

Expanding Medical Surge Capacity to Counteract COVID-19: South Korea's Medical Fee Adjustment Through the National Health Insurance System

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Background: South Korea has utilized its National Health Insurance (NHI) system to adjust the medical fees payable for healthcare services, to financially support the frontline healthcare providers combating COVID-19. This study evaluated the composition of such adjustments to the medical fees—made to secure resource surge capacity against the pandemic—in South Korea.

Methods: Descriptive statistics and schematization were employed to analyze 3,612,640 COVID-19-related NHI claims from January 1, 2020, to June 30, 2021. COVID-19 suspected and confirmed cases were evaluated based on the proportion of fees adjustment, classified into space, staff, or stuff (3S) using diagnosis codes. The proportion of fees adjustment was investigated in terms of the healthcare expenditure, number of patients, and number of healthcare services covered.

Findings: First, in terms of cost, medical fee adjustments covered over 96% of the total costs arising from the increased demand for testing (stuff) and isolated spaces among patients suspected of having COVID-19. Second, medical fees were adjusted to cover over 80% of the cost attributable to COVID-19 confirmed cases, in relation to isolated spaces and medical staff support. Third, the adjustment of less than 10% of the various types of medical fees, if selected strategically, can effectively induce a surge in resource capacity.

Interpretation: South Korea has improved its existing surge capacity by adjusting the medical fees payable through NHI to healthcare providers. Particularly, through the provider payment system of fee-for-service, the Korean government could prevent the spread of infection and protect the medical staff assigned to respond to COVID-19. However, additional studies on alternative payment systems are needed to control costs while maintaining an effective pandemic response system in the face of the prolonged COVID-19 outbreak.

Keywords: COVID-19, resource capacity, medical fees, national health insurance, fee-for-service, provider payment systems

Introduction

Fresh cases of coronavirus disease 2019 (COVID-19) infections continue to be reported worldwide even as of 2022. A lesson learned from observing the spread of the pandemic in major countries such as the United States, the United Kingdom, and Italy^{1–3} is that healthcare systems are considerably burdened by such public health emergencies and they may even collapse if left unaddressed. Many countries have developed a variety of COVID-19 response strategies. The success of these strategies is determined by the degree to which the existing healthcare system can be restructured,

managed, and financed.⁴ It is particularly crucial to provide financial support and create a responsive environment for frontline healthcare providers responding to COVID-19.⁵

The South Korean (hereafter, Korean) government has been compensating healthcare providers for pandemic-related income loss using general taxes and has been providing financial support through the National Health Insurance (NHI) fund. The Korean government has also set up a supplementary budget to compensate for the losses incurred by medical institutions due to COVID-19. Simultaneously, using the NHI fund, it has implemented a health insurance advance payment system for medical institutions in need of emergency funds, under which the payment is made first, followed by post-payment, or an infection control subsidy is actively passed on to medical institutions treating COVID-19 patients.^{6,7} In addition to adjusting the medical fee payable to healthcare providers, the Korean government has tried to reflect the actual demand for medical services by patients with COVID-19 through co-payment support.

Such financial support for healthcare providers in Korea was made possible through an improvement in the fee-for-service (FFS) program—the primary payment system in the country, under which healthcare providers are reimbursed based on a predetermined fee per service.⁸ Nonetheless, this payment system should be further improved, to quickly respond to the growing healthcare demands within the NHI.

Although Korea did not adjust the existing payment system in response to COVID-19, some countries either modified their provider payment mechanism or introduced a new payment system to aggressively respond to the pandemic.⁹ Given the healthcare crisis caused by COVID-19, the opportunities and limitations presented by payment systems have become a global issue.¹⁰ Particularly, payment systems have influenced the role of healthcare providers during the pandemic, determining their motivations as well as health outcomes.¹¹

Meanwhile, the World Health Organization (WHO) recommends strengthening the “dual track health system”, to maintain a balance in the healthcare services provided during a pandemic.^{4,5} The “dual track” refers to a healthcare system that balances between providing COVID-19-related healthcare services (Track 1) and returning to previous healthcare services (Track 2). Thus, it accounts for not only the prevention, diagnosis, isolation, and treatment of COVID-19 infections, but also the healthcare demands of all other patients.⁴

COVID-19 has disrupted healthcare systems’ preparedness due to (1) an increase in the number of patients, (2) an increase in the number of acute patients, (3) demands for special care, and (4) a decrease in resources. Accordingly, healthcare institutions should consider increasing their surge capacity with respect to space, staff, stuff, and systems (4S) to manage the growing healthcare demands.^{12–14} Surge capacity is the ability of a healthcare system to manage a sudden and unexpected influx of patients during a disaster or emergency.¹⁵

The motivation of healthcare providers, who are frontline responders to COVID-19, is a crucial issue in improving the healthcare system’s surge capacity. Hence, financing—the key input in a healthcare system—should be used to motivate healthcare providers to become more actively involved in the crisis response.^{16,17} Some countries, including Korea, have aggressively utilized social health insurance (SHI) or NHI by employing various financing sources. The roles of SHI during a pandemic are to increase the sustainability and resilience of the healthcare system by managing the current crisis while simultaneously preparing for future ones.^{18,19} Although global discussions on COVID-19 and modifications of payment systems have begun, very few quantitative studies have been conducted to examine financial coverage.^{9,10,20}

Thus, this study aimed to evaluate Korea’s response to the COVID-19 pandemic through the national health insurance in terms of securing the surge capacity of its resources: space, staff, stuff.

Materials and Methods

Design, Setting, and Population

The fees for most of the inpatient and outpatient healthcare services in Korea are reimbursed by the NHI based on FFS. Specifically, 93% of all healthcare expenses are paid through FFS and 7% via bundled payments.²¹ The FFS pays healthcare providers a fixed fee for each covered healthcare service. It is based on a fee schedule listing predetermined rates for each medical service code. In this study, coded data were created through matching, for quantitative analysis. Specifically, a coded dataset was constructed by combining the FFS codes in the Manual for COVID-19 Health Insurance

Fee Schedule with the master file for healthcare services within the Health Insurance Review & Assessment (HIRA) Database of the Criteria for Medical Care Benefits.

