Effect of fever or respiratory symptoms on leaving without being seen during the COVID-19 pandemic in South Korea

Dohyung Kim¹, Weon Jung², Jae Yong Yu², Hansol Chang¹, Se Uk Lee¹, Tae Kim¹, Sung Yeon Hwang¹, Hee Yoon¹, Tae Gun Shin¹, Min Seob Sim¹, Ik Joon Jo¹, Won Chul Cha¹²³

¹Department of Emergency Medicine, Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, Korea
²Department of Digital Health, Samsung Advanced Institute for Health Science & Technology (SAIHST), Sungkyunkwan University, Seoul, Korea
³Health Information and Strategy Center, Samsung Medical Center, Seoul, Korea

Objective Coronavirus disease 2019 (COVID-19) has notably altered the emergency department isolation protocol, imposing stricter requirements on probable infectious disease patients that enter the department. This has caused adverse effects, such as an increased rate of leave without being seen (LWBS). This study describes the effect of fever/respiratory symptoms as the main cause of isolation regarding LWBS after the COVID-19 pandemic.

Methods We retrospectively analyzed emergency department visits before (March to July 2019) and after (March to July 2020) the COVID-19 pandemic. Patients were grouped based on existing fever or respiratory symptoms, with the LWBS rate as the primary outcome. Logistic regression analysis was used to identify the risk factors of LWBS. Logistic regression was performed using interaction terminology (fever/respiratory symptom patient [FRP] × post–COVID-19) to determine the interaction between patients with FRPs and the COVID-19 pandemic period.

Results A total of 60,290 patients were included (34,492 in the pre–COVID-19, and 25,298 in the post–COVID-19 group). The proportion of FRPs decreased significantly after the pandemic (P < 0.001), while the LWBS rate in FRPs significantly increased from 2.8% to 19.2% (P < 0.001). Both FRPs (odds ratio, 1.76; 95% confidence interval, 1.59–1.84 (P < 0.001) and the COVID-19 period (odds ratio, 2.29; 95% confidence interval, 2.15–2.44; P < 0.001) were significantly associated with increased LWBS. Additionally, there was a significant interaction between the incidence of LWBS in FRPs and the COVID-19 pandemic period (P < 0.001).

Conclusion The LWBS rate has increased in FRPs after the COVID-19 pandemic; additionally, the effect observed was disproportionate compared with that of nonfever/respiratory symptom patients.

Keywords COVID-19; Hospital emergency service; Fever; Respiratory signs and symptoms; Isolation & purification
Leaving without being seen during COVID-19

What is already known
At post–COVID-19, the isolation processes of emergency departments (EDs) involve enhanced requirements for probable infectious disease patients entering an ED, consequently inducing substantial delays in this critical process. The implementation of enhanced isolation processes in EDs has caused adverse effects such as overcrowding.

What is new in the current study
Leaving without being seen rate has increased post–COVID-19 pandemic. The effect of the pandemic on leave without being seen was more prominent in the patients with fever or respiratory symptoms.

INTRODUCTION
The novel coronavirus disease 2019 (COVID-19) has significantly affected the world. On March 11, 2020, the World Health Organization declared COVID-19 to be pandemic. In response, South Korea implemented various national strategies, such as testing, tracing, and treating (the three Ts), as well as social distancing (internationally considered to be one of the most effective models). Emergency departments (EDs) in South Korea have established institution-level isolation protocols against COVID-19. These protocols necessitate enhanced requirements for probable infectious disease patients entering an ED, consequently causing substantial delays in this critical process. Although the implementation of enhanced isolation procedures in EDs has resulted in adverse effects—such as overcrowding—no studies have described this effect in detail.

Leave without being seen (LWBS) was defined as leaving the ED before consulting a physician after triage. LWBS is one of the factors reflecting the failure of the ED process, long waiting times, and ED overcrowding. LWBS results in a higher chance of re-visitation, since patients’ problems are often left unresolved. Moreover, patients with LWBS who require isolation—i.e., those with a higher likelihood of infection—may seek alternative care options, thereby risking the spread of infection to other health institutions.

