

# BMJ Open Protocol and clinical characteristics of patients under 'at-home care' for COVID-19 in South Korea: a retrospective cohort study

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## ABSTRACT

**Objective** As the number of patients with COVID-19 increased, at-home care was introduced for the first time in South Korea. This study aimed to analyse the characteristics and outcomes of patients who were treated under at-home care.

**Design, setting and participants** This retrospective cohort study targeted patients under at-home care for COVID-19 in Yeongdeungpo-gu in Seoul, Korea, from 18 October 2021 to 12 December 2021. The public health centre selected eligible patients for at-home care and registered with our institution. Nurses monitored patients, and doctors decided to transfer healthcare facilities and release the quarantined patients according to their symptoms.

**Outcome measures** Patient characteristics during the course of at-home care.

**Results** A total of 1422 patients were enrolled and 9574 patient-days were managed. Most patients were aged  $\geq 60$  years (22.7% (n=323)), and 82.8% did not have underlying conditions. The median length of care for patients was 8 days (IQR: 5–10 days). During the study period, 986 (69.3%) patients were released from quarantine, 82 (5.8%) patients were transferred to facilities and 354 (24.9%) patients were still under at-home care at the end of the study period. The most common cause of transfer was sustained fever (n=30; 36.6%), followed by dyspnoea and desaturation (n=17; 20.7%). Factors associated with transfer were diabetes (OR: 3.591, 95% CI 1.488 to 8.665, p=0.004), pregnancy (OR: 5.839, 95% CI 1.035 to 32.935, p=0.046) and being presymptomatic at diagnosis (OR: 4.015, 95% CI 1.559 to 10.337, p=0.004).

**Conclusions** There were no specific problems related to patient safety when operating at-home care. Patients with risk factors, such as diabetes, were more likely to be transferred to healthcare facilities. For safe at-home care, it is necessary to prepare for an appropriate response to the emergency.

## INTRODUCTION

SARS-CoV-2 was first discovered in Wuhan, China, in December 2019, and since the WHO announced the pandemic in March 2020, there have been approximately 290 million confirmed cases of COVID-19 worldwide, as of December 2021.<sup>1 2</sup> With the development

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This was the first study to introduce at-home care protocol for patients with COVID-19.
- ⇒ This was a single-centre retrospective cohort study.
- ⇒ This study depicted the early phase of at-home care for patients with COVID-19.

of vaccines, the number of confirmed cases in the USA and Europe seemed to be decreasing, but due to the easing of quarantine measures and the presentation of new variants, the number of confirmed cases skyrocketed again. There was no difference in the domestic situation. With the start of vaccination, the overall quarantine level was relieved. However, subsequently, a fourth epidemic occurred in Korea. In addition, emerging new variants have led to the updating of new confirmed cases daily.<sup>3</sup>

During each epidemic situation, the medical system faced a crisis, and it was accompanied by difficulties in allocating medical personnel, supplies and beds. During the initial epidemic, community treatment centres (CTC) for asymptomatic or mild patients were operated to fill the medical gap in Korea.<sup>4–6</sup> As the epidemic progressed, it became difficult to cope with the increasing number of patients with COVID-19 with CTCs alone. The occurrence of paediatric and psychological problems was another challenge for the CTC setting.<sup>7 8</sup>

As the COVID-19 pandemic protracted, the Korean government modified its policy for the management of critically ill patients with COVID-19. The domestic metropolitan area introduced at-home care as an alternative to a deficient medical system. This is the first home healthcare system for the management and monitoring of patients suffering from infectious diseases in Korea. To overcome the current COVID-19 pandemic and prepare

for a novel infectious disease, a well-established at-home care system is required. In this study, we aimed to introduce an at-home care protocol that is being implemented through our institution and analyse the characteristics and outcomes of patients under at-home care during the COVID-19 pandemic.

## MATERIALS AND METHODS

### Study design, setting and study population

This was a retrospective cohort study that used medical records. Kangnam Sacred Heart Hospital is a secondary university hospital with 572 beds located in Yeongdeungpo-gu, Seoul, South Korea. This institution provides internal medicine, surgery and paediatric intensive care units, as well as an emergency centre and outpatient department. This institution is responsible for treating patients mainly in the local constituency. Our institution signed an agreement with Yeongdeungpo-gu administration to become a provider of at-home medical care on 5 October 2021 and started operating as such on 18 October 2021. All patients under at-home care via Kangnam Sacred Heart Hospital between 18 October 2021 and 12 December 2021 were included in this study.

