



Successful provision of hemodialysis to patients with confirmed COVID-19 in Korea: the role of a cooperative network between public and private medical systems

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Background

Since the outbreak of coronavirus disease 2019 (COVID-19) in February 2020, hospitalizations and deaths have increased in end-stage kidney disease (ESKD) patients in Korea. The first cases of infection with severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) variant B.1.1.529 (omicron), which had replaced delta as the dominant variant, were reported in December 2021 in Korea [1]. Although the vaccination rate in ESKD patients was higher than in the general population (>61.4% vs. 36.0% as of December 31, 2021), due to the efforts of the Korean Society of Nephrology (KSN) for priority distribution of vaccines [2,3], the higher transmissibility of the omicron variant remained a threat to ESKD patients, who must undergo hemodialysis (HD) in a confined space.

According to the Korean clinical practice guidelines for preventing transmission of COVID-19 in HD facilities, a patient with confirmed COVID-19 should be transferred to

a healthcare facility with an isolation room and a portable dialysis machine. In addition, a management plan including transportation should be established in consultation with the public health center and infection control division of the hospital [4]. However, with the exponential increase in the number of patients with confirmed COVID-19, the workload of public health centers has reached its limit across Korea. In fact, in Daegu Metropolitan City, the daily number of confirmed cases of SARS-CoV-2 infection increased from 125 cases on January 1, 2022, to 1,256 cases on February 3, 2022, and peaked at 24,115 cases on March 16, 2022 [5].

Establishment of a public-private cooperative network for confirmed COVID-19 in patients undergoing hemodialysis

Overloaded working conditions in public health centers have resulted in delayed connections or transfers of pa-

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tients to receive HD in isolation. Since the medical resources and situations at each hospital are different, it was not easy to establish a common and consistent public-private cooperative system.

Thus, HD-specialist members of the KSN in the Daegu-Gyeongbuk provinces established a public-private cooperation network with health policy managers from Public Health Department in Daegu Metropolitan City to ensure that patients undergoing HD could be promptly transferred to facilities with the capacity to provide HD in isolation (Fig. 1). First, they designated dedicated medical institutions to serve as inpatient as well as outpatient isolated HD facilities. Patients who showed impaired consciousness or dyspnea and maintained a fever of 38.0°C or higher for more than three days that was not controlled by antipyretics were indicated for hospitalization according to the COVID-19 response guidelines [6,7]. Second, they secured HD specialists and expanded isolation beds, including intensive care units for admitted severe dialysis patients. Third, they

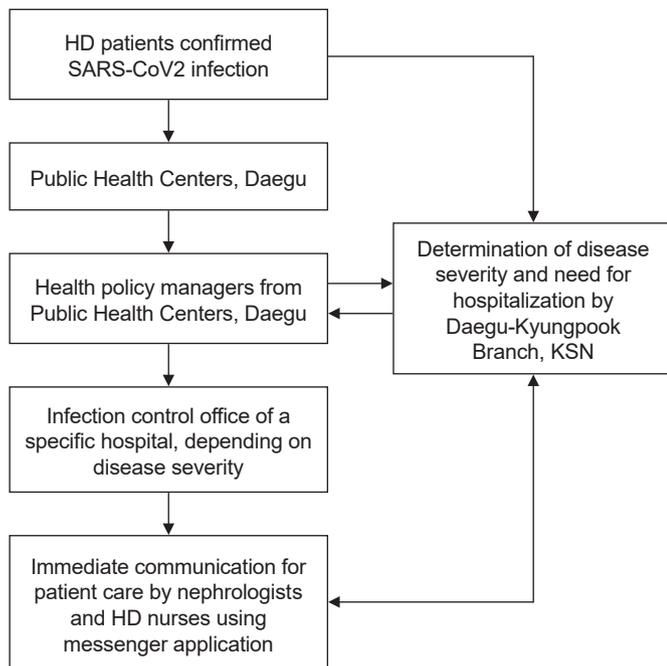


Figure 1. A flow diagram of the public-private cooperative network and communication system for the treatment of COVID-19 patients on HD.

COVID-19, coronavirus disease 2019; HD, hemodialysis; KSN, Korean Society of Nephrology; SARS-CoV-2, severe acute respiratory syndrome-coronavirus-2.

shared information with an established real-time hotline connecting HD units. If a patient who had been cared for in a private HD unit was confirmed to have COVID-19, the HD specialist in charge of the patient sent a message to the real-time hotline that included the patient's age, sex, date of COVID-19 diagnosis, last dialysis date, basic dialysis information, vital signs, symptoms, availability for outpatient dialysis, and whether or not oxygen was used. Then, the health policy managers in Daegu Metropolitan City checked the messages, monitored available beds for inpatients or outpatients, and matched the COVID-19 patient to an appropriate institution to receive isolated HD. Patients with high fever or who required oxygen were mainly admitted to Kyungpook National University Chilgok Hospital or Kyungpook National University Hospital. Patients who showed no or only mild symptoms (such as rhinorrhea and a sore throat) received isolated outpatient HD at Keimyung University Daegu Dongsan Hospital, from which they were transported using their own car or a quarantine taxi provided by Daegu Metropolitan City. If a patient who received outpatient HD developed aggravated symptoms or showed a poor general condition, they could also be admitted to an isolated bed through the hotline. Due to the established real-time hotline, the patients and dialysis specialists in private HD units no longer had to struggle to personally find isolated HD facilities. In addition, this connection system between the community of HD specialists and public health managers opened a path for HD patients to receive dialysis in a timely and safe manner, as well as to overcome staff work overloads at public health centers and medical dialysis institutions.