The purpose of this study was to describe the effect of fever or respiratory symptoms as the main cause of isolation in patients with LWBS after the COVID-19 pandemic.

METHODS
Ethics statement
This was a retrospective study approved by the institutional review board of the Samsung Medical Center (No. 2020-12-042). Informed consent was waived since the study used only retrospective data.

Study design and setting
This study was conducted in the ED of a tertiary teaching hospital in Seoul, South Korea, with approximately 2,000 inpatient beds. The outpatient department has approximately 2 million visits per year; the annual number of patients in the ED is approximately 80,000.

COVID-19 pandemic in South Korea
Although the first case of COVID-19 in South Korea was confirmed on January 20, 2020, the number of confirmed cases had rapidly increased by the end of February 2020. This was associated with an outbreak in a religious group in the city of Daegu. Since then, there have been almost 40,000 confirmed cases of COVID-19, with 600 deaths (800 confirmed cases with 11 deaths per 1 million population) occurring during the third wave in December 2020. As a result, national strategies against COVID-19—such as social distancing—have been adjusted according to the current situation and number of confirmed cases.

ED isolation process
The preexisting isolation process was established after the Middle East respiratory syndrome outbreak in 2015 (Fig. 1), where only patients with suspected droplet or airborne infections—such as tuberculosis, chicken pox, measles, mumps, plague, and Middle East respiratory syndrome—were to be isolated. However, the criteria for isolation changed after COVID-19 cases appeared in South Korea; all patients with fever or respiratory symptoms, and a history associated with COVID-19, were to be isolated at the onset of the pandemic. A history associated with COVID-19 included contact with confirmed COVID-19 cases, or traveling to regions
Patients could encounter a physician right after entering medical zones (both isolation and nonisolation zones); as such, LWBS was observed while patients waited to enter the medical zone after screening and triage. In the isolation zone, patients could only undergo basic medical processes, including physical examination, plain chest radiography, blood testing, and electrocardiography; further evaluation via computed tomography, magnetic resonance imaging, and echocardiography was limited. Isolated patients were released following a negative test for COVID-19, or if presumed to be unlikely to have an infection after consulting a physician.

Selection of participants

The study population included all individuals who visited the ED between March and July of 2019 and 2020; nonmedical visits (certificates or prescriptions) were excluded. Revisits were regarded as additional cases, since patients who revisit the ED undergo the same procedures of triage and isolation, regardless of whether or not the chief complaint is the same.

The post–COVID-19 period was defined from March to July 2020, while the comparative pre–COVID-19 period was defined from March to July 2019 (Fig. 2). We categorized patients into two groups according to the presence of fever or respiratory symptoms (e.g., coughing, sputum, rhinorrhea, sore throat, and dyspnea), which represent the major symptoms of COVID-19, and the main cause of isolation. Fever was defined as a body temperature > 37.5°C, which is the isolation criteria used in the center. Fever/respiratory symptom patients (FRPs) were defined as patients with fever or respiratory symptoms (Fig. 2).

Outcome

The primary outcome was LWBS among ED patients, defined as leaving the ED while waiting to enter the medical zone (both isolation and nonisolation) after screening and triage.

Statistical analysis

We used logistic regression analysis to identify the risk factors of LWBS. Risk factors with P-values < 0.05 in univariate logistic regression analyses were selected and included in multivariate analysis. After analyzing the effects of the post–COVID-19 period and
FRPs on targeted outcomes, the differences in effects on FRPs between the pre- and post–COVID-19 periods were further examined through interaction analysis; logistic regression for the interaction between FRPs and the post–COVID-19 period was performed using interaction terminology (FRP × post–COVID–19).

The WT data was heavily skewed; thus, the Kruskal-Wallis test was performed. The P-values for the WT and LWBS were calculated using the Kruskal-Wallis and chi-squared tests, respectively. Welch two-sample t-test was used to calculate the P-values for LOS and BOR.