### Criteria for patient enrolment and release from quarantine

In Korea, COVID-19 was designated as a class 1 legal infectious disease, which required all confirmed patients to report to public health authorities and to be quarantined for a set period. The person in charge of the public health centre interviewed all patients with confirmed diagnoses of COVID-19 and determined whether at-home care was appropriate or if they required hospital admission. Patients who could be treated at home and who provided consent to public health centre were registered at our institution as at-home care patients.

On 26 November 2021, policies for the care of patients with COVID-19 were changed, as were the criteria for at-home care. Before this date, asymptomatic patients with confirmed COVID-19 and those with mild symptoms under 70 years of age with no risk of hospitalisation were eligible to receive at-home care. From 26 November 2021 onwards, all patients were eligible to receive at-home care and were admitted to healthcare facilities only if there was a need for hospitalisation.

### Enrolment criteria

Before 26 November 2021, the Korea Centers for Disease Control and Prevention classified patients with asymptomatic and mild symptoms under 70 years of age as candidates for at-home care, following consent, except in the presence of the following risk factors for hospitalisation: mental change after symptom onset of COVID-19, dyspnoea, uncontrolled fever with antipyretics, uncontrolled diabetes mellitus (DM), haemodialysis, patients treated for chronic lung disease, asthma, heart failure, coronary artery disease, patients under chemotherapy or immunosuppressant, uncontrolled symptomatic

psychiatric disease, bedridden states, obese (body mass index  $>30\text{ kg/m}^2$ ), pregnant women with symptoms, such as abdominal pain, labour, vaginal bleeding, childhood who was with a high risk of dyspnoea, cyanosis, chest depression, poor oral intake or dehydration, diagnosed with chronic lung disease/cardiac disease/metabolic disease/abnormal immune system, under immunosuppressant, respiratory function or excretion problem, or risk of aspiration. Among patients over 60 years of age, only those who had been vaccinated were registered for at-home care. Patients in need of care, such as minors and those with disabilities, were required to be accompanied by a caregiver.<sup>9</sup> The exclusion criteria were as follows: (1) those who lived in a residential environment vulnerable to infection due to difficulty in distancing or (2) when communication for non-face-to-face healthcare and quarantine management was difficult for the patient or caregiver.

From 26 November 2021, patients with a confirmed COVID-19 diagnosis were all allocated to at-home care, except in the following cases: (1) those who had the aforementioned risk factors for hospitalisation, (2) those who lived in a residential environment vulnerable to infection, (3) individuals who were minors, disabled or over the age of 70 years who required care but could not be quarantined together with a caregiver, and (4) those who were deemed ineligible for at-home care treatment by the local government head (eg, due to a legal problem, etc).<sup>10</sup>

### Criteria for release from quarantine

Symptomatic patients were released from quarantine 10 days after symptom onset.<sup>9</sup> Asymptomatic patients were released from quarantine 10 days after diagnosis. The quarantine date was extended depending on the occurrence of symptoms, and the final decision for release was made by the medical staff.

### Intervention

Kangnam Sacred Heart Hospital operated at-home care by targeting patients with COVID-19 residing in Yeongdeungpo-gu. The at-home care programme involved four medical doctors and five nurses in one monitoring room. They operated during the day and used an on-call system at night. One doctor was in charge per day, but a backup doctor was designated in case of an emergency. Nurses worked in two shifts, with two nurses during the daytime and evening and one during the night for the on-call system.

The Yeongdeungpo-gu public health centre classified patients with COVID-19 for at-home care according to the enrolment criteria and supplied items necessary for at-home care, such as antipyretics, an oxygen saturation monitor, a thermometer and phone numbers of related medical institutions. The patients to be managed were registered as outpatients with assigned doctors every day so that prescriptions were available if needed. The list of patients under at-home care was secured through the public health centre and updated daily.

