Gray area; a novel strategy to confront COVID-19 in emergency departments

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Introduction

In 2020, the world society faced a novel crisis. A new infectious disease called coronavirus disease 2019 (COVID-19), affects almost every aspect of human life. To confront this crisis, a separate ward called gray area was designed for emergency departments (EDs) and applied at the provincial level in East-Azerbaijan, Iran. This study aimed to evaluate the effectiveness of this project, increase the serviceability and segregation of the location of infected patients, and show how feasible and fruitful it can be.

Methods:

This study is an analytical study. The statistical data collection from 39 hospitals was performed between 20 March to 21 September 2020. Descriptive Statistics as well as correlation coefficients were calculated using the 26th version of IBM SPSS.

Results:

Among 77,489 COVID-19 patients admitted to the EDs, approximately 0.38% of patients died in EDs. 22.63% of EDs area was allocated to COVID-19 patients and 70.46% of ED nurses, worked in the gray area. There was no significant correlation between area, number of patients, number of nurses, number of shifts of nurses, number of nurses for each patient, number of nurse shifts for each patient, and area for each patient with mortality rate and rates of disposition in 6 and 12 hours.

Conclusion:

Gray area is an appropriate strategy to confront COVID-19 in EDs and if more studies approve these results, this strategy can be used to confront this pandemic and future similar conditions in resource-limited countries.
response team designed a diagnostic algorithm. This process managed patients by considering their exposure history and respiratory status. This study aimed to evaluate the effectiveness of this project, increase the serviceability and segregation of the location of infected patients, and show how feasible and fruitful it can be.

**Methods**

This study is an analytical study based on the actions of the treatment deputy of Tabriz University of Medical Sciences, during the COVID-19 disease pandemic at the level of hospitals in EA province, Iran. Statistical information includes the ED and gray area in a square meter, number of COVID-19 patients referred to ED, number of nurses in ED and gray area, number of shifts of nurses in non-COVID-19 section and gray area, number of patients dispositioned within 6 and 12 hours, number of deaths due to COVID-19, number of general practitioners and emergency medicine specialists in ED, and rate of mortality due to COVID-19 collected from 39 hospitals in EA province, Iran, from 20 March to 21 September 2020. The detailed information about the "gray area" was reported elsewhere. In summary, all patients with respiratory symptoms entered the COVID-19 triage unit; negative chest CT-scan, normal serum levels of Erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), lactate dehydrogenase (LDH) and lymphocyte counts were the criteria for discharge.

Descriptive Statistics include minimum, maximum, sum, mean, and standard deviation, as well as Pearson correlation coefficients calculated using the 26th version of IBM SPSS software with 95% of confidence intervals and 0.05 level of significance for p-value.

**Results**

The results of descriptive analyzes are summarized in Table 1. Totally among 77489 COVID-19 patients who visited the ED in EA province in the mentioned period, 299 of them lost their lives in ED, which leads to a 0.38% motility rate. Approximately 22.63% of EDs area, was allocated to COVID-19 patients. Of 850 nurses in EDs, 599 (70.46%) worked in the gray area.

Table 2 shows the correlation coefficients between different factors. There was no significant correlation between gray area, number of COVID-19 patients referred to ED, number of nurses in the gray area, number of shifts of nurses in the gray area, number of nurses for each patient, number of nurse shifts for each patient, and area for each patient with mortality rate and rates of disposition in 6 and 12 hours. Totally 226 general practitioners and 129 emergency medicine specialists worked in EDs.

**Discussion**

We report the situation of EDs in EA province, Iran, during the COVID-19 pandemic. The overall mortality rate of COVID-19 was approximately 0.38% in EDs of EA province. Occupation of hospital intensive care unit (ICU) or ward beds, due to the huge number of COVID-19 cases, could negatively affect this rate.

To perfectly identify and manage the urgently COVID-19 patients, a guideline is designed by the Tabriz University of Medical Science. To avoid the transmission of infection among healthcare staff and other patients, COVID-19 patients’ rooms and other rooms are separated into three distinct areas; 1- high-risk area or infected area, 2- medium-risk area or semi-infected area, 3- low-risk area or clean area. Special protocols are also designed for each area due to the level of infection. In addition, patients with respiratory symptoms are separated from others at the entrance. The triage nurses make approaches according to patients’ symptoms and refer the suspected patients to a separated waiting room or examination room or isolated room. Also, top priority patients are sent to gray area immediately.

A similar study conducted in Italy in the terms of the gray area found the adoption of this area beneficial.
Administration of this method led to properly identifying and managing COVID-19 patients who otherwise could be referred to other medical wards, in presence of COVID-19-negative patients; so that transmission of infection would deteriorate the situation. In this way, the scenario of an intra-hospital epidemic outbreak was avoided. Designing a gray area in hospitals, during the COVID-19 pandemic or similar conditions in the future, will ensure patients with other problems to refer to hospitals, without worrying about getting infected.

The idea of the gray area could be fruitful in many aspects; for instance, the spread of infection among healthcare staff will decrease. Also, patients with typical symptoms of COVID-19 are separated from others until getting the result of PCR exam and then, the patient will whether be referred to special medical wards or discharged, so that, disease transmission between COVID-19 positive patients and other urgent patients will reduce. Considering the situation in resource-limited countries, the mentioned advantages seem crucial in the management of the current pandemic.

This study had multiple limitations. One of them is neglecting the role of medical facilities in the ED. The other one is the effects of different drugs and supplements on the mortality of the patients. The rate of hygiene observance in healthcare workers is another factor that could affect these outcomes.

Conclusion
In conclusion, our study demonstrated an appropriate outcome for the gray area strategy in EDs. If more studies approve these results, this strategy can be used in other regions, for confronting this pandemic and future similar conditions in resource-limited countries.

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Authors’ Contribution
RRG, SSV, SA, ZH: Investigation, resources, project administration, conceptualization, methodology, validation. MK, AN: Investigation, Data curation; Roles/Writing - original draft. All authors read and approved the final manuscript.

Availability of Data
The analyzed datasets are available from the corresponding author.

Conflict of Interest
There is no conflict of interest.

Ethical Approval
The Ethics committee of Tabriz University of medical science reviewed and approved the study protocol, according to the Declaration of Helsinki (Ethics code: IR.TBZMED.REC.1399.335).

Funding
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References

Table 2. Pearson correlations

<table>
<thead>
<tr>
<th></th>
<th>mortality rate in ED</th>
<th>disposition in 6 hours</th>
<th>disposition in 12 hours</th>
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<td>0.08</td>
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<td>p value</td>
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</table>

ED: emergency department

What is current knowledge?
• A separate ward called the gray area, was designed to confront COVID-19 in the emergency departments.

What is new here?
• This study found an appropriate outcome for this strategy; therefore, it can be used in future similar conditions in resource-limited countries.