All statistical analyses were performed using R statistical software ver. 4.0.3 (R Foundation for Statistical Computing, Vienna, Austria).

RESULTS

Characteristics of study subjects

In total, 34,492 and 25,798 visits were included in the pre–COVID-19 and post–COVID-19 periods, respectively. Table 1 shows the distribution of demographics in patients admitted to the ED; there were significantly fewer young patients (<18 years, P<0.001) than older patients (>18 years, P<0.001) during the post–COVID-19 period. High KTAS scores (4 or 5, less emergent, 55.0%; KTAS 4, 46.3%; KTAS 5, 8.8%) were more frequent than low KTAS scores (1 to 3, 45.0%; KTAS 1, 0.4%; KTAS 2, 5.2%; KTAS 3, 39.4%), and there were significantly fewer FRPs during the post–COVID-19 period (P<0.001); a very small effect size was observed. Both the rate and frequency of LWBS significantly increased during the post–COVID-19 period (P<0.001).

Main results

LWBS and WT

There were 240 (2.8%) and 1,106 (19.2%) LWBS cases involving FRPs during the pre–COVID–19 and post–COVID–19 periods, respectively. The median WTs were 24.0 minutes (range, 17.0–39.0 minutes) during the pre–COVID–19 period, and 45.0 minutes (range, 21.0–134.0 minutes) during the post–COVID–19 period (Table 2). Fig. 3 shows the changes in the LWBS rate, as well as

| Table 1. Characteristics of emergency department patients and presentation in the pre–/post–COVID–19 periods |
|---------------------------------------------------------------|-----------------------------------------------|
| Pre–COVID–19 | Post–COVID–19 |
| (n = 34,492) | (n = 25,798) |
| Sex | 0.977 |
| Female | 17,119 (49.6) 12,808 (49.6) |
| Male | 17,373 (50.4) 12,990 (50.4) |
| Age (yr) | <0.001 |
| < 18 | 6,652 (19.3) 3,197 (12.4) |
| 18–65 | 19,009 (55.1) 15,399 (59.7) |
| > 65 | 8,831 (25.6) 7,202 (27.9) |
| KTAS score | <0.001 |
| 1 | 163 (0.5) 105 (0.4) |
| 2 | 1,698 (4.9) 1,344 (5.2) |
| 3 | 15,439 (44.8) 10,154 (39.4) |
| 4 | 15,791 (45.8) 11,932 (46.3) |
| 5 | 1,401 (4.1) 2,263 (8.8) |
| Fever/respiratory symptoms | <0.001 |
| Fever | 7,371 (21.4) 4,677 (18.1) |
| Respiratory symptoms | 2,347 (6.8) 1,649 (6.3) |
| Fever or respiratory symptoms | 8,341 (24.2) 5,753 (22.3) |
| SBP (mmHg) | 0.240 |
| Abnormal | 6,807 (17.6) 4,457 (17.3) |
| Normal | 28,405 (82.4) 21,341 (82.7) |
| RR (/min) | <0.001 |
| Abnormal | 3,619 (10.5) 2,368 (9.2) |
| Normal | 30,873 (89.5) 23,430 (90.8) |
| HR (/min) | 0.410 |
| Abnormal | 9,859 (28.6) 7,454 (28.9) |
| Normal | 24,633 (71.4) 18,344 (71.1) |
| SpO2 (%) | 0.001 |
| Abnormal | 3,520 (10.2) 2,427 (9.4) |
| Normal | 30,972 (89.8) 23,371 (90.6) |
| Disposition | <0.001 |
| Discharge | 24,052 (69.7) 15,888 (61.6) |
| Admission | 7,248 (21.0) 5,998 (23.2) |
| Death | 136 (0.4) 101 (0.4) |
| Transfer | 1,314 (3.8) 692 (2.7) |
| LWBS (main outcome) | 1,742 (5.1) 3,119 (12.1) |

Values are presented as number (%).

