, when the first case was reported in the country, the emergency patient applications decreased by 50% and this decline increased to 68% with the occurrence of the disease in the region. Despite this decrease in the number of patients, it was noteworthy that the proportion of patients who needed hospitalization increased 2 times compared to the previous year. It was reported that while the number of pneumonia increased, trauma and cardiovascular diseases decreased significantly. In the same period, the increase in applications due to depression was interesting. It was reported that this change in the patient profile was not only effective in the primary care of chronic patients, but also the interruption of social activation of individuals and anxiety to become infected (24).

Visits for non-urgent reasons to EDs in Turkey is quite common and is thought to be more than half of the ED for non-urgent reasons (25). Shortly after the COVID-19 pandemic was seen in our country, there was a significant decrease in the number of patients in EDs (25). This may be one of the reasons why there is no problem in the management of possible COVID-19 patients in the country. Normalization of the EDs normally performed in chaotic settings helped healthcare workers focus on potential COVID-19 patients.

Our institution which is one of the three public university hospitals in Izmir, the third-largest city in the country, and served as a pandemic hospital during this period. Our ED was serving as overcrowded until this period (26). In our ED, we observed that there was a 31% decrease in ED visits in March 2020 and a 55% decrease in April. We think that there is a decrease in the number of patients admitted to the ED due to their anxiety. We also observed significant changes in the patient profile. In this period, there was a significant decrease in the number of applications due to trauma, probably due to the restriction of curfew. It is also noteworthy that acute coronary syndromes and stroke patients who require urgent intervention should apply to the ED late. Physicians from different regions in the country report that patients with urgent intervention are concerned about the disruption of their treatment (27).

Forensic medicine in the EDs with COVID-19

Services provided in university hospitals' EDs in cooperation with forensic medicine, especially outside of working hours; it is important to have a multidisciplinary approach to patients (forensic medicine, psychiatry, pediatric psychiatry, gynecology, neurosurgery, etc.), to collect medical evidence from patients in a timely manner and for the healthy functioning of forensic case reporting processes and thus to prevent loss of rights.

Special cases include patient groups such as victims of domestic violence, torture, and sexual assault in the practice of forensic medicine. Providing the necessary medical standards for the forensic medical evaluations of these patients in addition to the diagnosis, treatment and rehabilitation processes in accordance with the medical standards and examining them in accordance with internationally accepted workflows and patient privacy, obtaining the opinions of other specialties, collecting biological material that may be of medical evidence and medicolegal opinion (reporting) is required. There are examination protocols to be used in forensic medical evaluations and forensic report preparation of traumatized patients, as well as occupational disease notification forms (28).

With the COVID-19 pandemic, the cooperation with psychiatry and other units under the management of the forensic and emergency medicine clinic in the university hospital were tried to continue in order to ensure that victims have access to healthcare and forensic medical documentation. The forensic case reporting process also continued. The emergency clinic of our hospital has continued to be an application center during the COVID-19 pandemic patients of trauma victims, and it has been an exit door where special cases such as domestic violence are accepted.

It is reported that there is a 70% decrease in forensic autopsy requests in Italy, and centers, where victims of sexual assault and domestic violence apply, are closed or there is a 50% decrease in application (29). In this instance, the victims, especially women and children, live in their homes with violence practitioners without medical treatment, evidence collection, and documentation. In some sources, it is suggested to review the forensic services after the COVID-19 pandemic (29-32).

In Turkey, which is the center of providing such services within the university Forensic Medicine Department and Emergency clinic; It provides expertise

and consultancy services 24/7 to trauma applications on many issues such as interpersonal violence, human rights violations, family violence, sexual violence.

Forensic Medicine Department, which cooperates with psychiatry, related clinics, and ED, evaluates after the application of the traumatized person or legal representatives to the Forensic Medicine Clinic, gives information about the process, after the necessary preliminary examination of the claims/arguments, performs evaluations.

Prior to the official announcement of epidemics and pandemics regarding COVID-19, applications were received in official expertise and individual applications that were not different from the previous years. In the pandemic process, since the requests from the official authorities ceased, the number of patients who were given medical expertise services by making medical evaluation was limited. There is a significant decrease in consultation services for forensic cases requested by other services. However, in cases of domestic violence, especially those who applied to the ED, there were 2-3 fold increases compared to the same months of 2019.

Although it is thought that there will be no formal expertise due to the pandemic, it is thought that expert opinions or individual applications to the emergency clinic for forensic medical evaluation will come to the fore, but this assumption has not been realized due to the reasons such as stagnation in the process of seeking legal rights in parallel with the situation in the judicial system.

In the process of COVID-19 Pandemic (for clinical forensic medical services maintained 24/7);

1. No formal expertise request
2. A decrease in violence incidents that apply to EDs
3. A decrease in health control (detention, exit, etc.) examination requests
4. Increase in work accident-occupational disease notifications
5. The increase was observed in cases such as domestic violence, child abuse/neglect.

With the COVID-19 pandemic, at the time of individual application, access to health services and forensic medical documentation; Difficulties experienced due to the lack of time for patients, attention to privacy, or patients' concerns about legal follow-up have been tried to be overcome with the joint study and attitude of University Hospital Forensic Medicine, Emergency Medicine and Mental Health Clinics.

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