

The Role of the Armed Forces Medical Command and the Innovation of Medical Logistics Support: Responding to the Infectious Disease Crisis

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The World Health Organization (WHO) declared a pandemic on March 10, 2020, after COVID-19 had spread to the world. The virus has spread to 217 countries thus far, threatening the lives and health of people worldwide. The world is closely watching South Korea's quarantine measure, the so-called "K-quarantine" model, which has been successful in maintaining a low level of infection and fatality rates, thanks to its preemptive and systematic quarantine system. The military has played a significant role in producing such valuable outcomes of the K-quarantine. Since the first confirmed case in the military on February 21, there have been 204 confirmed cases (as of November 18, 2020). This means that 32.2 people for every 100,000 population have been infected with COVID-19 in the military, which is equivalent to 57.5% of the civilian infection rate (55.9 for every 100,000 people). It can be said that this outcome is the achievement of an effective quarantine system and the dedicated commitment of military medical staff despite the inevitable "3Cs": "close," "crowded," and "confined."

In a national crisis, such as COVID-19, the ROK Ministry of National Defense has established a medical response system for nontraditional threats, focusing on the Armed Forces Medical Command (hereafter, AFMC), the only military medical unit in South Korea. The AFMC has been playing the central role for medical support for the entire South Korean military by building the quarantine infrastructure and systematic response system. The following are the achievements of AFMC responses to COVID-19.

Achievements of the Responses to COVID-19 by the AFMC

First, upon the government's emergency request, the AFMC provided military medical personnel and hospital beds for infectious disease treatment on time by adjusting its military medical and emergency operation systems. In particular, as the number of confirmed cases involving inbound travelers increased, military medical personnel were dispatched to major airports and ports to support special immigration procedures, such as medical assistance at temporary waiting facilities, selective treatment, and sample collection. Medical personnel were also dispatched to foreign quarantine facilities in five countries, including China, Iran, and Italy, where overseas Koreans were quarantined. In addition, military medical personnel were promptly sent to private hospitals when there was a shortage of medical staffs to stabilize the national medical system. Furthermore, on February 11, the AFMC launched telemedical consultations for overseas Koreans in response to an emergency request from the Ministry of Foreign Affairs. Until recently, the AFMC provided telemedical consultations to 119 overseas Koreans who were in self-isolation after being confirmed as positive for COVID-19 in 32 countries, including China, the United States, Guatemala, Italy, and Russia. Furthermore, as the shortage of hospital beds for confirmed COVID-19 patients worsened, the AFMC supplied 423 hospital beds in three hospitals, including the Armed Forces Capital Hospital, at the request of the Central Disaster Management Headquarters.

Second, the AFMC contributed to the success of the K-quarantine model by developing and proactively introducing innovative technologies, such as COVID-19-related apps and advanced testing techniques, and maintaining a lower infection rate than the civilian society. COVID 19-related apps include the "severity triage app" for on-site medical staff, the "checkup app" that can verify whether a test is necessary, and the "our health keeper app" that can examine and manage the health status of individuals and groups. These apps are still being used, thereby contributing to the prevention of the spread of infection by identifying and verifying confirmed patients in advance and steering them into the public management system. In addition, the Armed Forces Medical Research Center has developed a pooling technique that bundles and tests multiple samples at once; it is used actively to test newly recruited military personnel, units deployed overseas, and those subject to full-scale COVID-19 tests according to the epidemiological investigation results. The Korea Disease Control and Prevention Agency also introduced and verified this testing method, effectively using it for selective group screening in local communities.

Furthermore, by applying an isothermal amplification technology that has accumulated the research results of the malaria diagnostic test, the AFMC has developed its own rapid diagnosis test (RDT) for COVID-19. Patent applications, registrations, international PCT patent applications, and technology transfer to companies in the private sector have been completed for the COVID-19 RDT. In comparison with the existing PCR testing method, this technology is especially useful in reducing the time required for

diagnosis because it reduces the time required for testing after nucleic acid extraction from two hours to 20 minutes. The test reagent is exported to European and South American countries for use in the screening process at medical institutions or airports (for quarantine purposes). The AFMC is contributing to the prevention of a massive outbreak of confirmed cases by introducing drive-through and walk-through methods in the early stage to support swift execution of mass inspections.