COVID-19, coronavirus disease 2019; KTAS, Korean Triage and Acuity Scale; SBP, systolic blood pressure; RR, respiratory rate; HR, heart rate; SpO2, peripheral oxygen saturation; LWBS, leave without being seen.

aBody temperature more than 37.5°C.
b100–160 mmHg.
c12–20 breaths/min.
d60–100 beats/min.
e> 95%.

Table 2. LWBS and WT in FRPs and NFRPs in the pre–/post–COVID–19 periods

| Table 2. LWBS and WT in FRPs and NFRPs in the pre–/post–COVID–19 periods |
|-----------------------------------------------|
| Pre–COVID–19 | Post–COVID–19 |
| (n = 34,492) | (n = 25,798) |
| NFRP (n = 26,151) | NFRP (n = 20,045) |
| FRP (n = 8,341) | FRP (n = 5,753) |
| P-value | P-value |
| LWBS | 1,502 (5.7) 2,013 (10.0) |
| FRP (n = 8,341) | 1,116 (19.2) 45.0 (21.0–134.0) |
| P-value | 0.001 |
| WT (min) | 24.0 (17.0–39.0) 26.0 (17.0–40.0) |
| P-value | 0.002 |

Values are presented as number (%) or median (interquartile range).

LWBS, leave without being seen; WT, waiting time; FRP, fever/respiratory symptom patient; NFRP, non-fever/respiratory symptom patient; COVID-19, coronavirus disease 2019.

*aChi-squared test. **Kruskal–Wallis test.
the proportion of waiting patients per 10-minute increase in WT. The highest LWBS rate during the post–COVID-19 period was 5.21%, seen after a WT of 20 to 30 minutes. The LWBS rate within 60 minutes was higher during the post–COVID-19 period than the pre–COVID-19 period (Fig. 3).

**Logistic regression**

Univariate analysis demonstrated that LWBS in ED patients was significantly related to the proportion of FRPs, post–COVID-19 period, age, high KTAS score, and normal vital signs; sex was not significantly associated with LWBS in ED patients (Table 3). FRPs (odds ratio, 1.76; 95% confidence interval, 1.59–1.84) and the post–COVID-19 period (odds ratio, 2.29; 95% confidence interval, 2.15–2.44) were significantly associated with LWBS. Additionally, LWBS was associated with higher KTAS scores (4 or 5; less emergent) (P < 0.001). Age group was also significantly associated with LWBS (P < 0.001) (Table 3).

**Interaction of FRPs and the post–COVID-19 period**

We compared the effect size of FRPs and the post–COVID-19 period on the primary outcome using the interaction term (FRP × post–COVID-19). A significant interaction was observed between FRPs and the post–COVID-19 period regarding the LWBS rate (P < 0.001) (Fig. 4).

**Subanalysis of FRPs**

We subanalyzed the differences between FRPs who did and did not LWBS during the pre–/post–COVID–19 periods (Table 4). The proportion of low KTAS scores (4 or 5; less emergent) was higher in FRPs who LWBS during the post–COVID–19 period than in other groups. The median WT was shorter when FRPs did LWBS (36 minutes; range, 20–92 minutes) than when they did not LWBS (48 minutes; range, 21–142.5 minutes) during the post–COVID–19 period (P < 0.001). Conversely, the median WT was longer when FRPs did LWBS (39 minutes; range, 25–66.5 minutes) than when they did not LWBS (24 minutes; range, 16–38 minutes) during the pre–COVID–19 period (P < 0.001) (Table 4).
Table 3. Logistic regression analysis of leave without being seen