The monitoring room was equipped with computers, monitors and smartphones. Patients checked their blood pressure and body temperature and uploaded the data via smartphone applications. Nurses called the patient at 09:00 and 17:00 daily to check the patient's vital signs and symptoms and update patient information on electronic health records. If the patient had symptoms and wanted to take medication, the doctor interviewed the patient and prescribed the medicine. The prescription was sent to the public health centre by fax. After prescribing the medicine at the pharmacy, the person in charge of the public health centre delivered the medicine to the patient's house. If the patient had persistent fever, desaturation or worsening clinical symptoms, the doctor interviewed the patient and decided whether to transfer the patient to another facility at the discretion of that doctor, such as a CTC or hospital, according to severity. The public health centre assigned an ambulance and medical institution and transported the patient accordingly.

The medical staff checked the list of patients who were subject to release from quarantine daily and assessed whether it was possible to release them from quarantine according to the criteria. When those under quarantine were released, at-home care and monitoring also ended. The results were then reported to the public health centre.

### Data collection and statistical analysis

Data regarding patient characteristics, such as age, sex, enrolment date, release from quarantine date, transfer date (if transferred), symptoms and medical prescription,

were collected through a retrospective medical record review.

Continuous variables are presented as mean±SD or median (IQR), as appropriate. Statistical significance was assessed using the  $\chi^2$  test and Fisher's exact test for categorical variables. Non-categorical variables were tested using the two-sided unpaired t-test or Mann-Whitney U test. The factors associated with transfer were calculated using a logistic regression model. Statistical significance was set at  $p < 0.05$ . All statistical analyses were performed using SPSS V.27 (IBM).

### Patient and public involvement

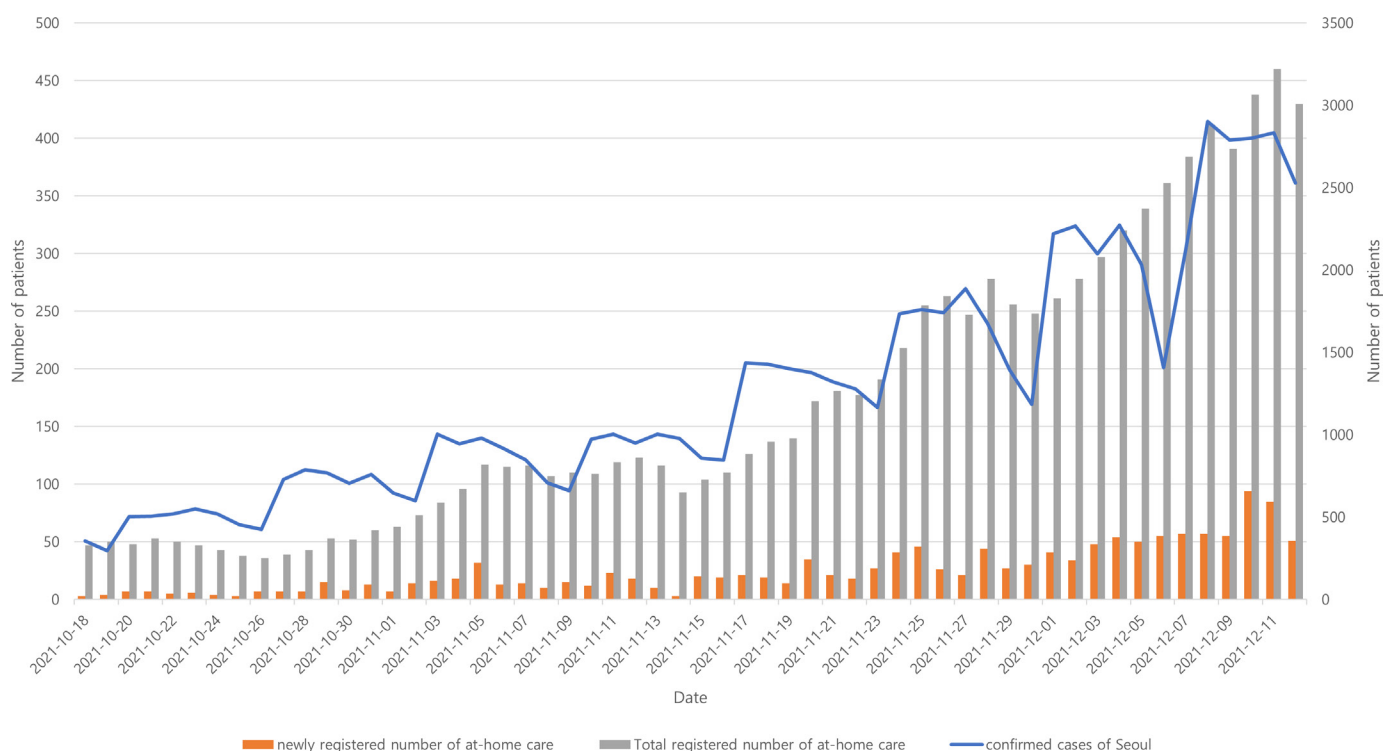
None.

