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Screening Clinic for Coronavirus Disease 2019 to Prevent Intrahospital Spread in Daegu, Korea: a Single-Center Report

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ABSTRACT

There is still a paucity of studies on real-world outcome of screening clinic for hospital protection from coronavirus disease 2019 (COVID-19). As the number of COVID-19 cases was growing rapidly in Daegu, Korea, we started operating an active screening clinic outside the hospital premises. Over two weeks, 2,087 patients were screened using real-time reverse transcriptase polymerase chain reaction testing for severe acute respiratory syndrome coronavirus 2, with 42 confirmed cases. Before the screening clinic period, an average of 36 beds (maximum 67 beds) per day were closed due to unrecognized COVID-19 patients entering the hospital. In contrast, after the screening clinic operated well, only one event of closing emergency room (25 beds) occurred due to a confirmed COVID-19 case of asymptomatic patient. We report the operational process of screening clinic for COVID-19 and its effectiveness in maintaining the function of tertiary hospitals.

Keywords: Coronavirus Disease 2019; Severe Acute Respiratory Syndrome Coronavirus 2; Screening Clinic

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection causing coronavirus disease 2019 (COVID-19) was identified in December 2019.¹⁻³ On March 11, 2020, the World Health Organization declared COVID-19 as pandemic. In Korea, the first patient with COVID-19 was confirmed on January 20, 2020. One month later, number of cases surged due to a secretive religious organization in Daegu, which is the fourth largest city of Korea with 2.5 million residents. Majority of COVID-19 cases in Korea (64.1%; 6,830 patients) were identified in Daegu on April 17, 2020.⁴ Here, we report the operational process of screening clinic for COVID-19 and its effectiveness in maintaining the function of tertiary hospitals, by presenting the case of Keimyung University Dongsan Hospital.

When an undiagnosed COVID-19 patient visited or was admitted to a hospital, this led to the closure of some wards and emergency rooms (ERs) and to quarantine of health care workers (HCWs).⁵ With the surge of COVID-19 cases, visits from confirmed patients resulted in the simultaneous shut-down of four of the five university hospitals in Daegu during the

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Disclosure

The authors have no potential conflicts of interest to disclose.

Author Contributions

Conceptualization: Park SH, Kim Ha, Park JS. Data curation: Kwon YS, Park SH, Kim HJ, Lee JY, Hyun MR. Formal analysis: Kwon YS. Investigation: Kwon YS, Park SH. Writing - original draft: Kwon YS, Park SH, Park JS. Writing - review & editing: Park SH, Park JS.

period from February 19 to February 22, 2020. Since the loss of a hospital function may result in collapse of burdened health care system, it is important to protect nosocomial transmission of SARS-CoV-2. Although the Centers for Disease Control and Prevention (CDC) recommends healthcare facilities guidelines to prepare for COVID-19 patients,⁶ there is limited evidence and real-world application regarding patient and hospital protection from COVID-19.

During the first few weeks after the initial COVID-19 patient in Korea, we were only limiting visitors and were passively screening visitors for respiratory illness or contact history prior to entering the hospital. However, as the number of COVID-19 cases was growing rapidly in the community, we started operating an active screening clinic outside the hospital premises from February 24, 2020 (Fig 1). All patients and visitors were asked to complete a questionnaire survey, which included questions about exposure history and history of signs and symptoms associated with COVID-19 at the entrance of the hospital. People with any contact history or symptoms and signs were not allowed to enter into the hospital and were instead required to visit the outdoor screening clinic prior to entering the hospital. Detailed exposure history or symptoms and signs are described as follows.

