EVALUATION OF COVID-19 TRIAGE ASSESSMENT SCALE IN PATIENTS ATTENDING THE EMERGENCY DEPARTMENT

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ABSTRACT

Objective: To predict SARS-CoV-2 Polymerase chain reaction **(**PCR) positivity on the basis of symptoms and contact history of individuals who attend emergency department (ED).

Methods: The data for the study which was of a prospective-methodological type were collected from 503 patients who attended ED of a hospital with suspected Coronavirus Disease 2019 (COVID-19) between 02 January - 15 March 2021 and were given PCR test. COVID-19 Visual Triage Scale (VTS) and questionnaire were used for collecting data. Distribution of socio-demographic data was interpreted in frequency, percentage. Independent samples t-test and chi-square test were used to compare quantitative data. Cut-off value of the scale was determined. In the study, sensitivity and specificity of the scale were tested through scoring adopted based on the real time PCR test result.

Results: According to the PCR test, 67% of the patients were tested negative while 33% of them were positive. According to COVID-19 VTS, 55% of the patients were found to be negative while 45% were found positive. Validation of scale resulted in 0.65 AUC with a 45% sensitivity and 82% specificity using a cut-off value >4. In its comparison with PCR test, the scale was found to detect 93 real positive and 204 real negative patients. Self-reported fever, cough, sore throat, loss of taste and smell and history of contact with a confirmed COVID-19 case were found to be strong predictors for detecting COVID-19 (p<.05).

Conclusions: In the study, sensitivity and specificity of COVID-19 VTS were found to be low. However, for COVID-19 and future pandemics, it is supposed to be useful in sorting patients during the early stages of the pandemic where testing facilities are limited and during the times of fluctuation.

Keywords: COVID-19, SARS-CoV-2, Emergency triage, sensitivity, specificity.

INTRODUCTION

COVID-19 has spread rapidly as a pandemic since its first discovery in a group of patients with symptoms related to respiratory tract (fever, cough, shortness of breath) in the late December in 2020 in the Chinese city of Wuhan (1). Severity of the symptoms of the disease ranged from mild, common cold-like symptoms to life threatening ones that require intensive care stay and mechanical ventilation (2,3).

Following emergence of the first case in Turkey on 11 March 2020, the number of cases were expressed in thousands in the same month (4). New variants of the virus emerged in the late December 2020. According to data from Center for Disease Control (CDC), these variant spreads very fast and is highly infectious and poses higher mortality risk compared to other variants. Sufficient information on severity of disease

and the effectiveness of vaccination on this variant is not available yet (5). Vaccination efforts aimed at preventing the disease have been started all over the world and in our country. However, mutation of the virus and high speed of transmission and mortality risk show that there is an urgent need for a comprehensive strategy that involves supervision, diagnosis, research and clinical treatment to win the fight against COVID-19 (1). An ED is the primary point of attendance patients go to. Patients are sorted based on the degree of urgency in the triage area in emergency departments (6). Triage is very important in terms of sorting patients who are likely to be infected with the pathogen that causes disease in cases of disasters like the pandemic (7). This is because emergency departments are attended not only by COVID-19 patients or suspected COVID-19 patients but also other patients who are not infected. Sorting patients as positive, suspected or uninfected using appropriate triage methods is very important for ensuring continuity of the treatment of patients (8).

Diagnostic tests are used for sorting patients accurately. The standard test used to detect SARS-CoV-2 is Reverse Transcription–Polymerase Chain Reaction (RT-PCR) of the nasopharyngeal swab material (9). However, RT-PCR is time-consuming and causes failure in case of deficiency of test material (10). Besides PCR test, computed tomography (CT) scan of the lung is used to detect COVID-19 pneumonia (11). Unfortunately, in the event of increase in the number of cases, it is not possible to provide CT scan to all patients admitted to emergency department, in particular in the developing countries and in small hospitals with limited resources (12). In addition, due to high transmission rate of SARS-CoV-2, risk of infection to unstable patients with hypoxemia and hemodynamic failure, use of CT for such patients is not regarded as an appropriate option (11).