This study used three data sources: the HIRA database of claims made by health institutions, pharmacies, and public health centers; the Manual for COVID-19 Health Insurance Fee Schedule; and the HIRA Database of the Criteria for Medical Care Benefits. Korea has a universal healthcare coverage system and is, thus, a representative country with an NHI system. All citizens except for those from low-income backgrounds are enrolled in the NHI, and healthcare institutions cannot deny treatment to NHI patients.²² Consequently, HIRA collects and manages all data regarding Koreans' healthcare use, including consultations, tests, treatments, and surgeries. In this study, information on COVID-19-related healthcare expenditures was selectively extracted by specifying the type of national disaster relief support as "novel coronavirus disease."²³ COVID-19 healthcare expenditures included costs of inpatient and outpatient healthcare services provided for all COVID-19 patients, which were calculated based on the billing statements of NHI and Medical Aid patients.

To design the research framework, we reviewed the literature as well as the type of NHI claims in Korea. The results are summarized in Figure 1 and Table 1. Ever since the first COVID-19 case was reported, healthcare demands have been rising, and the COVID-19 curve has increased correspondingly. The main domain (ie, the COVID-19 curve) can be differentiated into COVID-19 suspected and confirmed cases. The COVID-19 curve depicts the healthcare demands of COVID-19 confirmed patients, patients under investigation, suspected patients, and patients with respiratory disease. It also shows the NHI's payments for patients who used inpatient or outpatient services in healthcare institutions.

The subdomains include space, staff, and stuff (3S), and they confirm the increased demand for healthcare resources since the outbreak of COVID-19. In response to the pandemic, the Korean government adjusted medical fees, to manage healthcare demands and improve resource capacity. In this study, the status of healthcare expenditures, number of patients, and number of healthcare services were analyzed according to the government's adjustment of medical fees. The healthcare services offered under the main domain and each of the subdomains were examined for each category.

Under the main domain, "COVID-19 suspected cases" refers to the healthcare services provided in relation to diagnosis, prevention, and treatment, for COVID-19 patients under investigation, suspected patients, and patients with respiratory diseases. "COVID-19 confirmed cases" refers to the healthcare services rendered for diagnosis, prevention, and treatment in COVID-19 confirmed patients (Table 1). Non-COVID-19 patients without respiratory symptoms were excluded from this study.

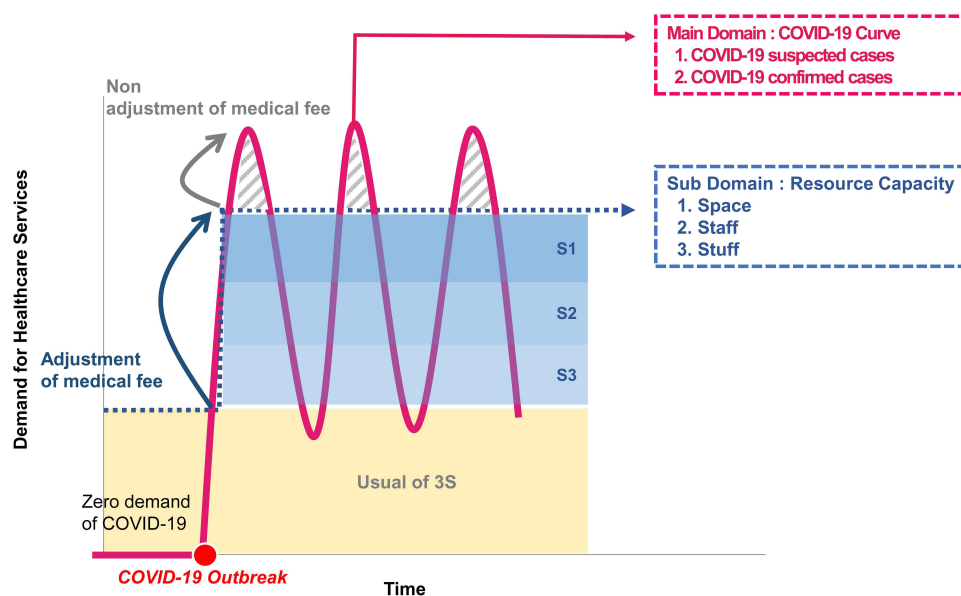


Figure 1 Research framework.

Table 1 Contents of Research Domains

Domain	Type	Contents
Main domain (COVID-19 Curve)	COVID-19 suspected cases	<ul style="list-style-type: none"> • Medical services such as diagnosis, prevention, and treatment for COVID-19 patients under investigation, suspected patients, and those with respiratory diseases.
	COVID-19 confirmed cases	<ul style="list-style-type: none"> • Medical services such as diagnosis, prevention, and treatment for COVID-19 confirmed patients.
Subdomain (Resource Capacity)	Space	<ul style="list-style-type: none"> • Medical services such as basic management and physical spaces for inpatients. <ul style="list-style-type: none"> ○ Admission ○ Meals for inpatients
	Staff	<ul style="list-style-type: none"> • Medical services such as consultation, treatment, and surgery performed directly by medical staff. <ul style="list-style-type: none"> ○ Consultation ○ Treatment and Surgery ○ Physiotherapy and Psychotherapy
	Stuff	<ul style="list-style-type: none"> • Medical service providing injections and managing materials such as medical equipment, treatment materials, and pharmaceuticals. <ul style="list-style-type: none"> ○ Tests ○ Radiology and radiotherapy ○ Medication ○ Injection ○ Anesthesia

With regard to the subdomains, “space” refers to physical spaces and inpatient healthcare services for basic patient management, including meals and admission fees. “Staff” refers to not only the healthcare services performed by medical staff, such as examination, treatment, surgery, consultation, physiotherapy, and psychotherapy but also their associated costs. “Stuff” refers to healthcare services for managing materials such as medical equipment, treatment materials, and pharmaceuticals and their administration. Fees for testing, radiology and radiotherapy, medication, injection, and anesthesia were included under this category.