Third, the AFMC has been preventing influx of the virus into the military and a spread within by operating its Disease Control Headquarters since January 20 to monitor the COVID-19 situation, assess risks, and respond to confirmed cases. The Quarantine Countermeasure Headquarters has four teams (surveillance and quarantine team, health operation support team, situation control team, and personnel/logistics support team) consisting of about 70 people. The Commander is the head of the headquarters, which maintains the situation response system 24 hours a day, 365 days a year. The Quarantine Countermeasure Headquarters not only cooperates with the Ministry of National Defense and quarantine countermeasure headquarters of each armed branch and medical situation bureau, but it also cooperates closely via its hotline with the Central Disaster and Safety Countermeasure Headquarters, Central Disaster Management Headquarters, and Central Disease Control Headquarters, all of which are government crisis management organizations. Thus, quarantine management guidelines on military isolation and disinfection are reviewed and disseminated promptly to the entire army.

Fourth, the AFMC has contributed to preventing the spread of infectious diseases through active early diagnoses and rapid epidemiological investigations. As the COVID-19 situation develops, AFMC is relocating testing places flexibly and is assisting in COVID-19 testing at the Armed Forces Capital Hospital and Medical Research Institute since they were designated as nationally accredited COVID-19 diagnostic testing institutions. At the time of the large-scale outbreak of confirmed cases in Daegu and North Gyeongsang Province, the AFMC equipped local military hospitals with COVID-19 diagnostic kits to support testing in the region. Subsequently, as the number of confirmed patients in Seoul and its metropolitan area continued to increase, it maximized operational performance against availability by flexibly managing medical resources, such as transferring the testing function.

Furthermore, the AFMC has treated 50,000 people by running 24-hour screening centers in 12 military hospitals; currently, it is operating three teams of military epidemiological investigators per region. To date, it has dispatched its medical teams about 140 times for suspected and confirmed COVID-19 cases. By applying stronger quarantine measures than those of the state health authorities, it has quarantined people in a way that suits the characteristics of the military, including those with COVID-related symptoms, returnees, and those whose movements overlap with the findings of the epidemiological investigation along with those who were already subject to quarantine for preventive purposes. At the same time, by

implementing active comprehensive inspection and preemptive quarantine measures, such as tracking down the chain of transmission, routes, and contact tracing, it is preventing the spread of transmission within army units and the occurrence of additional confirmed cases. Additionally, the Medical Emergency Operation Center is operating the COVID-19 Military Call Center 24/7, similar to the call center run by the Korea Disease Control and Prevention Agency, providing counseling services in response to COVID-19 cases within the military.

Current Status of Innovation in Medical Logistics Support

Behind the success of AFMC responses to COVID-19, efforts to innovate medical logistic support played a great role. Since the MERS outbreak in 2015, the AFMC has recognized that the capabilities and roles played by the military are keys to overcome a national crisis, like an infectious disease crisis, and it has pursued innovation in medical logistics support, such as updating medical equipment and enhancing supplies to respond effectively to prolonged infectious disease crisis through preemptive measures.

Accordingly, the AFMC's medical logistics department promoted the mid- to long-term Armamentarium Acquisition Project Plan in order to update medical equipment for infectious disease response and successfully secured equipment across all military hospitals, including X-rays at screening clinics, sample collection booths, DNA and RNA extraction, negative pressure emergency vehicles, negative pressure transport carts, and negative pressure chambers. Based on the experience and know-how gained from responding to infectious diseases in the past, the AFMC preemptively responded to the COVID-19 situation from the beginning stage in a wartime-like level and focused on reinforcing medical equipment and supplies in four areas—screening clinics, testing, patient transportation, and hospitalization and treatment—by integrating civilian, government, and military medical resources. In particular, it has renewed the medical logistical support sector with an emphasis on military medical support for responding to COVID-19 and on the acquisition of mid- and long-term medical equipment and supplies in consideration of the second wave or a “twindemic.”