Triage nurses should assess the likelihood of SARS-CoV-2 infection in all patients admitted to the emergency department. Standard and fast patient sorting is very important for all patients, positive, suspected or uninfected, to receive the care they need in a timely fashion. Detection of SARS-CoV-2 in the ED and determining patients in more critical condition for admission to hospital is performed by means of PCR test. However, the fact that it takes more than 6 hours to get the test results causes difficulty in patient sorting (13). For this reason, in order to speed up triage in the emergency department, we have developed an early diagnosis scale that involves symptoms of the patients who present with suspected COVID-19 and their history of being in a risk area or contacting a person at risk. We aimed to predict with this scale if any person attending ED with suspected COVID-19 had COVID-19 or not.

Aim: This study aimed to investigate effectiveness of visual triage scale in predicting if any person attending ED with suspected COVID-19 had COVID-19 or not. The secondary aim of the study is to determine and isolate confirmed COVID-19 patients earlier using the scale and to restore vital functions of critically ill patients with a multidisciplinary approach and ensure continuity of treatment services.

MATERIALS AND METHODS
Patient population
The research is a methodological type prospective study. The research population consisted of 2774 patients who presented with suspected COVID-19 in the ED of Konya Beyhekim Training and Research Hospital between January - mid-March 2021. The hospital serving as a pandemic hospital has 2 COVID-19 polyclinics. Patients who wish to receive a COVID-19 test or have COVID-19 symptoms are given medical care in these polyclinics between 08.00 am-11.00 pm during the day. ED gives medical care to COVID-19 patients from 11.00 pm to 8.00 am, therefore the number of patients is low. It is suggested that sample size in methodological studies should be at least between five or ten times the number of items of the scale used (14,15). Sample size of the study comprised 480 people which corresponds to 40 times the number of items. We included only patients attending the ED. Patients without ED triage data were excluded from the analysis.

Inclusion criteria for the study were;
- Being 18 years old and over,
- Attending ED with suspected COVID-19,
- Being given PCR test,

Exclusion criteria were;
- Being under 18,
- Not being given PCR test,

The study was completed with 503 people. 1432 patients were excluded from the study as they did not have suspected COVID-19 and were not given PCR test whereas 1342 were excluded because their PCR results could not be reached. The study flow diagram is given in Figure 1.
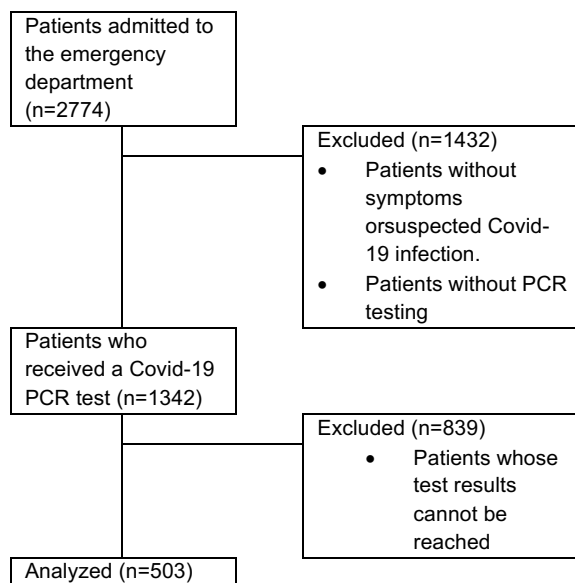
Figure 1. The study flow diagram

Measurements

Questionnaire and COVID-19 VTS were used for data collection. The questionnaire included 10 questions about sociodemographic data such as age, gender, marital status, presence of chronic disease, if any, the name of the disease, employment status and the number of households, and PCR test results, chest x-ray (CXR) or CT scan results.