| Symptom                  | Univariate analysis | Multivariate analysis |
|--------------------------|---------------------|-----------------------|
|                          | OR                  | 95% CI                | P-value | OR                  | 95% CI                | P-value |
| Symptom                  | OR                  | 95% CI                | P-value |
| NFRP                     | Ref                 | Ref                   | Ref     |
| FRP                      | 1.27                | 1.19–1.36             | < 0.001 | 1.76                | 1.59–1.84             | < 0.001 |
| COVID-19 period          |                     |                       |         |
| Pre                      | Ref                 | Ref                   | Ref     |
| Post                     | 2.59                | 2.43–2.75             | < 0.001 | 2.29                | 2.15–2.44             | < 0.001 |
| Sex                      |                     |                       |         |
| Male                     | Ref                 | 1.00–1.12             | 0.063   | Ref                 |                       |         |
| Female                   | 1.06                |                       |         |
| Age (yr)                 |                     |                       | < 0.001 |                     |                       |         |
| < 18                     | Ref                 | Ref                   | Ref     |
| 18–65                    | 1.16                | 1.07–1.26             | < 0.001 | 0.97                | 0.89–1.00             | 0.507   |
| > 65                     | 0.83                | 0.75–0.91             | < 0.001 | 0.85                | 0.76–0.94             | 0.002   |
| KTAS score               |                     |                       | < 0.001 |                     |                       |         |
| 1                        | Ref                 | Ref                   | Ref     |
| 2                        | 1.20                | 0.53–3.45             | < 0.001 | 1.10                | 0.48–3.15             | 0.845   |
| 3                        | 2.28                | 1.05–6.42             | < 0.001 | 2.12                | 0.97–5.96             | 0.098   |
| 4                        | 5.17                | 2.38–14.52            | < 0.001 | 4.62                | 2.12–13.00            | 0.001   |
| 5                        | 26.94               | 12.36–75.74           | < 0.001 | 21.40               | 9.78–60.29            | < 0.001 |
| SBP                      |                     |                       | < 0.001 |                     |                       |         |
| Abnormal                 | Ref                 | Ref                   | Ref     |
| Normal                   | 1.54                | 1.41–1.69             | < 0.001 | 1.23                | 1.12–1.35             | < 0.001 |
| RR                       |                     |                       |         |
| Abnormal                 | Ref                 | Ref                   | Ref     |
| Normal                   | 1.83                | 1.63–2.08             | < 0.001 | 1.21                | 1.06–1.39             | 0.005   |
| HR                       |                     |                       |         |
| Abnormal                 | Ref                 | Ref                   | Ref     |
| Normal                   | 1.52                | 1.42–1.64             | < 0.001 | 1.29                | 1.19–1.39             | < 0.001 |
| SpO₂                     |                     |                       |         |
| Abnormal                 | Ref                 | Ref                   | Ref     |
| Normal                   | 1.64                | 1.46–1.85             | < 0.001 | 1.13                | 1.00–1.29             | 0.048   |

OR, odds ratio; CI, confidence interval; NFRP, non-fever/respiratory symptom patient; Ref, reference; FRP, fever/respiratory symptom patient; COVID-19, coronavirus disease 2019; KTAS, Korean Triage and Acuity Scale; SBP, systolic blood pressure; RR, respiratory rate; HR, heart rate; SpO₂, peripheral oxygen saturation.

**ED LOS and BOR**

There was a significant decrease in the mean LOS (mean change, 0.42 hours; pre–COVID-19, 7.06 hours; post–COVID-1, 6.64 hours; P < 0.001), as well as the mean BOR, during the post–COVID-19 period (mean change, 19%; pre–COVID-19, 66.2%; post–COVID-19, 46.5%; P < 0.001).

**DISCUSSION**

Healthcare and ED systems worldwide—including screening and isolation procedures—have been detrimentally affected by the recent COVID-19 pandemic. Changes in these procedures have affected patients visiting the ED, and although these changes were established to protect vulnerable patients from those with potential infections, a substantial proportion of these potentially infected patients are severely ill, requiring urgent care.