People with a history of overseas travel within two weeks or those who had visited specific places where confirmed COVID-19 outbreak occurred were defined as contact with COVID-19

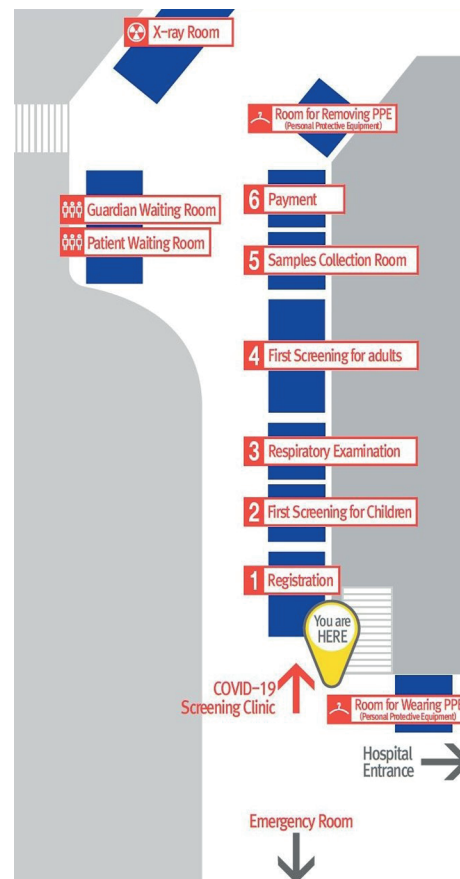


Fig. 1. Map of the active screening clinic outside the hospital premises for COVID-19. COVID-19 = coronavirus disease 2019.

patients. Those who had been in direct contact with COVID-19 patients were also defined as having contact. Furthermore, the contact history was further divided into familial contact and social contact groups, depending on whether they cohabited with confirmed cases or not. We suspected people to have COVID-19 if they had any of the following symptoms or signs: fever or reports of febrile sensation, coughing, sputum, rhinorrhea, sore throat, shortness of breath, myalgia, chest pain, diarrhea, or headache. People or visitors suspected of COVID-19 pneumonia had chest radiography taken and were initially managed at the screening clinic to minimize exposure to other people.

All eligible patients were screened for SARS-CoV-2 using real-time reverse transcriptase-polymerase chain reaction (RT-PCR) unless they refused. When the first patient suspected with COVID-19 patient visited our hospital, we took three specimens, including nasopharyngeal and oropharyngeal swabs and sputum, as recommended by the CDC.⁷ However, we only had two negative pressured examination rooms and it took around 2 hours to disinfect the rooms after the tests were performed. After the screening clinics were established, doctors wore personal protective equipment and performed nasopharyngeal swab tests within an isolated examination tent. Sputum tests could not be performed due to the risk of aerosol generation. With the screening clinics, we were able to perform over 300 tests per day for SARS-CoV-2 using RT-PCR. People with positive or indeterminate/unknown results from RT-PCR analysis were not allowed to enter the hospital. Even among those with negative RT-PCR results, patients with atypical pneumonia were treated in a negative pressure isolation room or at a screening clinic as per the physician's decision, whose specialty was either infectious diseases or pulmonology. Even all ER patients who completed the screening clinic procedures were required to be tested RT-PCR at least once for COVID-19 regardless of contact history and symptoms and signs prior to hospital admissions.

If a patient not considered as suspect for COVID-19 entered the clean area and was later diagnosed, the area where the patient stayed was closed and a contact investigation was conducted. Any HCWs who were in contact with the confirmed COVID-19 patient who were not wearing appropriate personal protective equipment at the time were classified as close contacts and were subjected to a two-week period of quarantine; a negative RT-PCR test for SARS-CoV-2 was required before the quarantine was lifted. The potentially contaminated areas were closed and surfaces were sterilized with a disinfectant according to hospital regulations. More than four-hours of ventilation was required prior to re-opening of the facility.