COVID-19 Visual Triage Scala

The scale items were designed using the relevant literature and COVID-19 diagnosis guideline of the Ministry of Health (8,12,16). A draft scale was formed aimed at identifying suspected COVID-19 cases when designing the scale. Due attention was paid to develop items that identify COVID-19 symptoms and the risk of being exposed to COVID-19.

Opinions of 4 academic members, 2 triage nurses serving in the ED and 2 emergency physicians on the scale were taken in order to assess intelligibleness and suitability of the scale items in terms of language. Davis technique was taken into consideration in the assessment of expert opinions. In line with expert opinions, the number of items in the draft scale was increased from 11 to 12.

The scale is a computational measuring instrument with a scoring calculated based on clinical symptoms, travel or contact history in a certain period of time prior to onset of symptoms. It was developed for adults for early detection of suspected COVID-19 patients. The scale consisted of two sections that include symptoms and findings of the patient and the risk of potential exposure. Section A comprised 10 items including measured temperature, self-reported fever, cough, difficulty in breathing, saturation level (SPO_2), sore throat, headache and muscle and joint pains, loss of taste and smell and diarrhea. Section B included two items that involved the history of being in an area with high risk of transmission and contact with any confirmed cases within 14 days preceding the onset of symptoms and that allowed risk assessment. The scale items get points ranging from "1" to "2". Minimum score to be obtained from the scale is "1" while the maximum score is "19". Getting a score of 4 and above indicates that the patient must be evaluated for COVID-19 by a physician.

Application of data collection tools

In order to speed up triage in the ED, we developed an early diagnosis scale that involves symptoms of the patients who present with suspected COVID-19 in the ED and their history of being in a risk area or contacting a person at risk. Developed scale was applied by the triage nurse in the ED to the patients who presented with suspected COVID-19 between January - mid-March 2021. The patients were informed of the scope of the study and written consents were taken from the patients. In addition to the scale, the patients were also applied a questionnaire which included descriptive data such as age, gender, employment status that are supposed to be associated with COVID-19.

Patients who presented with suspected COVID-19 were given PCR tests. Samples for PCR tests were taken from the upper (nasopharyngeal or oropharyngeal swabs) respiratory tract. Besides PCR test, according to clinical symptoms, some of the patients were asked by the physician to take a chest x-ray and some others a CT scan. The decision for doing a PCR test was left to the physicians or assistants serving in the ED without any interference. Subsequently, percentages of detecting a confirmed case of PCR and COVID-19 VTS were compared. The scale's sensitivity and specificity for identifying a positive COVID-19 case was evaluated based on the data obtained.

Approval of the ethical board and institutional permission from the Ministry was obtained for conducting the research. Patients who participated in the study were explained the purpose of the study, informed consent text was read to them and their consent was obtained. The study was performed in

accordance with the declaration of Helsinki and with the terms of local legislation.

Statistical analyses

Data obtained from the research were evaluated using SPPS (Statistical Package for Social Science) 25.0. Distribution of socio-demographic data was interpreted in frequency, percentage. Normal distribution of the data was examined using Kolmogorov-Smirnov test before the analysis. Independent samples t-test and chi-square test were used to compare quantitative data. The results were evaluated with a 95% confidence interval, with a significance level of $p<0,05$. Sensitivity and specificity of the scale was tested with the scoring adopted for identifying confirmed cases regarding detection of virus with real time PCR test.

RESULTS

Throughout the study, 503 patients who presented with suspected COVID-19 in ED were given PCR test. Among them, 67% tested negative and 33% tested positive. Of the 46 patients who took CT scan, 80% tested positive while 20% tested negative. Of the 125 patients who took chest x-ray, 66% tested positive while 34% tested negative. Of the 503 patients who were given COVID-19 VTS, 45% tested positive and 55% tested negative (Table 1).