## RESULTS

### Baseline characteristics of study population

During the study period, 1453 patients were registered. Three patients moved to another district, and 28 patients were excluded from at-home care on the day of admission due to other causes of admission, such as severe symptoms at diagnosis. Finally, a total of 1422 patients and 9574 patient-days were managed under at-home care at Kangnam Sacred Heart Hospital. The number of patients managed daily is shown in [figure 1](#).

Among the 1422 patients, 725 (51.0%) were male, and the median age was 40 (IQR: 27–58, range: 0–87) years ([table 1](#)). Most patients were over 60 years of age (22.7% (n=323)), followed by those in their 30s (18.5% (n=263)). Further, most patients (n=1177; 82.8%) did not have underlying conditions, and hypertension (n=153; 10.8%)



**Figure 1** Trends of number of patients with COVID-19 in this study and in Seoul, South Korea.

**Table 1** Baseline characteristics of patients under at-home care system (n=1422)

Characteristics	Total (n=1422) n (%)	Released from quarantine (n=986) n (%)	Transferred (n=82) n (%)	P value
Sex				0.873
Male	725 (51.0)	508 (51.5)	43 (52.4)	
Female	697 (49.0)	478 (48.5)	39 (47.6)	
Mean age, years (range)	40 (0–87)	40 (0–83)	45 (1–87)	0.051
0–9	156 (11.0)	109 (11.1)	3 (3.7)	
10–19	122 (8.6)	73 (7.4)	10 (12.2)	
20–29	151 (10.6)	112 (11.4)	8 (9.8)	
30–39	263 (18.5)	194 (19.7)	14 (17.1)	
40–49	186 (13.1)	120 (12.2)	11 (13.4)	
50–59	221 (15.5)	152 (15.4)	11 (13.4)	
≥60	323 (22.7)	225 (22.9)	25 (30.5)	
Underlying conditions				
Hypertension	153 (10.8)	99 (10.0)	15 (18.3)	0.020
Diabetes	43 (3.0)	28 (2.8)	7 (8.5)	0.005
Thyroid disease	22 (1.5)	17 (1.7)	0 (0)	0.231
Psychiatric disorder	12 (0.8)	10 (1.0)	1 (1.2)	0.860
Pregnancy	6 (0.4)	4 (0.4)	2 (2.4)	0.018
Others*	53 (3.7)	26 (2.6)	5 (6.1)	
None	1177 (82.8)	820 (83.2)	60 (73.2)	0.022
Symptoms				0.009
Asymptomatic	233 (16.4)	159 (16.1)	7 (8.5)	
Presymptomatic	160 (11.3)	89 (9.0)	15 (18.3)	
Symptomatic	1029 (72.4)	738 (74.8)	60 (73.2)	
Medicine prescription	176 (12.4)	117 (11.9)	21 (25.6)	0.020
Transfer to healthcare facilities	82 (5.8)			
Cumulative percentage of duration from symptom onset to transfer (%)				
3 days			18.3	
5 days			54.9	
7 days			74.4	
10 days			95.1	
14 days			100	
Median days from symptoms to diagnosis, days (IQR)	2 (1–4)	2 (1–4)	2 (1–3.75)	0.307
Median days from diagnosis to management, days (IQR)	1 (0–1)	1 (0–2)	0 (0–1)	<0.001
Median management days†, days (IQR)	8 (5–10)	8 (6–10)	3 (2–4.25)	<0.001

\*Epilepsy, autoimmune disease, liver disease, asthma, bronchiectasis, angina, cerebrovascular disease, ulcerative colitis.

†Released from quarantine and transferred patients, excluded under management.

was the most common comorbidity. Approximately 16.4% (n=233) of patients under at-home care were asymptomatic. There were 209 cases of drug prescriptions in 176 (12.4%) patients. On average, 3.7±3.73 (range: 0–16) prescriptions were requested per day. Symptoms for the prescribed drugs are described in table 2. The most common symptom was cough (n=115; 55.8%), followed

by sputum production (n=62; 30.1%) and sore throat (n=54; 26.2%). Night calls occurred in 68 cases which was an average of 1.2±1.64 (range: 0–6 cases) night calls per day.