Patient outcomes

Among 641,322 patients in Daegu, Korea, who were newly diagnosed with COVID-19 from January 1 to April 18, 2022, 862 were on maintenance dialysis (Fig. 2). Of these, seven patients were on peritoneal dialysis. Among 852 total COVID-19 patients on HD, 425 were classified into the at-home treatment group and underwent outpatient HD; the remaining 420 patients were hospitalized and received inpatient HD. The mean age was 63.7 ± 13.8 years, and 60.2% were male. The average age of the inpatient HD group was older than that of the outpatient HD group (66.8 ± 13.7 years vs. 60.9 ± 13.3 years). In the outpatient group, 16 pa-

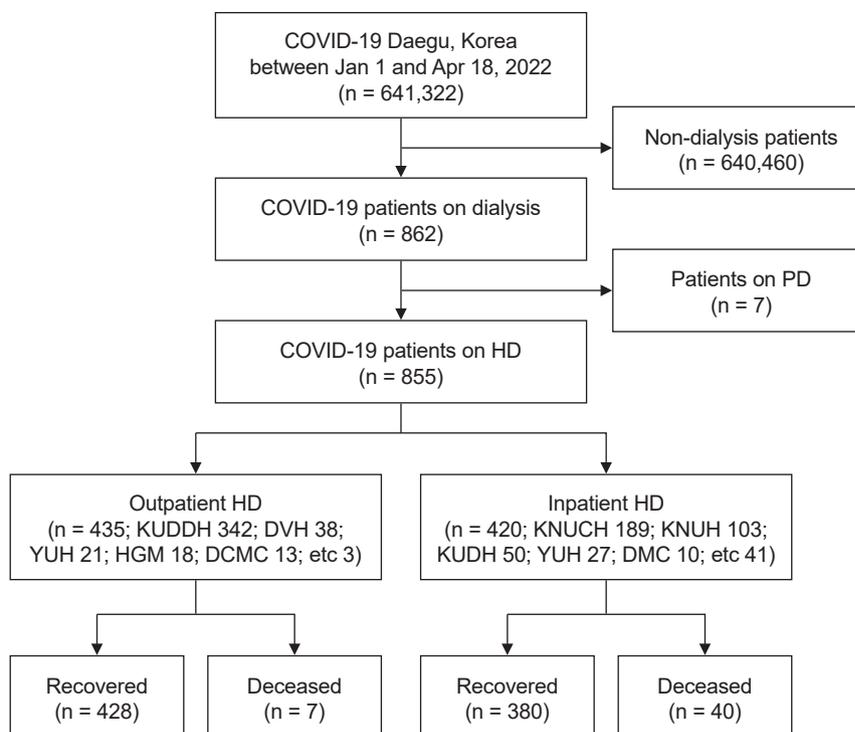


Figure 2. The incidence and outcomes of COVID-19 patients on HD in Daegu during the period of omicron variant dominance. COVID-19, coronavirus disease 2019; DCMC, Daegu Catholic Medical Center; DMC, Daegu Medical Center.; DVH, Daegu Veterans' Hospital; HD, hemodialysis; HGM, Han Garam Medicine; KNUCH, Kyungpook National University Chilgok Hospital; KNUH, Kyungpook National University Hospital; KUDDH, Keimyung University Daegu Dongsan Hospital; KUDH, Keimyung University Dongsan Hospital; PD, peritoneal dialysis; YUH, Yeungnam University Hospital.

tients (3.7%) were hospitalized due to a worsening clinical course. Finally, 428 patients (98.4%) recovered, and seven patients (1.6%) died. Among the inpatient group, a total of 380 patients (90.5%) recovered, while 40 patients (9.5%) died.

Summary

In the event of an outbreak of an infectious disease, fast and clear communication among a unit's healthcare personnel at primary, secondary, and tertiary medical institutions; the medical director of the city's public health department; and the national quarantine system is vital in managing patients and preventing the transmission of infections, especially for HD patients who require regular visits to medical institutions for dialysis. This establishment of a real-time network for medical delivery was centered on HD specialists, who play an important role in responding to crises of infectious diseases, such as COVID-19.

Conflicts of interest

All authors have no conflicts of interest to declare.

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Data sharing statement

The data presented in this study are available on request from the corresponding author.

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Authors' contributions

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