Table 1. The distribution of positive and negative according to the tests type

Tests	Positive		Negative	
	n	%	n	%
PCR	166	33.0	337	67.0
CT	37	80.4	9	19.6
CXR	82	65.6	43	34.4
Covid 19 VTS	226	44.9	277	55.1

It was found that descriptive parameters for patients who attended ED with suspected COVID-19 consisting of age, number of households, gender, marital status, employment status, chronic disease and type of disease were not statistically significant between patients who tested COVID-19 positive and negative according to PCR test ($p>.05$). COVID-19 VTS, CT and CXR test results were found to have statistically significant differences with respect to patients who tested COVID-19 positive and negative according to PCR test ($p<.001$). The median for

COVID-19 positive patients according to COVID-19 VTS was calculated as 4.00 (3.00-6.00) while the same was calculated as 3.00 (2.00-4.00) for negative patients (Table 2) (Figure 2).

COVID-19 VTS resulted in a model with a sensitivity of 46% and specifity of 82% at an AUC value of 0.65 (% 95 CI 0.61–0.69) in ROC analysis conducted based on the data of 503 patients (Table 3) (Figure 2,3).
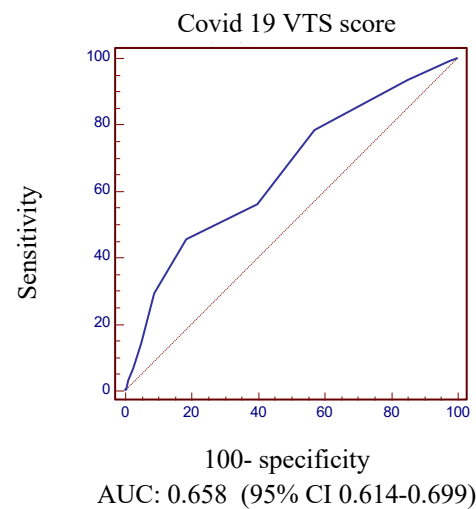

AUC: 0.658 (95% CI 0.614-0.699)

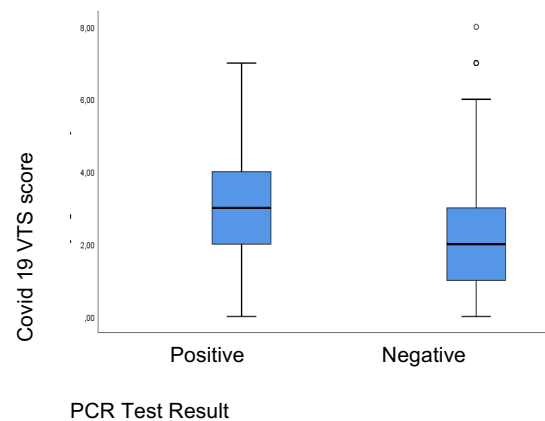**Figure 2.** ROC Curve for Triage Scale Scores

Figure 3. Triage Scale Scores of Patients Who Tested Positive and Negative According to PCR Test

Box plot showing median difference between patients who tested COVID-19 negative and positive obtained from 503 patients. The effect of the items in the scale that was developed for the purpose of rapid diagnosis of patients attending ED with suspected COVID-19 on being positive and negative according to the result of PCR test. Statistically significant difference was found between patients who tested COVID-19 positive and negative according to PCR test, with respect to fever, cough, sore throat, loss of taste and

Table 2. Distribution of Descriptive Characteristics According to PCR Test Status (n=503)

	PCR Test Result				
	Positive (n=166)		Negative (n=337)		
	Mean±SD	Median [Q1-Q3]	Mean±SD	Median [Q1-Q3]	p value
Age	43.23±16.24	14.00 [30.00-53.00]	40.37±15.97	38.00 [27.00-52.00]	0.061
Number of Households	3.62±1.40	4.00[2.00-5.00]	3.63±1.27	4.00[3.00-4.00]	0.947
Covid-19 VTS	4.28±2.09	4.00[3.00-6.00]	3.16±1.78	3.00[2.00-4.00]	<0.001*
Gender					
Female	81 (48.8)		168 (49.9)		0.824
Male	85 (51.2)		169 (50.1)		
Marital Status					
Married	131 (78.9)		240 (71.2)		0.065
Single	35 (21.1)		97 (28.8)		
Employment Status					
Working	76 (45.8)		166 (49.3)		
Working from Home	8 (4.8)		13 (3.9)		0.714
Not Working	82 (49.4)		158 (46.9)		
Chronic Disease					
Yes	50 (30.1)		90 (26.7)		0.442
No	116 (69.9)		247 (73.3)		
Name of Disease					
Hypertension	19 (35.8)		24 (26.7)		
Diabetes	13 (24.5)		14 (73.3)		
Heart disease	4 (7.5)		8 (8.9)		0.275
Asthma	12 (22.6)		35 (38.9)		
Other	5 (9.4)		9 (10.0)		