The median length from symptoms to diagnosis was 2 days (IQR: 1–4 days), and 1 day (IQR: 0–1 day) from diagnosis to management. The median length of care for

**Table 2** Symptoms for prescription medication (n=209)

Symptoms*	n (%)
Cough	115 (55.8)
Sputum production	62 (30.1)
Sore throat	54 (26.2)
Nasal congestion	38 (18.4)
Rhinorrhoea	33 (16.0)
Fever	17 (8.3)
Headache	14 (6.8)
Myalgia	8 (3.9)
Conjunctivitis	7 (3.4)
Gastrointestinal symptoms	7 (3.4)
Other†	10 (4.9)

\*Allowed duplicates.  
†Sleep disorder, febrile sense, underlying disease.

patients was 8 days (IQR: 5–10 days). During the study period, 986 (69.3%) patients were released from quarantine, 82 (5.8%) patients were transferred to CTCs or hospitals and 354 (24.9%) patients were still under at-home care when the study period ended. No patients under at-home care died during the study period.

### Characteristics according to transfer

A total of 82 (5.8%) patients were transferred. Sex and age did not differ significantly according to the transfer (table 1). Among the transferred patients, 52.4% (n=43) were male, and patients over 60 years of age (n=25; 30.5%) were most frequently transferred. Patients with comorbidities were significantly more likely to be transferred than those who were released from quarantine (25.8% vs 16.8%, p=0.022). The proportion of patients with hypertension and DM was significantly higher among transferred patients (10.0% vs 18.3%, p=0.020; 2.8% vs 8.5%, p=0.005). The proportion of pregnant women was significantly higher among transferred patients (0.4% vs 2.4%, p=0.018). The median management duration of at-home care was 8 days (IQR: 6–10 days) for release from quarantine and 3 days (IQR: 2–4.25 days) for transferred patients.

The most common cause of transfer was sustained fever (n=30; 36.6%) (table 3). Seventeen patients (20.7%) were transferred because of dyspnoea, and their oxygen saturation was <90%. The time from symptom onset to transfer request was a median of 5 days (IQR: 4–8 days), and a median of 3 days (IQR: 2–5 days) was required from diagnosis to transfer request. Most transfers (n=61; 75.5%) were made on the same day as the transfer requests. For 21 (25.6%) patients, it took 1 day to allocate a bed after the request. One patient required 2 days and one patient required 3 days for transfer. All patients with dyspnoea were transferred on the same day.

**Table 3** Reasons for transfer (n=82)

Reasons	n (%)
Sustained fever	30 (36.6)
Dyspnoea/desaturation	17 (20.7)
Patients wanted	13 (15.9)
Cough/chest pain	9 (11.0)
Resident with family	5 (6.1)
Minor	4 (4.9)
Aggravation of underlying disease	2 (2.4)
As caregiver	1 (1.2)
Old age	1 (1.2)

### Risk factors for transfer

The factors associated with transfer are shown in table 4. In univariate analysis, age and sex were not significantly associated with transfer. The presence of underlying disease (OR: 1.811, 95% CI 1.081 to 3.035, p=0.024), hypertension (OR: 2.006, 95% CI 1.104 to 3.644, p=0.022), DM (OR: 3.193, 95% CI 1.350 to 7.553, p=0.008) and pregnancy (OR: 6.137, 95% CI 1.107 to 34.023, p=0.038) was significantly associated with transfer. On multivariate analysis, we found no significant association of age or sex with transfer. DM (OR: 3.591, 95% CI 1.488 to 8.665, p=0.004), pregnancy (OR: 5.839, 95% CI 1.035 to 32.935, p=0.046) and being presymptomatic (OR: 4.015, 95% CI 1.559 to 10.337, p=0.004) were independent risk factors for transfer.

### DISCUSSION

Despite the increase in vaccination against COVID-19, the number of confirmed cases worldwide has been increasing due to the easing of quarantine measures, waning vaccination immunity and the emergence of new SARS-CoV-2 variants.<sup>1</sup> Because of the limitations of medical manpower and resources, such as hospital beds, at-home care was introduced in Korea. As this system was introduced for the first time in Korea, we aimed to explain the initial operating protocol and results.