This study is the first analysis of LWBS in ED patients after the COVID-19 pandemic, and is similar to a previous study wherein low acuity, young age, and normal vital signs were also found to be associated with LWBS. In particular, FRPs (representing isolated patients) and the post–COVID-19 period were significantly associated with LWBS (Fig. 4). It may be interpreted that FRPs—who may require more urgent medical attention than NFRPs—are forgoing the opportunity to receive medical treatment and visiting other locations in general without appropriate medical consultation. While our efforts to protect other patients have proven successful, a considerable proportion of patients may be exposed to unequal medical services and suboptimal care.
Since the WT of FRPs during the post–COVID-19 period was significantly longer than that of other groups, the bottleneck phenomenon at the isolation zone may explain the LWBS findings in this cohort. Our study demonstrated that the number of isolation zones was insufficient when considering the increasing number of isolated patients due to the strict isolation criteria; nevertheless, the total ED volume, LOS, and overcrowding in the ED decreased during the post–COVID-19 period. Redistribution and reallocation of ED resources should be considered to resolve this gridlock, as EDs should protect both FRPs and NFRPs.

Implementing additional resources at a community level for FRPs is not only required in EDs. Regarding infection control, LWBS in patients who require isolation could be more dangerous than those who do not, as they still have the potential to transmit infection and can thus continue the spread of disease. To monitor FRPs who leave the ED before encountering a physician, a tracking and supervising system is suggested to reduce secondary infections by providing timely alternative testing and treatment options; furthermore, we suggest creating a parallel system for FRPs—such as 24-hour clinics or hospitals—specialized to treat fever. The increase in LWBS rate represents a problem within the public health system, not just hospitals.

The study had several limitations; first, it was limited by its single-center, retrospective design. The isolation process is an institutional-level system that is not standardized according to a national-level strategy; therefore, large multicenter studies should be performed to identify general characteristics and trends of LWBS in the post–COVID-19 era. Still, designing a randomized trial on LWBS is difficult, as we cannot set a control group.

Second, the situation of FRPs in this study may differ from those of isolated patients in the real world. Although the presence of fever or respiratory symptoms is the main cause of isolation after the COVID-19 pandemic, there are many other causes of isolation associated with COVID-19; these include contact confirmed COVID-19 case, or traveling to regions with known outbreaks. However, it is difficult to consider all factors, since they change over time and differ according to the patient’s individual situation. Third, this study did not describe the patient’s condition after LWBS; therefore, it is difficult to follow-up and predict the prognosis of patients with LWBS, except in the case of revisitation.
Although it remains unknown whether LWBS has a poor effect on prognosis, it is evident that these patients do not receive proper medical care. Further research should therefore be conducted regarding the prognosis of patients with LWBS.