Table 2. Continue

Chest X-Ray			
Positive	79 (96.3)	3 (7.0)	<0.001*
Negative	3 (3.7)	40 (93.0)	
CT			
Positive	36 (97.3)	1 (11.1)	<0.001*
Negative	1 (2.7)	8 (88.9)	

Q1: 1. Quartile Value (25%); Q3:3. Quartile Value (75%). Data for qualitative values are denoted by n (%).
p: Independent Samples T Test and Chi-Square Test; *p value is significant at 0,05 level.

smell reported by patients and history of contact with a confirmed COVID-19 case ($p<.05$). It was found that measured temperature ≥38⁰, shortness of breath, SPO$_2$, headache, muscle pain, diarrhea and being in a high-risk area did not cause a statistically significant difference between positive and negative patients ($p>.05$) (Table 4).

DISCUSSION

In order to speed up triage in the ED, we developed an early diagnosis scale that involves symptoms of the patients who present with suspected COVID-19 in the ED and their history of being in the risky area or contact with any person at risk. We validated the scale using the data collected from 503 patients who attended ED. Validation of the scale resulted in 0.65 AUC with a 45% sensitivity and 82% specificity using a cut-off value >4. In its comparison with PCR test, the scale was found to detect 93 real positive and 204 real negative patients.

Sensitivity of the scale developed in this study was found to be 45% and its specificity was found to be 82%. It was reported in the literature that sensitivity of corona-score algorithm developed by Kurstjens et al. that involved laboratory tests, demographic data and chest x-ray and CT scan was 96% and its specificity was 95%, at cut-off values of 4 and 11 (17). Lippi et al. reported a sensitivity of 82% and specificity of 96% in their study conducted in in the United States of America using the same corona-score algorithm (18). In the study by Chou et al. which they conducted creating a triple model; in the joint model which combined both clinical data and CT scan, sensitivity was found to be 82.8% and specificity was found 92%; in the model which only used CT scan data, sensitivity was 83.6% and specificity was 75.9%; in

the multi-layer detecting model which combined clinical data alone, sensitivity was 80.6% and specificity was 68.3% (19). The sensitivity and specificity of the scale developed by Joshi et al. based on components of full blood count and patient gender in different countries were reported to be Northern California 93%, 43%; Washington 88%, 35%; Chicago 86%,49%; South Korea 89%, 55%, respectively (20). In this study, sensitivity was found to be lower compared to other studies. This is supposed to be caused by the fact that studies were conducted with different populations, measurement tools developed in other studies included laboratory findings and the countries had different healthcare policies. In addition, it was found in the literature that sensitivity of PCR test which we used to validate the scale was between 70-90% (21,22). Another reason could be the fact that inclusion of patients with wrong negative PCR tests in the population could impair the data set and cause underestimation of scale performance and this could result in the likelihood of low scale sensitivity.