Data Collection

The final data for analysis were collated in three steps. The unit of analysis was the healthcare service code (Figure 2). The study period was January 1, 2020 to June 30, 2021. We initially extracted 3,629,108 COVID-19-related billing statements filed at the HIRA (number of patients: 2,792,613; healthcare expenses: 885.4 billion KRW). The final data analysis included 3,612,640 billing statements filed by tertiary hospitals, general hospitals, clinics, and health centers for inpatient and outpatient treatments (number of patients: 2,786,004; healthcare expenses: 854.9 billion KRW; number of healthcare services rendered: 3023).

In step one, the main domain was classified using patient diagnosis codes. Cases in which the first main diagnosis or sub-diagnosis was coded with “B342”, “B972”, “U181”, or “U071” were categorized under “COVID-19 confirmed cases”, and all other cases were categorized under “COVID-19 suspected cases.” In step two, data were classified as space, staff, or stuff as per billing item type. In step three, data were classified based on whether there was a medical fee adjustment. Thus, in the final dataset, cases in which the government (1) expanded the medical insurance cover criteria, (2) increased the medical fee per unit (service), or (3) created new medical fee items to adjust the medical fee for COVID-19 were coded “Y”, and all other cases were coded “N.”.

Statistical Analysis

Data were analyzed using descriptive statistics with SAS 9.4 (SAS Institute, Cary, NC, USA), focusing on the following areas:

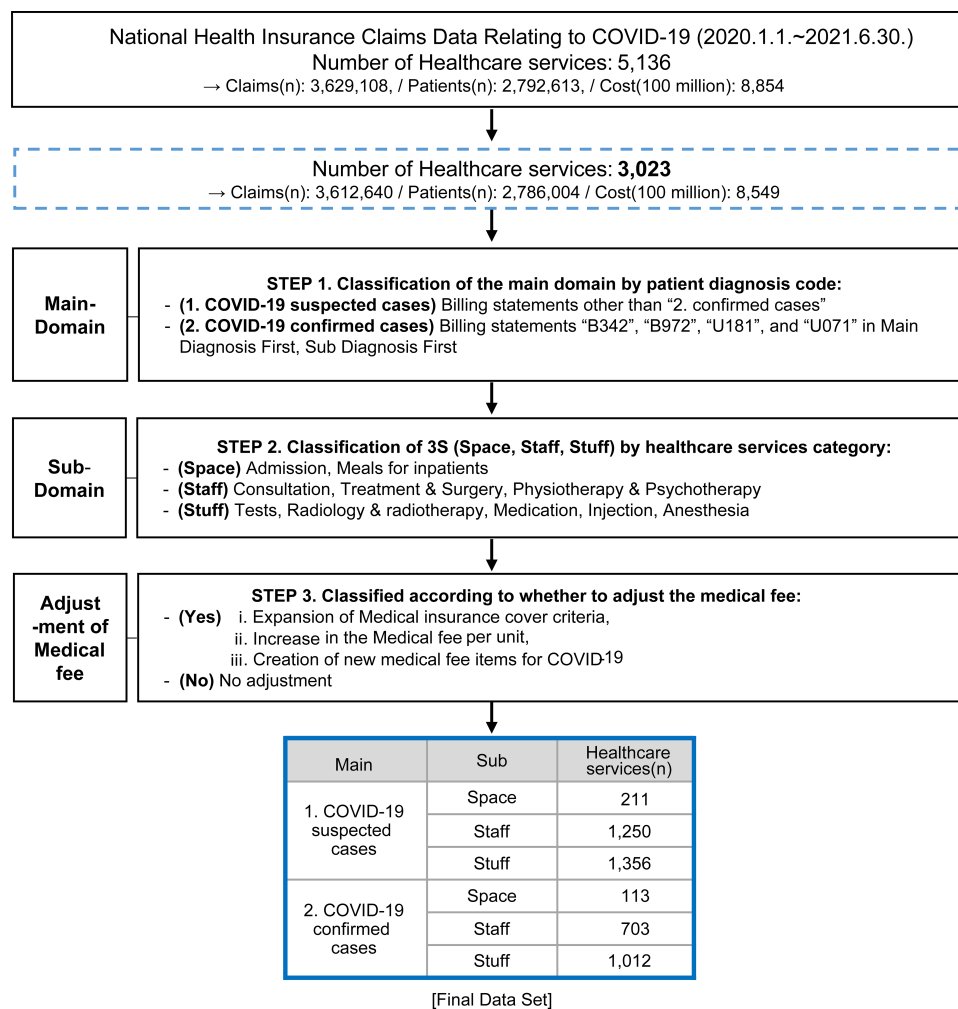


Figure 2 Data collection and processing workflow.

First, the number of healthcare services, costs, and number of patients were examined for each research domain, according to government's adjustment of medical fees. The research domain consisted of the main domain and subdomains.

Second, major healthcare services were summarized in a table according to the government's adjustment of medical fees by research domain, with particular focus on the top three healthcare services in terms of costs and number of patients (Tables S1 and S2). For a detailed analysis, the subdomains were further categorized based on the type of claims.

Third, medical fees for negative pressure isolation rooms were compared with those in the previous year. The fees for inpatient care in standard and negative pressure isolation rooms and for the masks used by medical staff working in negative pressure rooms in 2019 and 2020 were compared in terms of costs, and the number of patients and rates of change were calculated (Table S3). Details of healthcare services rendered in the three cases are presented in Table S4.