In conclusion, the LWBS rate increased in FRPs after the COVID-19 pandemic, and the effect observed was disproportionate compared with that in NFRPs.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Sohrabi C, Alsaﬁ Z, O’Neill N, et al. World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19). Int J Surg 2020;76:71-6.
2. Choi JY. COVID-19 in South Korea. Postgrad Med J 2020;96:399-402.
3. Lee D, Heo K, Seo Y. COVID-19 in South Korea: lessons for developing countries. World Dev 2020;135:105057.
4. McGrail DJ, Dai J, McAndrews KM, Kalluri R. Enacting national social distancing policies corresponds with dramatic reduction in COVID19 infection rates. PLoS One 2020;15:e0236619.
5. Park JH, Lee SG, Ahn S, et al. Strategies to prevent COVID-19 transmission in the emergency department of a regional base hospital in Korea: from index patient until pandemic declaration. Am J Emerg Med 2021;46:247-53.
6. Kim YJ, Jeong YJ, Kim SH, et al. Preparedness for COVID-19 infection prevention in Korea: a single-centre experience. J Hosp Infect 2020;105:370-2.
7. Yoo JH, Hong ST. The outbreak cases with the novel coronavirus suggest upgraded quarantine and isolation in Korea. J Korean Med Sci 2020;35:e62.
8. Chang H, Yu JY, Yoon SY, et al. Impact of COVID-19 pandemic on the overall diagnostic and therapeutic process for patients of emergency department and those with acute cerebrovascular disease. J Clin Med 2020;9:3842.
9. O’Reilly GM, Mitchell RD, Mitra B, et al. Impact of patient isolation on emergency department length of stay: a retrospective cohort study using the Registry for Emergency Care. Emerg Med Australas 2020;32:1034-9.
10. Kennedy M, MacBean CE, Brand C, Sundararajan V, McD Taylor D. Review article: leaving the emergency department without being seen. Emerg Med Australas 2008;20:306-13.
11. Li DR, Brennan JJ, Kreshak AA, Castillo EM, Vilke GM. Patients who leave the emergency department without being seen and their follow-up behavior: a retrospective descriptive analysis. J Emerg Med 2019;57:106-13.
12. Tropea J, Sundararajan V, Gorelik A, Kennedy M, Cameron P, Brand CA. Patients who leave without being seen in emergency departments: an analysis of predictive factors and outcomes. Acad Emerg Med 2012;19:439-47.
13. Rowe BH, Channan P, Bullard M, et al. Characteristics of patients who leave emergency departments without being seen. Acad Emerg Med 2006;13:848-52.
14. Song JY, Yun JG, Noh JY, Cheong HJ, Kim WJ. COVID-19 in South Korea: challenges of subclinical manifestations. N Engl J Med 2020;382:1858-9.
15. Korean Society of Infectious Diseases; Korean Society of Pediatric Infectious Diseases; Korean Society of Epidemiology; Korean Society for Antimicrobial Therapy; Korean Society for Healthcare-associated Infection Control and Prevention; Korea Centers for Disease Control and Prevention. Report on the epidemiological features of coronavirus disease 2019 (COVID-19) outbreak in the Republic of Korea from January 19 to March 2, 2020. J Korean Med Sci 2020;35:e112.
16. World Health Organization. Republic of Korea: WHO coronavirus disease (COVID-19) dashboard [Internet]. Geneva: World Health Organization [cited 2020 Oct 1]. Available from: https://covid19.who.int/region/wpro/country/kr.
17. Park SW, Sun K, Viboud C, Grenfell BT, Dushoff J. Potential role of social distancing in mitigating spread of coronavirus disease, South Korea. Emerg Infect Dis 2020;26:2697-700.
18. Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of coronavirus disease 2019 in China. N Engl J Med 2020;382:1708-20.
19. Kwon H, Kim YJ, Jo YH, et al. The Korean Triage and Acuity Scale: associations with admission, disposition, mortality and length of stay in the emergency department. Int J Qual Health Care 2019;31:449-55.
20. Armstrong BP, Clancy M, Simpson H. Making sense of vital signs. Emerg Med J 2008;25:790-1.
21. Kulstad EB, Hart KM, Waghchoure S. Occupancy rates and emergency department work index scores correlate with leaving without being seen. West J Emerg Med 2010;11:324-8.
22. García-Castrillo L, Petrino R, Leach R, et al. European Society for Emergency Medicine position paper on emergency medical systems’ response to COVID-19. Eur J Emerg Med 2020;27:174-7.
23. Jeffery MM, D’Onofrio G, Paek H, et al. Trends in emergency department visits and hospital admissions in health care systems in 5 states in the first months of the COVID-19 pandemic in the US. JAMA Intern Med 2020;180:1328-33.
24. Vaughan L. Where are the patients? The factors affecting the use of emergency care during COVID-19 [Internet]. London: Nuffield Trust; 2020 [cited 2020 Oct 1]. Available from: https://www.nuffieldtrust.org.uk/news-item/where-are-the-patients-the-factors-affecting-the-use-of-emergency-care-during-covid-19.

25. Hossain MM, Sultana A, Purohit N. Mental health outcomes of quarantine and isolation for infection prevention: a systematic umbrella review of the global evidence. Epidemiol Health 2020;42:e2020038.