From March 2 to March 21, 2020, 2,146 patients visited the clinic for COVID-19 screening. No data were collected from the screening clinic during the first week (from February 24 to March 1, 2020) while the screening clinic was undergoing construction. Among these, 2,087 patients were tested for SARS-CoV-2 RT-PCR assay of a nasal swab specimen according to the CDC recommendations.⁷ Of the patients who underwent RT-PCR testing, 42 (42/2,087; 2.0%) were identified as being infected with SARS-CoV-2. The positive RT-PCR rates were 3.3% (19/577) in symptomatic patients with contact history, 0.9% (5/572) in asymptomatic patients with contact history, and 2.2% (17/772) in symptomatic patients without contact history. Among the symptomatic patients with contact history, those with familial contact and social contact had positive RT-PCR rates of 12.0% (6/50) and 2.5% (13/527), respectively. Although, there were 163 patients were asymptomatic without contact history, only one (0.6%) showed a positive RT-PCR result. In addition, three people showed indeterminate results and re-examination was considered. However, these patients were lost to follow-up.

During the study period (from March 2 to March 21, 2020), we identified 42 cases of confirmed COVID-19 and we were able to prevent these patients from entering the hospital. Before this period, an average of 36 beds (maximum 67 beds) per day were closed due to unrecognized COVID-19 patients entering the hospital. In contrast, from March 2 to March 21, 2020, only one event of closing ER (25 beds) occurred due to a confirmed COVID-19 case of asymptomatic patient. During the same period, number of patients in Daegu was in an increasing phase, and the cumulative number of patients exceeded 6,000, but the number of closed beds was minimal with the screening clinic (Fig. 2).

Prior to the outbreak of SARS-CoV-2, the Korea Centers for Disease Control and Prevention simultaneously identified patients and those who had been in contact with patients. However, thorough investigation of each contact became impossible as hundreds of cases were confirmed daily due to the spread of the epidemic. Therefore, patients with contact history and/or suspected symptoms and signs were encouraged to visit the screening clinic to exclude a diagnosis of COVID-19.

Among those who visited the screening clinic, those reporting symptomatic or exposure history were those with the highest rates of SARS-CoV-2 infection (19/577, 3.3%). Those reporting familial contacts showed higher positive rates with RT-PCR testing than those with social contact only (6/50 [12.0%] vs. 13/527 [2.5%], $P = 0.004$). However, it was difficult to obtain detailed information on contact history from many people during the rapidly increasing phase of COVID-19. We were unable to distinguish close contact patients among those with contact history. Therefore, familial contact was defined as contact with a COVID-19 patient who was a family member either the same household or an unrelated cohabitant. Social contact mostly included contact with a work colleague or friend. However, we were unable to determine whether there had been contact within 2 meters for a prolonged period according to CDC recommendation.⁸ In addition, 2.2% of symptomatic people without contact history were identified as COVID-19 patients when the endemic spread occurred.

We were able to maintain function of the tertiary hospital with active screening of patients with symptoms and signs or any contact history when the endemic spread occurred. Since the screening clinic operated well, the number of bed or ward closures was remarkably small. There was only one case when an asymptomatic patient without contact history was revealed as a COVID-19 patient when we performed RT-PCR test for all patients who visited ER and had plans for admission.

When the outbreak of COVID-19 occurred, it was important to develop ways to distinguish and separate COVID-19 and non-COVID-19 patients to ensure normal function of the tertiary hospital. Acute serious ill patients such as myocardial infarction, cerebral hemorrhage should not lose the opportunity to receive medical treatment due to closing the hospital by nosocomial spread. Planning and utilizing screening clinics based on health facilities' own environment are recommended to prevent nosocomial transmission, as seen from the presented screening clinic's effectiveness.