Definitions

The healthcare services presented in the tables are in accordance with the criteria for healthcare services stated in the Framework Act on Health and Medical Services (Articles 3 and 57), Korean Standard Terminology Of Medicine (KOSTOM), and HIRA database of reimbursement criteria. KOSTOM was developed to provide standard terminology for diagnoses, services, testing, nursing, dentistry, and public health by standardizing extensive basic public health data.²⁴ Healthcare services were defined based on the International Classification of Diseases (ICD-9-CM Procedures Vol. 3, v.32) and local clinical terms.²³

Table 2 Comparison of the COVID-19 Suspected and Confirmed Group by the Costs, Number of Patients and Healthcare Services of the Adjustment of Medical Fees^a. (Unit: Number, KRW 100 Million, Person)

Main Domain	Subdomain	All					Adjustment of Medical Fee						No Adjustment of Medical Fee					
		Costs(%)	Patients n(%)		Healthcare Services n(%)		Costs(%)		Patients n(%)		Healthcare Services n(%)		Costs(%)		Patients n(%)		Healthcare Services n(%)	
Total		8549(100.0)	3,210,533	(100.0)	4645	(100.0)	7337	(85.8)	2,958,702	(92.2)	248	(5.3)	1212	(14.2)	251,831	(7.8)	4397	(94.7)
COVID-19 suspected cases	Sub total	3004(100.0)	2,685,313	(100.0)	2817	(100.0)	2883	(96.0)	2,663,351	(99.2)	122	(4.3)	121	(4.0)	21,962	(0.8)	2695	(95.7)
	Space	155(100.0)	15,824	(100.0)	211	(100.0)	116	(74.8)	9505	(60.1)	31	(14.7)	39	(25.2)	6319	(39.9)	180	(85.3)
	Staff	66(100.0)	17,095	(100.0)	1250	(100.0)	24	(36.4)	8206	(48.0)	83	(6.6)	41	(62.1)	8889	(52.0)	1167	(93.4)
	Stuff	2783(100.0)	2,652,394	(100.0)	1356	(100.0)	2743	(98.6)	2,645,640	(99.7)	8	(0.6)	40	(1.4)	6754	(0.3)	1348	(99.4)
COVID-19 confirmed cases	Sub total	5545(100.0)	525,220	(100.0)	1828	(100.0)	4454	(80.3)	295,351	(56.2)	126	(6.9)	1091	(19.7)	229,869	(43.8)	1702	(93.1)
	Space	2757(100.0)	153,094	(100.0)	113	(100.0)	2547	(92.4)	76,720	(50.1)	43	(38.1)	210	(7.6)	76,374	(49.9)	70	(61.9)
	Staff	2026(100.0)	210,683	(100.0)	703	(100.0)	1650	(81.4)	133,912	(63.6)	76	(10.8)	376	(18.6)	76,771	(36.4)	627	(89.2)
	Stuff	762(100.0)	161,443	(100.0)	1012	(100.0)	257	(33.7)	84,719	(52.5)	7	(0.7)	505	(66.3)	76,724	(47.5)	1005	(99.3)

Notes: ^aThe number of healthcare services and the number of patients are calculated as duplicate values. Costs comprise the total cost incurred during treatment and are determined to be valid by the HIRA review process. It is the sum of the co-payment and the insurance benefit.

Results

Table 2 compares the COVID-19 suspected and confirmed groups based on costs, number of patients, and the healthcare services eligible for adjustment of medical fees. Over the study period, 4645 healthcare services were provided for 3,210,533 patients, costing 854.9 billion KRW. A more detailed analysis revealed that medical fees were adjusted for 248 healthcare services (5.3%) and 2,958,702 patients (92.2%), which accounted for 733.7 billion KRW (85.8%) of the costs; medical fees were not adjusted for 4397 healthcare services (94.7%) and 251,831 patients (7.8%), which accounted for 121.2 billion KRW (14.2%). Thus, financing for 94.7% of the healthcare services rendered did not receive any government assistance; however, the medical fees of only 7.8% of patients were not adjusted. Regarding costs, of the total expenditure of 8549 billion KRW, 85.8% was adjusted by the government and 14.2% was not.

The results presented in **Table 2** are graphically depicted in **Figure 3**. For suspected cases, the government's adjustments of the fees covered 96.0% of the costs incurred and 99.2% of patients. However, there was no adjustment of medical fees for 95.7% of the healthcare services. An analysis by subdomain revealed the following: costs for 85.3% of space, 93.4% of staff, and 99.4% of stuff were not adjusted by the government. By contrast, the government adjusted 96.0% of the costs overall. By subdomain, the level of government adjustment was the highest for stuff (98.6%), followed by space (74.8%) and staff (36.4%). Regarding the number of patients, the costs of 99.2% of the patients was adjusted by the government. By subdomain, the medical fees for most of the suspected cases were adjusted by the government, being the highest for stuff (99.7%), followed by space (60.1%) and staff (48.0%).

Meanwhile, the medical fees for 56.2% of confirmed patients were adjusted, accounting for 80.3% of costs, but the fees for 93.1% of the healthcare services rendered were not adjusted. By subdomain, the highest level of adjustment of medical fees for healthcare services was for space (38.1%); fees for stuff (99.3%) and staff (89.2%) were not adjusted in any significant amount by the government. With respect to costs, the highest level of government adjustment was for space (92.4%), followed by staff (81.4%) and stuff (33.7%). Regarding the number of patients, only the fees for 56.2% were adjusted by the government. For all 3S subdomains, the fees for approximately half of the items were adjusted by the government.