Symptoms of COVID-19 disease vary. Patients who show mild symptoms and are even asymptomatic despite having the virus make up the majority. This makes it difficult for clinicians to distinguish COVID-19 from other respiratory tract diseases (23-25). However, doing a PCR test for each patient brings a financial burden on the countries. For this reason, using scales that involve only symptoms for detecting the disease without the need for laboratory tests will at least help ensure continuity of healthcare system. In this study, an early diagnosis instrument was developed which involved symptoms like measured temperature, self-reported fever, cough, difficulty in breathing, SPO$_2$ value, headache, muscle pain, sore

Table 3. ROC Curve parameters of Covid 19 VTS

	AUC	%95 CI	Cut-off	Sensitivity (%)	Specificity (%)
Covid-19 VTS	0.65	0.61–0.69	>4	45.78	81.60

Rate of likelihood of testing positive:2.49; Rate of likelihood of testing negative: 0.66

throat, diarrhea and history of presence in the risk area and exposure to a confirmed COVID-19 case. As a result of analysis, self-reported fever, cough, sore throat, loss of taste and smell and history of contacting a confirmed COVID-19 case were found to be parameters associated with COVID-19. Similar to findings of our study, Chou et al. reported in their study that exposure to a confirmed COVID-19 case, fever, cough, productive cough and number of white blood cells were reported to be important clinical characteristics associated with COVID-19 (19). In our study, measured temperature was not found to be a strong clinical predictor in detecting COVID-19 but self-reported fever was a strong clinical predictor. Self-reported fever, state of not smoking, bilateral infiltrates on the chest x-ray and absence of leukocytosis in blood tests were reported to be strong predictors in the study by O'reilly et al. (26).

Considering the fact that the virus is mutating, its speed of transmission is increasing and it seems to survive for a long time to come until vaccination is done all over the world and immunization is ensured, people will continue to visit hospitals for suspected COVID-19. COVID-19 VTS is also a valuable scale in that it is an assessment method based only on the symptoms of the patient aimed at rapid diagnosis by triage nurses without requiring laboratory tests in an attempt to avoid excessive tests and reduce testing costs in hospitals. However, this study conducted with 503 patients showed that clinical scoring is not predictive for COVID-19 infection. We recommend that patients with self-reported fever, cough, sore throat, loss of taste and smell and history of exposure to a confirmed COVID-19 case should be isolated for COVID-19 until they are confirmed with PCR test.

The fact that the study was conducted from a single center, patients in the pandemic polyclinic were not included but only those who attended ED were included constituted the limitations of the study. Since PCR test was selected as inclusion criterion and comparison test, inclusion only of patients who were given PCR test may cause a selection bias. Use of the scale in pediatric patients was not validated since the study was conducted with adult patients.

CONCLUSION

In conclusion, sensitivity of the scale that was developed based on prediction and symptom oriented was found to be low while its specificity was found high. The scale predicted accurately 93 of 166 patients who tested positive according to PCR test and 204 of 337 patients who tested negative. Due to its low sensitivity, primary objective of the study which was "to predict if patients had COVID-19" and among the secondary objectives, the one "to detect and isolate patients with COVID-19 earlier and restore vital functions of critically ill patients with a multidisciplinary approach" were partly achieved. However, because of high specificity, in other words, a good level of predicting negative patients, the other secondary objective which was "to ensure continuity of treatment services" was achieved. Therefore, the scale is supposed to be an early diagnosis scale that can be used by triage nurses for ensuring continuity of treatment services for patients who attend ED but do not have COVID-19, for rapid patient hosting and isolation of suspected COVID-19 cases. The scale is supposed to be useful in sorting patients during the early stages of the pandemic where testing facilities are limited and during the times of fluctuation with respect to COVID-19 and future pandemics. Moreover, it is suggested that it can also be used for patient sorting in workplaces where people work collectively, when entering into crowded environments and in scanning programs to be performed at certain intervals.

COVID-19 VTS is capable of sorting accurate and wrong negatives and may serve as an early diagnosis instrument. Further validation will be needed to determine how effectively this early diagnosis instrument can be used in clinical practice.

Implications for practice

- COVID-19 VTS can be used to distinguish between negative and positive patients, but this does not mean that it can be used as a substitute for the PCR test.
- The scale can be used in emergency triage or collective workplaces where rapid patient distinction is required.