As for medical equipment, 164 products (11 items) worth KRW 5.73 billion were purchased; as for diagnostic testing, both PCR equipment and nucleic acid extractors were supplied to the frontlines and backlines. In addition, through emergency procurement for moving testing vehicles, Korea's first COVID-19 on-site dispatch and One-Stop diagnostic system are expected to be completed around June of next year. Moreover, the AFMC was able to regularly supply medical resources to its 12 subordinate military hospitals on a monthly basis by systemically analyzing the resource exhaustion rate of each hospital and promoting the project—worth about KRW 12.45 billion (15 items; 1,101,416 products). Thus, it was able to establish

a stable infectious disease prevention and medical support system. In particular, it contributed to preventing the spread of infectious diseases in the military by securing 8,722 products from five items, including Level D products, through close cooperation with the Korea Disease Control and Prevention Agency. As demonstrated above, the AFMC recognized the importance of having a mid- to long-term budget to acquire medical equipment and supplies and put forth its best effort to secure it. For example, it secured an additional budget worth KRW 3.9 billion for the year 2021 for medical equipment for infectious diseases and KRW 1.3 billion for the year 2021 for medical supplies as preventive medical supplies. It plans to further strengthen its capacity to provide infectious disease response supplies in a timely manner.

Moreover, for the sake of Medical Logistics Support that will remain sustainable in the future, the AFMC established “Military Logistics Vision and Action Strategies” based on the following keywords, i) infectious diseases, ii) public medical institutions, and iii) the world to achieve sustainable medical logistics support innovation in the future. It plans to carry out 14 small assignments by designating the acquisition of cutting-edge medical devices and supplies, the securing of publicly funded medical resources, mutual support and research on allies’ armed forces, and attendance at domestic and foreign exhibitions as major implementation strategies. These strategies will serve as the main engine for our military to be reborn as a global medical powerhouse.

Development Direction for Infectious Disease Responses, including Medical Logistic Support

In the future, responses to infectious diseases—including medical logistics support—need to be promoted with a particular focus on the following three areas. First, it is necessary to reinforce a rapid response system to counter the threat of infectious diseases. To respond quickly to a crisis, it is necessary to strengthen the groups that are designed specifically for fast infectious disease control within the Ministry of Defense and the AFMC. It is also necessary to fill the void created during the transitional period until the national crisis system is stabilized.

To this end, infectious disease response facilities must be established within the military hospitals, such as the Armed Forces Daegu Hospital and Armed Forces Daejeon Hospital, during peacetime to develop a preparedness that can be operated immediately by switching functions when the government announces an emergency. Furthermore, it must prepare to respond to emergencies by developing and practicing the infectious disease response guidelines and medical operation plans through various drills during peacetime. In addition, it must prepare for an actual crisis by revising the military infectious disease management guidelines and organizing a working manual for an infectious disease crisis

Second, it is necessary to build the military capacity to respond to infectious disease crises. This will require expanding and developing education and training programs to strengthen human resources, such as infection control experts, epidemiological investigators, specialized researchers, and healthcare testing personnel. Moreover, it must secure Biosafety Level 3 (BSL-3) buildings and negative pressure isolation rooms as military facilities to respond to infectious diseases while increasing the number of various types of testing equipment, such as moving testing vehicles, nucleic acid extractors, and PCR equipment. Additionally, an operational concept must be developed.

Third, it is necessary to participate actively in private medical equipment exhibitions and public discussions to acquire advanced medical devices and supplies, thereby minimizing the gap with medical technology in the private sector while developing a close professional cooperative network. In responding to infectious diseases, we must ensure that our military's resources and capabilities are sufficient.