The Korean government prioritized the healthcare services most relevant to infection prevention in all 3S subdomains for both COVID-19 suspected and confirmed cases. As shown in **Table S1**, with respect to space, the government adjusted the medical fees for inpatient care to prevent the spread of infection by covering the fees for standard air pressure isolation rooms,

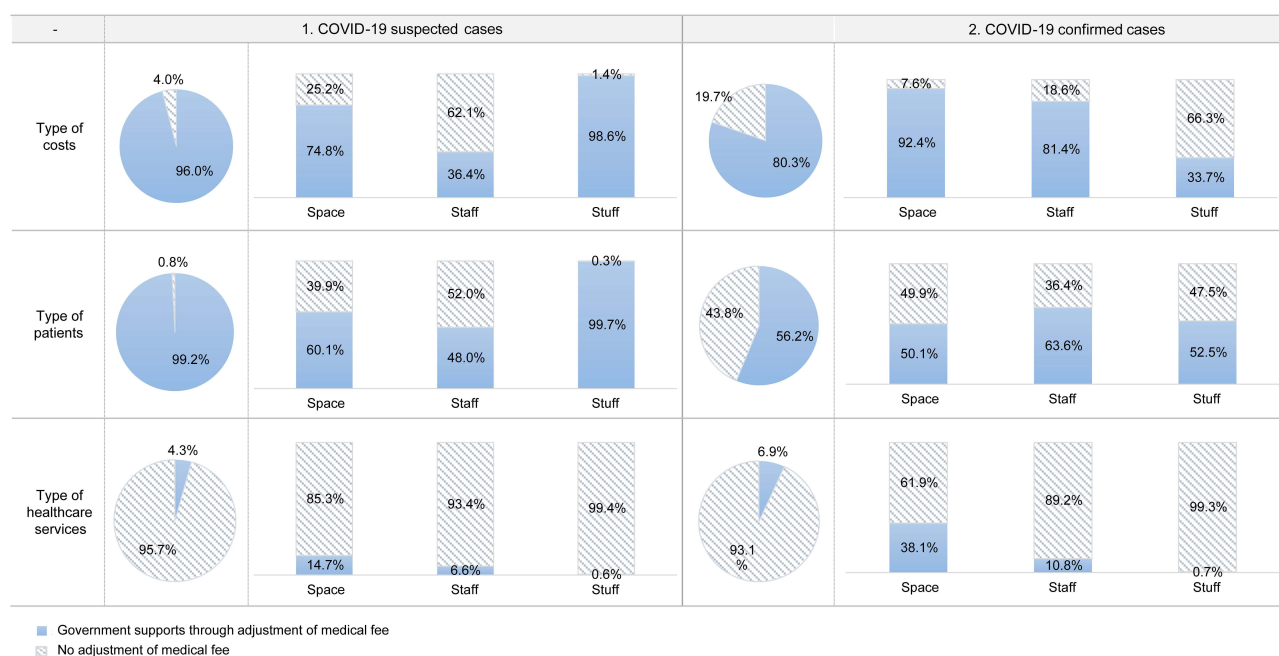


Figure 3 Comparison of the COVID-19 suspected and confirmed groups based on the proportion of adjustment of medical fees.

negative pressure isolation rooms, and severe COVID-19-dedicated intensive care units (ICUs). Regarding the staff subdomain, the government adjusted the medical fees for infection prevention measures taken by medical staff in isolation rooms, isolation management including the establishment and management of an infection response system, and infection prevention management. Further, to protect both the medical staff and patients, the government temporarily adjusted the medical fees for telemedicine at the same level as an in-person consultation. [Table S2](#) shows that telemedicine was ranked among the top three healthcare services in terms of the number of patients for both COVID-19 suspected and confirmed cases. In terms of stuff, the pooled COVID-19 real-time polymerase chain reaction (RT-PCR) test (hereafter, diagnostic test) is a representative example of medical fee adjustment. Pooled diagnostic testing is performed on a combined pool of specimens collected from several individuals and is a useful screening method. In [Table S2](#), the top three fees for diagnostic testing were ranked in terms of costs and number of patients in both domains. Additional medical fees were adjusted for personal protective equipment (PPE) used in isolation rooms, such as masks.

Meanwhile, the Korean government developed medical fee items focusing on the subdomain of staff to compensate healthcare providers for the additional volume of work and support newly introduced systems in response to the pandemic. For example, medical fees were adjusted for COVID-19 response personnel and night-shift nurses. The medical fees for COVID-19 response personnel were adjusted differentially according to patient severity. Night-shift nurses were paid three times more than their existing level of pay. Additionally, the medical fees for national safety hospitals (where patients with respiratory issues are separated from all other patients and take separate routes during the entire treatment process, right from hospital entrance through admission) and clinics dedicated to respiratory disease were adjusted by the government for infection prevention management. Residential treatment centers became non-healthcare facilities for patients with mild COVID-19 symptoms. The adjustment of medical fees for the centers included in-person treatment by healthcare providers, patient monitoring, and chest X-rays.

As mentioned previously, the medical fees for 4397 (94.7%) healthcare services were not adjusted the government; 2695 (95.7%) services pertained to COVID-19 suspected cases and 1702 (93.1%) to confirmed cases. The column “No adjustment of medical fee” in [Table S1](#) shows that some unadjusted services were those that provided direct treatment to confirmed patients while others were ancillary services provided by healthcare institutions. In the space subdomain, meals fees (general diets, therapeutic diets, and diets for postpartum mothers), which are basic in managing NHI and Medical Aid patients, were not adjusted. In the staff and stuff subdomains, the number of unadjusted healthcare services was even greater. Unadjusted healthcare services under the category of consultation in the staff subdomain included inpatients’ safety management, transfer service, hospice and palliative care, and the selection and classification of emergency patients by severity. Rehabilitation treatment for respiratory patients in physiotherapy and psychotherapy under the staff subdomain was also not financially supported. These are basic healthcare services for patient safety, transfer, severity classification, and rehabilitation. Inpatients safety management fees cover visitor management, fall and bed sore preventions, security personnel, and alarm systems, which are essential services during the pandemic. In the stuff subdomain, medical fees were not adjusted to cover imaging test materials, medications at discharge, and masks used by medical staff in multi- and double-bed standard air pressure and negative pressure isolation rooms.

Along with the ancillary services, the medical fees for treatments directly affecting the health outcomes of COVID-19 confirmed patients were not adjusted by the government. In the category of treatment and surgery under the staff subdomain, the government did not cover the medical fees for cardiopulmonary resuscitation, 24-hour bedside monitoring, percutaneous blood O₂ saturation monitoring, extracorporeal circulation by heart-lung machine, artificial ventilation, extra corporeal membrane oxygenation (ECMO), patient position change, and lung transplantation.