Table 4. Distribution of positive and negative status according to PCR test with Covid 19 VTS items

Covid 19 VTS Items	PCR Test Result				
	Positive (n=166)		Negative (n=337)		
	n	%	n	%	P value
Fever (≥38^0)					
Yes	14	42.4	19	57.6	
					.159
No	152	32.3	318	67.7	
Self-reported fever					
Yes	44	41.9	61	58.1	
					.020
No	122	30.7	276	69.3	
Cough					
Yes	61	44.2	77	55.8	
					.001
No	105	28.8	260	71.2	
Shortness of breath					
Yes	19	32.8	39	67.2	
					.547
No	147	33.0	298	67.0	
SPO$_2$					
Yes	7	58.3	5	41.7	
					.061
No	159	32.4	332	67.6	
Sore throat					
Yes	31	23.3	102	76.7	
					.003
No	135	36.5	235	63.5	
Headache					
Yes	43	32.8	88	67.2	.525
No	123	33.1	249	66.9	

Table 4. Continue

Muscle pain					
Yes	90	33.7	177	66.3	
					.409
No	76	32.3	159	67.7	
Loss of smell and taste					
Yes	21	46.7	24	53.3	
					.032
No	145	31.7	313	68.3	
Diarrhea					
Yes	14	42.4	19	57.6	
					.159
No	152	32.3	318	67.7	
Visit to the risk area in the last two weeks					
Yes	50	36.8	86	63.2	
					.167
No	116	31.7	250	68.3	
Exposure to a confirmed Covid-19 case in the last two weeks					
Yes	74	52.9	66	47.1	
					<.001*
No	91	25.1	271	74.9	

- The risk of disease transmission can be reduced by isolating those who have self-reported fever, loss of taste and smell, a history of contact with a positive person or those who score 4 and above on the scale, patients can be isolated early and continuity in health services is ensured.

Highlights

- COVID-19 VTS is capable of sorting accurate and wrong negatives and may serve as an early diagnosis instrument.
- Negative patients can be distinguished and continuity of treatment services for patients who are not infected can be ensured.

- Contact of healthcare personnel working in the healthy area with SARS-CoV-2 infection can be reduced by sorting patients.
- Patients who attend ED can be sorted swiftly. COVID-19 patients can be diagnosed and isolated earlier and vital functions of critically ill patients can be rapidly restored with a multidisciplinary approach.

REFERENCES

1. Al-Sadeqa DW, Nasrallaha GK. The incidence of the novel coronavirus SARS-CoV-2 among asymptomatic patients: A systematic review. International Journal of Infectious Diseases, 2020; 98: 372–80. http://creativecommons.org/licenses/by-nc-nd/4.0/.

2. Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 2020;395:507–13.

3. Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med 2020; 395: 507–13.

4. Republic of Turkey Ministry of Health, Covid 19 Information Page. General Coronavirus Table. Ankara 2020. Avaible at: https://covid19.saglik.gov.tr/TR-66935/genel-koronavirus-tablosu.html.

5. Center for Disease Control (CDC). Covid 19, Emerging SARS-CoV-2 Variants. 2021. Avaible at: https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research/scientific-brief-emerging-variants.html

6. Kunt MM, Karaca MA. COVID 19 Pandemic and Emergency Service Triage. Anatolian Journal of Emergency Medicine 2020;3(3):96-8.

7. Center for Disease Control (CDC). Standard Operating Procedure (SOP) for Triage of Suspected COVID-19 Patients. Published online 2020:1-5. Avaible at: https://www.cdc.gov/coronavirus/2019-ncov/hcp/non-us-settings/sop-triage-prevent-transmission.html.

8. Tokem Y, Turhan S, Uyur Celik G. Emergency Approach Strategies in COVID-19 Adult Patients with Definitive and Possible Diagnosis. Izmir Katip Celebi University Faculty of Health Sciences Journal, 2020;5(2):203-209.

9. Chan JF, Yuan S, Kok KH, To KK, Chu H, Yang J, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. Lancet 2020;395:514–23.