In Korea, since the first COVID-19 outbreak in Daegu in 2020, CTCs have been operating in the face of the COVID-19 epidemic. Some facilities, such as dormitories and hotels, were converted to quarantine units for patients with COVID-19, and a monitoring system for patients with stationed medical staff was established. This system was flexibly operated according to trends in the number of confirmed cases. To operate a CTC, it is necessary to provide a space for both quarantining patients and working medical staff. To prepare such facilities, a certain period was required, and after the increase in the number of confirmed cases, there were difficulties in arranging space and medical staff. This could be managed in the case of a short-term epidemic, but as the epidemic became longer and the number of confirmed cases increased, like during the fourth epidemic in Korea, there was a limit

**Table 4** Factors associated with transfer

Variables	Univariate analysis			Multivariate analysis		
	OR	95% CI	P value	OR	95% CI	P value
Female sex	0.964	0.614 to 1.513	0.873	0.742	0.579 to 1.476	0.742
Age (years)						
0–9	0.385	0.100 to 1.491	0.167	0.439	0.112 to 1.723	0.238
10–19	1.918	0.723 to 5.086	0.191	2.169	0.804 to 5.849	0.126
20–29	Reference		Reference	Reference		Reference
30–39	0.982	0.411 to 2.483	0.982	0.957	0.384 to 2.386	0.924
40–49	0.605	0.498 to 3.306	0.605	1.371	0.523 to 3.596	0.521
50–59	0.978	0.395 to 2.601	0.978	0.961	0.360 to 2.566	0.937
>60	0.300	0.677 to 3.544	0.300	1.346	0.547 to 3.315	0.518
Underlying disease	1.811	1.081 to 3.035	0.024	0.662	0.219 to 1.999	0.465
Hypertension	2.006	1.104 to 3.644	0.022	2.106	0.682 to 10.208	0.196
Diabetes mellitus	3.193	1.350 to 7.553	0.008	3.591	1.488 to 8.665	0.004
Pregnancy	6.137	1.107 to 34.023	0.038	5.839	1.035 to 32.935	0.046
Symptoms						
Asymptomatic	Reference		Reference	Reference		Reference
Presymptomatic	3.828	1.505 to 9.741	0.005	4.015	1.559 to 10.337	0.004
Symptomatic	1.847	0.829 to 4.115	0.134	1.983	0.880 to 4.469	0.099

to the management through CTCs. The medical system was saturated due to the number of confirmed cases and the increase in the number of patients with severe cases; therefore, the government of the Republic of Korea changed the policy for the management of severely ill patients. As a result, at-home care was introduced in Korea. Before the fourth epidemic, some local governments operated at-home care by a public health centre for certain patients, such as children and their parents, or patients who were healthy and young. As the fourth epidemic began, at-home care expanded its target to all over the country and was managed by hospitals from October 2021.

With the COVID-19 pandemic, some countries, including the USA, quarantined asymptomatic or mild patients in their homes without hospitalisation.<sup>11–14</sup> At-home care in Korea was a system that monitored patients twice a day over the phone. Procurement of necessary supplies and transfer systems were established and managed. Through this system, some solutions have been suggested for medical problems that could be missed due to simple home quarantine alone.

Entering quarantine facilities, such as a CTC, due to COVID-19 could cause psychological problems. Approximately 30% of patients admitted to a CTC presented with psychological problems due to quarantine in an unfamiliar environment.<sup>8</sup> In particular, when considering psychological factors and diagnosis time after symptom onset in paediatric patients, which might be after the transmission period had passed, quarantine in a CTC or hospital was somewhat disadvantageous.<sup>7</sup> At-home care compensated for the psychological disadvantages of

CTCs by maintaining quarantine in a familiar environment, especially with family.

Respiratory symptoms, such as cough, sputum production, sore throat, fever and anosmia, were symptoms of COVID-19.<sup>4 5 15</sup> In the present study, cough was the most common symptom for which medicines were prescribed. Most prescribed medicines were for respiratory symptoms, but there were also cases of digestive symptoms, conjunctivitis or sleep disorder. As the COVID-19 epidemic persisted and many patients were treated under at-home care, strategic preparedness was required so that medicines for respiratory symptoms and other possible symptoms could be smoothly supplied to patients. In some cases, patients ran out of medications that were being taken in cases of underlying conditions. This indicated that, during the quarantine period, there may be a need for an alternative to the prescription of medicines for underlying conditions, such as hypertension.