Discussion

The present study is the first to examine the Korean government’s adjustment of medical fees to create surge capacity against the COVID-19 pandemic in terms of space, staff, and stuff. Similar to how early detection and isolation were accepted as essential national strategies, the adjustment of medical fees was an effort to focus on costs related to stuff (tests), space (isolation rooms), and staff (health protection).

First, the Korean government provided financial support to healthcare providers, which covered over 96% of the total cost arising from the greater demand for testing and isolated spaces among those suspected of COVID-19 infection,

through the adjustment of medical fees payable by the NHI. In the 3S subdomains, the Korean government extensively supported healthcare services fundamental to the prevention of the spread of infection, even for suspected cases. Representative examples are the adjustment of medical fees for inpatient care in isolation rooms to prevent the infection's spread (space); infection prevention measures performed by medical staff, and patient consultation in facilities other than healthcare institutions, such as telemedicine (staff); and diagnostic testing and masks used by medical staff (stuff). Demands for admission to hospitals equipped with negative pressure rooms were prioritized to protect non-COVID patients and healthcare providers by preventing contact with confirmed patients; consequently, mass infections within healthcare facilities were prevented.

It is important to adjust the medical fees for COVID-19 patients under investigation, those suspected of having COVID-19, and patients with respiratory diseases, namely, those who are closest to presenting the symptoms of COVID-19. Overall, the adjustment of medical fees for early detection was appropriate. However, if the pandemic is prolonged, the provider payment system will need to be reformed to prevent disruption of non-COVID-19 essential care. The primary goals of the global response to COVID-19 are to slow down the spread of the virus; detect, isolate, and treat all suspected cases; and provide timely treatment to COVID-19 patients.²⁵ To identify individuals suspected of having COVID-19 as well as confirmed patients, all individuals must be screened at their first point of contact with the healthcare system. In other words, early recognition of confirmed patients is critical and to do so, patient screening, triage, and clinical assessment should be appropriately performed.²⁵

Second, medical fees were adjusted for more than 80% of the costs for COVID-19 confirmed cases in terms of isolated spaces and medical staff support. For confirmed cases, the Korean government prioritized the healthcare services most relevant to infection prevention in the domains of space and staff. For instance, the cost for confirmed cases relating to negative pressure isolation rooms amounted to 193.9 billion KRW (86.7%) and that for masks used by medical staff in negative pressure rooms amounted to 7.3 billion KRW (83.4%) in 2020 ([Table S3](#)). Space refers to physical spaces, encompassing both the hospital and patient rooms. There should be separate spaces for emergency and non-emergency situations along with cohort wards and triage areas with adequate ventilation. Additionally, spaces should be readily repurposed to accommodate an influx of patients in settings other than healthcare facilities (eg, hotels, community centers).¹⁵ Due to the lack of isolation wards, if a multi-bed isolation room or general patient room was converted to a single-bed isolation room, the fee for a single-bed isolation room was paid. Further, to secure more beds, assistance in patient management fees was provided to live-in treatment centers—these are non-healthcare facilities that accommodate patients if a medical staff member is dispatched for treatment.

With regard to the staff subdomain, there should be an adequate number of sufficiently supervised healthcare providers who are experts in emergency situations, as well as of administrative personnel who can work shifts outside normal working hours.^{12,15} Healthcare providers can galvanize healthcare services and play an essential role, serving on the COVID-19 frontlines in the dual track system.²⁶ This study found that the government adjusted the medical fees as an incentive to healthcare providers, by providing relief funds for COVID-19 responders and increasing the payment to night-shift nurses.

Conversely, the stuff subdomain has some limitations. This subdomain is directly linked to the staff subdomain, because healthcare providers should be trained to utilize supplies and equipment. It is also related to the availability of certain specialized equipment to treat patients and safeguard medical staff, such as beds, hospital wards, intubation equipment, mechanical ventilators, and essential medications as well as supplies of oxygen, ECMO, and PPE.¹⁵ The medical fees were not adjusted for the masks used by medical staff working in double- or multi-bed standard air pressure rooms for purposes other than treating confirmed patients or for some healthcare services directly affecting the health outcomes of confirmed patients (such as cardiopulmonary resuscitation, percutaneous blood O₂ saturation monitoring, extracorporeal circulation by heart-lung machine, artificial ventilation, ECMO, and lung transplantation). These services are important in both the staff and stuff subdomains. Although the level of difficulty differs depending on whether the patient has severe COVID-19 or other illnesses, the payment amount is the same. In March 2022, Korea began to transition to a “step-by-step recovery” COVID response system focusing on severe COVID-19 confirmed patients, and COVID-19 fatality management and infection prevention measures were loosened. However, medical fees for the treatment of severe COVID-19 patients have not yet been reviewed.

Third, the adjustment of less than 10% of the various types of medical fees, if selected strategically, could effectively induce a surge in resource capacity. Korea, where the FFS is the primary payment system, provided comprehensive support to healthcare providers during the COVID-19 pandemic. Thus, in Korea, a fixed payment was made against each healthcare service rendered in response to COVID-19.

There are benefits to using FFS, which rewards physicians for the volume of rendered services multiplied by the fixed fee per service, as it motivates physicians to effectively provide healthcare services while facilitating the introduction of new technology.¹¹ These features drive healthcare providers to respond early to rapidly rising healthcare demands and quickly transition to a disaster response system. In fact, Korea developed a medical fee schedule for diagnostic tests, stimulating large-scale testing, and promptly covered non-face-to-face consultation to prevent infection under NHI.⁷ Poland created an FFS list of reimbursable expenses for inpatient care, outpatient treatment, and transfer and isolation of COVID-19 patients.²⁷ Belgium developed a list of reimbursable services for COVID-19 treatment, ICU, and specialized treatment.²⁸