10. Cheng MP, Papenburg J, Desjardins M, Kanjilal S, Quach C, Libman M, et al. Diagnostic testing for severe acute respiratory syndrome-related coronavirus-2: a narrative review. Ann Intern Med 2020;172:726–34.

11. Peng QY, Wang XT, Zhang LN, Chinese Critical Care Ultrasound Study Group (CCUSG) (2020) Findings of lung ultrasonography of novel corona virus pneumonia during the 2019–2020 epidemic. Intensive Care Med 2020;46(5):849-850.

12. Açıksarı K, Kınık K. Process Management and Outcomes of the Emergency Department of a Training and Research Hospital in Turkey During the Coronavirus Disease 2019 Pandemic. Anatolian Clinic Journal of Medical Sciences 2020;25(Special Issue1):263-83.

13. Levenfus L, Ullmann E, Battegay E, Schuurmans MM. Triage tool for suspected COVID-19 patients in the emergency room: AIFELL score. Braz J Infect Dis 2020;24(5):458–461.

14. Coskun S, Bebis H. Psychometric evaluation of a Turkish version of the e-health literacy scale (e-heals) in adolescent. Gulhane Med J 2015;57:378-84.

15. Ozdamar, K. (2016). Structural equation modeling for scale and test development in education. (1st ed.). Eskişehir: Nisan Bookstore.

16. Republic of Turkey Ministry of Health, Covid 19 General Information, Epidemiology and Diagnosis, 2020. Avaible at: https://hsgm.saglik.gov.tr/depo/covid19/Ingilizce/Rehber/COVID-19_Rehberi__Genel_bilgiler_epidemiyoloji_ve_tani_8.06.2020_eng.pdf.

17. Kurstjens S, van der Horst A, Herpers R, Geerits MWL, Kluiters-de Hingh YCM, Göttgens E-L, et al. Rapid identification of SARS-CoV-2-infected patients at the emergency department using routine testing. Clin Chem Lab Med 2020;58(9):1587–93.

18. Lippi G, Henry BM, Hoehn J, Benoit S, Benoit J. Validation of the Corona-Score for rapid identification of SARS-CoV-2 infections in patients seeking emergency department care in the United States. Clin Chem Lab Med 2020;58(12):311–3.

19. Chou EH, Wang C, Hsieh Y, Namazi B, Wolfshohl J, Bhakta T, et al. Clinical Features of Emergency Department Patients from Early COVID-19

Pandemic that Predict SARS-CoV-2 Infection: Machine-learning Approach. West J Emerg Med 2021;22(2):244-51.

20. Joshi RP, Pejaver V, Hammarlund NE, Sung H, Lee SK, Furmanchuk A, et al A predictive tool for identification of SARS-CoV-2 PCR-negative emergency department patients using routine test results. Journal of Clinical Virology 129 (2020)104502.

21. Jamal AJ, Mozafarihashjin M, Coomes E, Powis J, Li AX, Paterson A, et al. Sensitivity of Nasopharyngeal Swabs and Saliva for the Detection of Severe Acute Respiratory Syndrome Coronavirus 2. Clinical Infectious Diseases 2021; 15;72(6):1064-1066.

22. Wang W, Xu Y, Gao R, Lu R, Han K, Wu G, et al. Detection of SARSCoV-2 in different types of clinical specimens. JAMA 2020;12;323(18): 1843-4.

23. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020;395(10223):497-506.

24. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet. 2020;395(10223):507-13.

25. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 novel coronavirus-infected pneumonia in Wuhan, China. JAMA 2020;323(11):1061-9.

26. O'reilly GM, Mitchell RD, Mitra B, Akhlaghi H, Tran V, Furyk JS, et al. Epidemiology and clinical features of emergency department patients with suspected and confirmed COVID-19: A multisite report from the COVID-19 Emergency Department Quality Improvement Project for July 2020 (COVED-3). Emergency Medicine Australasia 2021;33:114–124.