Elderly patients and pregnant women have a high risk of acute exacerbation and severity.<sup>16–18</sup> Comorbidities, such as hypertension and DM, were other risk factors for disease aggravation in patients with COVID-19.<sup>18</sup> In the present study, DM and pregnancy were risk factors for transfer, along with presymptomatic status. Although age was not significantly associated with transfer, 30.5% of transferred patients were older than 60 years. At-home care patients with underlying conditions or old age required more thorough management with caution.

In the present study, 5.8% of patients were transferred to CTCs or hospitals. In a previous study of CTCs that treated asymptomatic or mild patients with COVID-19, the transfer rate ranged from 0.7% to 10.3%.<sup>4 6 19 20</sup>

Patients transferred for worsening of symptoms requested a transfer at a median of 5 days after symptom onset and a median of 3 days from diagnosis. The duration from diagnosis to transfer was different on comparison with a previous study reporting a median of 3.5–11 days.<sup>4 6 15 19</sup> This duration was shorter in the present study because all patients with COVID-19 were under at-home care as a basic treatment, and the proportion of patients who wished to be transferred to a CTC or hospital and that of patients who faced difficulties in self-quarantine was as high as 15.9% and 6.1%, respectively. Patients were transferred quickly after diagnosis. In approximately 55% of cases in this study, transfer requests were made within 5 days of symptom onset. However, in the remaining 45%, symptoms worsened 6 days after symptom onset. Some studies reported that symptoms were aggravated between 4 and 14 days after symptom onset.<sup>21 22</sup> As COVID-19 epidemic prolonged, the monitoring period of at-home care was changed from 10 to 7 days, and the remaining 3 days were either monitored or not depending on symptoms. Patients with risk factors were monitored thoroughly, as there were some patients who needed to be transferred to a CTC or hospital even at the end of monitoring.

This system was not a monitoring and treatment system that checks a patient in real time. The worsening of symptoms may have been missed. This risk was even greater in patients who received at-home care alone. In addition, if the patient did not feel any symptoms even when the condition worsened, the patient might have been left unattended. Difficulty in responding to emergent situations was another problem. Since the patient was not treated in the same space as medical personnel, it took time to directly contact the medical personnel, even if the symptoms were monitored. In addition, after confirming the transfer, it took time to assign and implement emergency measures. Unlike in a CTC, if a transfer was delayed, proper medical measures, such as oxygen supply, were also delayed, which could prove to be fatal to patients. Therefore, there is a need for a system that secures and uses an ambulance and an available emergency bed for at-home care patients in advance.

Currently, in a situation where the number of patients with COVID-19 has skyrocketed and the basic treatment policy has been switched to at-home care, the number of patients receiving at-home care is continuously increasing. Because at-home care was a system in which medical staff directly interviewed patients twice a day over the phone, medical personnel were needed for this. Administrative personnel were also required to allocate patients, deliver supplies and deliver drugs through prescriptions. In the beginning of the COVID-19 epidemic, patient management with the help of assigned medical personnel was possible, but as the number of patients increased, management by the existing staff became difficult. This may lead to future difficulties in identifying patients and responding to patients. In preparing for the continuing epidemic, measures should be taken on how to procure the required manpower.

This study had some limitations. First, this was a single-centre study. As at-home care has been expanded to cover the entire nation and all patients confirmed to have COVID-19, it is necessary to analyse additional data of the results of at-home care. Second, this study analysed the results of the early phase of at-home care, which was a point in time when the setting was not completely established. Thus, additional system supplementation is required.

## CONCLUSION

Due to the increase in the number of confirmed cases beyond those that medical facilities could handle, at-home care was an unavoidable option. Patients with risk factors, such as DM, were more likely to be transferred to health-care facilities. For safe at-home care, it is necessary to prepare for an appropriate response to the emergency.

**Contributors** YBS conceptualised and edited the manuscript. JJP contributed to data curation, data analysis and manuscript writing. JL, SHN and YKC contributed to acquisition of data. All authors have read and approved the submission. YBS acts as a guarantor for the manuscript.

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**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not required.

**Ethics approval** The study was approved by the Institutional Review Board (IRB) of Kangnam Sacred Heart Hospital (IRB No: 2021-11-035-001), and the requirement for informed consent was waived.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available upon reasonable request. No data are available.

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