However, although a large proportion of costs and patients was financially supported by the government, there are some limitations of FFS. Due to COVID-19, volume-based payment systems pose a challenge worldwide. Countries utilizing activity-based payment systems, such as FFS and pay-for-performance, have suffered a drastic reduction in income during the pandemic, resulting in financial burden, as the number of patients and volume of consultations decreased.²⁹ Further, because the reimbursement amount is predetermined for each service, a support system can only be designed to pay per service, creating an unavoidable gap. Korea responded to the pandemic by simply revising the existing payment system, whereas some European countries preemptively responded by putting the existing payment system on temporary hold or introducing a new system for COVID-19-specific healthcare services. In the United Kingdom, the diagnosis-related group (DRG) reimbursement for inpatient charges was temporarily placed on hold, and the global budget was assigned to cover COVID-19-related healthcare costs considering the average monthly payment in the previous year and the inflation rate.³⁰ Germany maintained DRG for inpatient care, providing additional financial assistance for COVID-19 through a per-diem payment based on the Hospital Relief Act.³¹

This study has the following limitations. First, it did not identify empirical causes or patterns. Second, it did not comprehensively evaluate whether the financial support for healthcare providers was sufficient, nor did it investigate the effectiveness of assistance. Despite its limitations, this study is the first to examine COVID-19 healthcare demands considering the type of COVID-19 patient and the components of surge capacity as proposed by the WHO and the Johns Hopkins National Center for the Study of Preparedness and Catastrophic Event Response (PACER). Additionally, it quantitatively confirmed a gap in the NHI financial system by analyzing the government's adjustment of COVID-19-related medical fees.

Future research should investigate the effectiveness of government's financial support to healthcare institutions by analyzing NHI finances and government budgets, such as income loss compensation payments to healthcare providers. Additionally, studies should evaluate whether the government's COVID-19 response policy is enough to handle a pandemic by examining each of the indirectly affected healthcare areas where continuity of services is crucial, such as for chronic patients, emergency patients, pregnant women, and older patients. After an objective evaluation, a detailed study should be performed with respect to a new healthcare provider payment mechanism.

Conclusion

To combat COVID-19, Korea has proactively utilized NHI among various sources of financing, and expanded surge capacity. It responded aggressively to control the number of both COVID-19 suspected and confirmed cases in accordance with the global response strategy, managing to decelerate the spread of infection by focusing on diagnosis and isolation.

However, discussions regarding effective treatments and systems are lacking, and discussions on provider payment mechanisms that can encompass COVID-19-related healthcare areas are unavoidable; thus, it is essential to develop payment systems that can play a critical role in not only increasing the motivation of healthcare providers but also improving health outcomes.

Therefore, volume-based payment inducement, such as the adjustment of FFS medical fees, can be effective in increasing the surge capacity for early detection and isolation. However, as the epidemic becomes prolonged, it is

necessary to find a way to maintain an effective response system while controlling costs by introducing an alternative payment system.

Globally, there is little research that systematically summarizes payment adjustments made in response to COVID-19 and that determines the potential effects of the adjustments. Hence, additional studies should be conducted on provider payment mechanisms other than the current FFS method of reimbursement, to prepare for a future disaster.

Data Sharing Statement

All data used in this study are publicly available. The use of Health Insurance Review & Assessment (HIRA) data are available via the Healthcare Big Data Hub (<https://opendata.hira.or.kr/home.do>). However, the NHI claims data must be approved by HIRA before use. Institutional Review Board (IRB) approval is required to request HIRA data. The HIRA data sharing review committee then evaluates the request and decides whether to provide the data. Data are provided to support policy and academic research under the Act on Promotion of the Provision and Use of Public Data in Korea. Detailed data approval procedures are carried out in accordance with HIRA's internal guidelines. More information about data sharing can be obtained by contacting opendata@hira.or.kr.

Ethics Approval

Ethical approval was granted by the Institutional Review Board of Health Insurance Review & Assessment (HIRA) Service under authorization number 2021-077.

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Disclosure

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References

1. The Centers for Medicare & Medicaid Services. CMS takes action nationwide to aggressively respond to coronavirus national emergency. CMS Newsroom; 2020. Available from: <https://www.cms.gov/newsroom/press-releases/cms-takes-action-nationwide-aggressively-respond-coronavirus-national-emergency>. Accessed December 8, 2021.
2. Ellyatt H 'The UK really is in trouble': doctors warn of a dire Covid crisis as officials reject restrictions. CNBC; 2021. Available from: <https://www.cnbc.com/2021/10/22/uk-covid-doctors-warn-of-crisis-as-officials-reject-restrictions.html>. Accessed December 8, 2021.
3. Horowitz J. Italy's health care system groans under coronavirus—A warning to the world. The New York Times; 2020. Available from: <https://www.nytimes.com/2020/03/12/world/europe/12italy-coronavirus-health-care.html>. Accessed December 8, 2021.
4. World Health Organization. Regional office for Europe. strengthening and adjusting public health measures throughout the COVID-19 transition phases: policy considerations for the WHO European Region. Regional Office for Europe. World Health Organization; 2020. Available from: <https://apps.who.int/iris/handle/10665/332473>. Accessed December 8, 2021.
5. World Health Organization. Regional office for Europe. Health systems resilience during COVID-19: lessons for building back better. Health Policy Series: 56; 2021. Available from: <https://apps.who.int/iris/handle/10665/348493>. Accessed January 10, 2022.
6. COVID-19 loss compensation guide. COVID-19 central disaster management headquarters compensation support team. Medical institutions, pharmacies, general business establishments that closed, suspended and disinfected that for local governments; 2021. Available from: <https://www.hygn.go.kr/03017/04357.web?gcode=7048&idx=886068&amode=view&stype=title&sstring=%EC%BD%94%EB%A1%9C%EB%82%9819+%EC%86%90%EC%8B%A4%EB%B3%B4%EC%83%81&cpage=1>. Accessed August 31, 2022.
7. Ministry of Health and Welfare. Current status of the National Health Insurance Medical fee introduced by the Korean government in response to COVID-19; 2021. Available from: <https://www.hira.or.kr/bbsDummy.do?pgmid=HIRAA020002000100&brdScnBltno=4&brdBltno=8555&pageIndex=1>. Accessed December 8, 2021.
8. Health Insurance Review & Assessment Service. The function and role of health insurance review & assessment service; 2021. Available from: <https://www.hira.or.kr/co/ebook/list.do?pgmid=HIRAA030402000000>. Accessed December 8, 2021.
9. Waitzberg R, Gerkens S, Dimova A, et al. Balancing financial incentives during COVID-19: a comparison of provider payment adjustments across 20 countries. *Health Policy*. 2022;126(5):398–407. PMID: 34711443, PMCID: PMC8492384. doi:10.1016/j.healthpol.2021.09.015