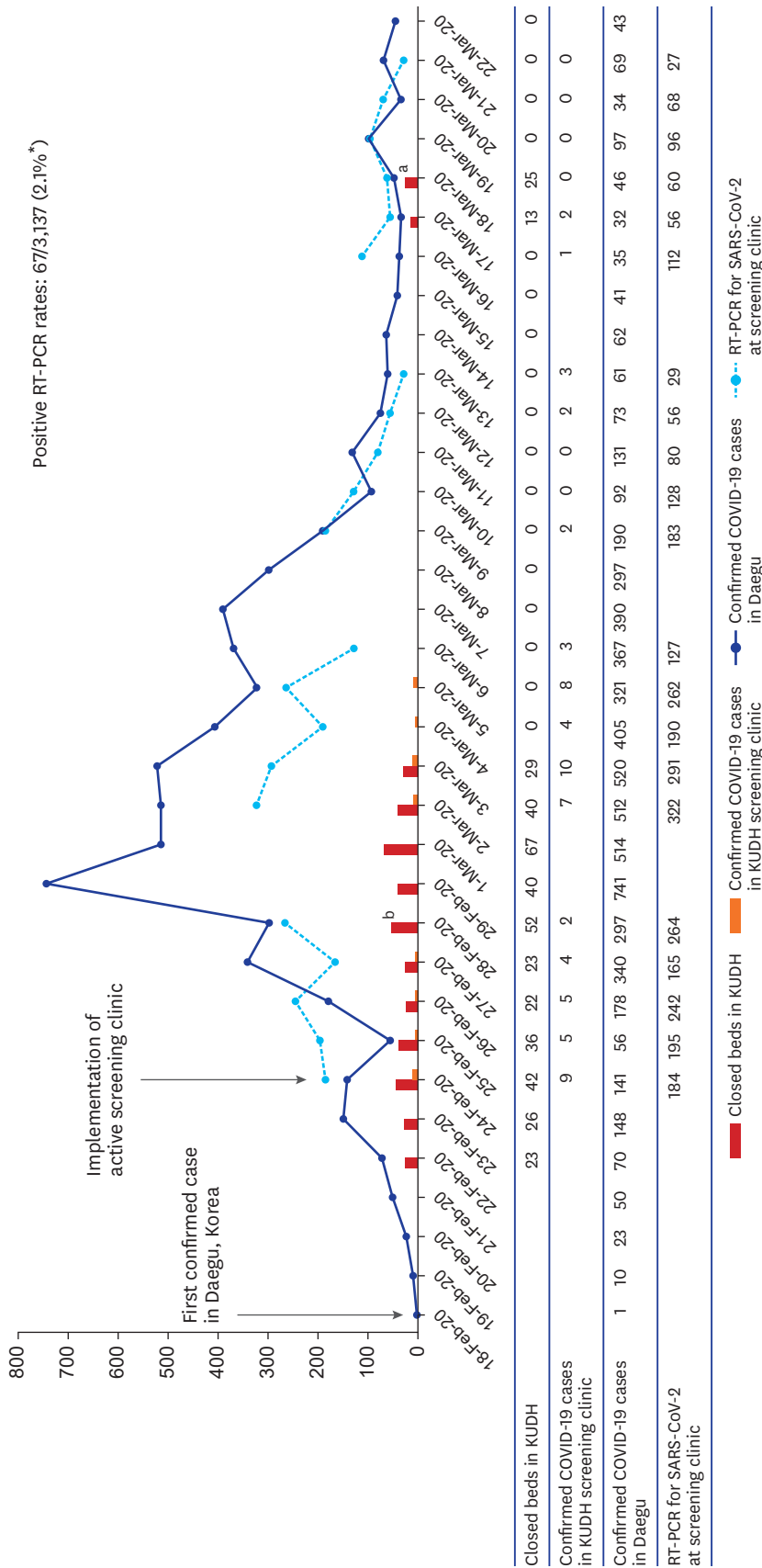


Fig. 2. Numbers of daily COVID-19 confirmed patients in Daegu, closed bed and RT-PCR assay for SARS-CoV2 at screening clinic in KUDH between 2/18/2020 and 3/23/2020. COVID-19 = coronavirus disease 2019, KUDH = Keimyung University Dongsan Hospital, RT-PCR = real-time reverse transcriptase polymerase chain reaction, SARS-CoV-2 = severe acute respiratory syndrome coronavirus 2.

^aAfter the screening clinic operated well, the number of bed closures was remarkably small.

^bThe screening clinic did not operate on the weekends; SARS-CoV-2 testing was not performed on these days.

*Although, detailed data from the screening clinic were not collected during the first week (from February 24 to March 1, 2020), the overall positive rate was 2.1% (67/3,137) during this period and the entire study period (from February 24 to May 21, 2020).

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