10. McClellan M, Rajkumar R, Couch M, et al. Health care payers COVID-19 impact assessment: lessons learned and compelling needs. *NAM Perspect.* 2021;2021. doi:10.31478/202105a
11. Lee S, Baek D, Jo B. *Introduction to Health Sciences Revision*. Seoul: National University Publishing & Cultural Center; 2015.
12. Anesi GL, Lynch Y, Evans L. A conceptual and adaptable approach to hospital preparedness for acute surge events due to emerging infectious diseases. *Crit Care Explor.* 2020;2(4):e0110. doi:10.1097/CCE.0000000000000110
13. Abir M, Nelson C, Chan EW, et al. Critical care surge response strategies for the 2020 COVID-19 outbreak in the United States; 2020. Available from: https://www.rand.org/pubs/research_reports/RR164-1.html. Accessed December 8, 2021.
14. Toerper MF, Kelen GD, Sauer LM, Bayram JD, Catlett C, Levin S. Hospital surge capacity: a web-based simulation tool for emergency planners. *Disaster Med Public Health Prep.* 2018;12(4):513–522. doi:10.1017/dmp.2017.93
15. World Health Organization. Regional office for Europe. strengthening the health systems response to COVID-19: technical guidance no. 2: creating surge capacity for acute and intensive care. Regional Office for Europe: World Health Organization. 2020. Available from: <https://apps.who.int/iris/handle/10665/332562>. Accessed January 10, 2022.
16. World Health Organization. Everybody's business – strengthening health systems to improve health outcomes: WHO's framework for action. World Health Organization; 2007. Available from: <https://apps.who.int/iris/handle/10665/43918>. Accessed December 8, 2021.
17. World Health Organization. Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. World Health Organization; 2010. Available from: <https://apps.who.int/iris/handle/10665/258734>. Accessed February 23, 2022.
18. Zuo F, Zhai S. The influence of China's COVID-19 treatment policy on the sustainability of its social health insurance system. *Risk Manag Healthc Policy.* 2021;14:4243–4252. doi:10.2147/RMHP.S322040
19. Schmidt AE, Merkur S, Haindl A, et al. Tackling the COVID-19 pandemic: initial responses in 2020 in selected social health insurance countries in Europe. *Health Policy.* 2022;126(5):476–484. PMID: 34627633. doi:10.1016/j.healthpol.2021.09.011
20. Waitzberg R, Quentin W, Webb E, Glied S. The structure and financing of health care systems affected how providers coped with COVID-19. *Milbank Q.* 2021;99(2):542–564. doi:10.1111/1468-0009.12530
21. Health Insurance Review & Assessment Service. Medical expense statistical index in 2020; 2021. Available from: <https://www.hira.or.kr/bbsDummy.do?pgmid=HIRAA020045030000&brdScnBltno=4&brdBltno=2413&pageIndex=1#none>. Accessed December 8, 2021.
22. National Health Insurance Service (NHIS). Health security system of Korea. Available from: <https://www.nhis.or.kr/english/wbheaa02300m01.do>. Accessed February 10, 2022.
23. Ministry of Health and Welfare insurance benefit division-376. Guide to medical insurance cover standards and claim methods. Novel infectious disease syndrome (novel coronavirus infectious disease) related medical care benefit standards and claim method [isolation room inpatients fee, etc.] [internet]. 2020. Available from: <http://www.hira.or.kr/rd/insuadctr/bbsView.do?pgmid=HIRAA030069000400&brdScnBltno=4&brdBltno=51460>. Accessed February 10, 2022.
24. Korean standard terminology of medicine. What is a health terminology standard [Internet]. Available from: <https://www.hins.or.kr/menu.es?mid=a10303120000>. Accessed February 10, 2022.
25. World Health Organization. COVID-19 clinical management: living guidance; 2021. Available from: <https://apps.who.int/iris/handle/10665/338882>. Accessed February 7, 2022.
26. Jakab M, Nathan NL, Pastorino G, et al. Managing health systems on a seesaw: balancing the delivery of essential health services whilst responding to COVID-19. *Eurohealth.* 2020;26(2):63–67.
27. European Observatory on Health Systems and Policies. COVID-19 Health System Response Monitor (HSRM). Poland. Available from: <https://eurohealthobservatory.who.int/monitors/hsrm/hsrm-countries/hsrm/poland/paying-for-services/health-financing/>. Accessed February 10, 2022.
28. European Observatory on Health Systems and Policies. COVID-19 Health System Response Monitor (HSRM). Belgium. Available from: <https://eurohealthobservatory.who.int/monitors/hsrm/hsrm-countries/hsrm/belgium/paying-for-services/health-financing/>. Accessed February 10, 2022.
29. Quentin W, Albrecht T, Bezzina A, et al. Adjusting hospital inpatient payment systems for COVID-19. *Eurohealth.* 2020;26(2):88–92.
30. European Observatory on Health Systems and Policies. COVID-19 Health System Response Monitor (HSRM). United Kingdom. Available from: <https://eurohealthobservatory.who.int/monitors/hsrm/hsrm-countries/hsrm/united-kingdom/paying-for-services/health-financing/>. Accessed February 10, 2022.
31. European Observatory on Health Systems and Policies. COVID-19 Health System Response Monitor (HSRM). Germany. Available from: <https://eurohealthobservatory.who.int/monitors/hsrm/hsrm-countries/hsrm/germany/paying-for-services/health-financing/>. Accessed February 10, 2022.

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