Creation and Operation of a Task Force Hospital by Armed Forces in the Epicenter of Coronavirus Disease 2019

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BACKGROUND
The coronavirus disease of 2019 (COVID-19) pandemic has caused a global public health crisis. As of February 17, 2020, there were 31 cases in the ROK, and subsequently, numerous local-transmitted cases related to religious facilities and nursing homes in Daegu city. Despite utilizing all community hospitals, some fatal cases were reported because of aggravated conditions while waiting at home. This was a result of insufficient medical facilities to accommodate approximately 500 newly confirmed cases per day.¹

The Armed Forces Medical Command (AFMC), the high command of 13 Armed Forces hospitals of ROK, immediately designated the Armed Forces Daegu Hospital (AFDH) as the Infectious Disease Task Force Hospital (IDTFH) exclusively for COVID-19 civilian patients. Task Force for AFDH was organized and several medical officers of the AFMC were deployed on February 24, 2020. After remodeling of the facility, the AFDH was initiated on March 5 with 303 medical beds for inpatients and operated as the IDTFH for 8 weeks until April 24.

This article aims to share the experiences of overcoming a local public health crisis with military medical cooperation and discusses what is necessary to establish a medical facility that is prepared for a future public health crisis from possible novel infectious diseases.

TRANSFORMATION INTO AN INFECTIOUS DISEASE TASK FORCE HOSPITAL
The AFDH had been an outpatient-based primary clinic with 54 beds for medical and surgical inpatients. Most patients were young males on active duty. The expansion of beds and the construction of negative-pressured isolation rooms commenced on February 29, 2020.

In all, the Corps of Engineers were recruited to the AFDH and began the transformation. Consultations on zoning for infection control and prevention were referred to the Infection Control team of Armed Forces Capital Hospital as well as to the Korea Centers for Disease Control (KCDC). Construction of isolation walls and establishing negative-pressure machinery were conducted with a civilian construction team arranged by Daegu Metropolitan City government and the Corps of Engineers.

To minimize the medical staff’s risk of exposure to the infection was initially emphasized. The entire building was divided into a clean and a contamination zone. As the central hallway and elevators were in the clean zone, confirmed patients were admitted through lateral stairways of each ward (Fig. 1). A negative-pressured cart was used to transfer patients to other wards or out of the hospital. Moreover, 10 isolation wards were opened with 303 beds, including 85 beds with oxygen support in 4 wards. One room was reserved for temporary critical care with a mechanical ventilator and was ready for cases that needed to be transferred to an advanced medical facility; however, this room was for limited use only.

PATIENT MANAGEMENT BASED ON SEVERITY CLASSIFICATION
A total of 10 medical officers and 121 nursing officers were deployed from AFMC to operate 303 beds in addition to 28 medical officers and 36 nursing staffs of the AFDH. Moreover, 38 civilian nursing assistants volunteered to work in the IDTFH via the KCDC. One doctor and 4 registered nurses were allocated to 10 patients, and a total of 248 medical staffs with 152 medical support staffs worked together in the AFDH.

Before the operation, Daegu Metropolitan City government was requested to admit low-severity male patients below the age of 60 to the AFDH considering the limitations and aforementioned characteristics of the Army hospital. Confirmed COVID-19 patients in Daegu Metropolitan City and Gyeongbuk province were admitted as of March 5, 2020. An average of 37 patients per day were admitted in the first week. By the eighth day of operations, there were 277 inpatients occupying 90% of the total beds.

It was important to assign patients to appropriate wards based on the potential severity and possible need for oxygen, considering the limited amount of oxygen-available beds and the difficulty of transferring patients between wards after
admission. With almost 50 new patients expected to be admitted simultaneously each day, a task force of physicians developed a clinical pathway based on the severity of patients’ status, including initial diagnosis, wards and beds allocation, and sets of prescriptions for the first 2 days (Table I). Following a cohort study that indicated the correlations between characteristics of a chest computed tomography (CT) scan and clinical features from Huan province, China\(^2\), a CT scan was administered to all admitted patients as it was expected to shorten triage with clinical features. New patients were initially transferred via ambulances to the primary clinic located in a separate building outside of the main hospital. The doctor on duty in the primary clinic interviewed the patient and created the admission record based on the patient’s clinical manifestation and findings of the physical examination. Subsequently, all patients underwent a low-dose chest CT scan. The CT room physician established triage with the arrangement of a ward based on the admission record and the CT scan. The doctors wore personal protective equipment (PPE) in primary clinics and CT rooms, and had 2-hour working shifts.

Based on the clinical pathway, patients classified into either the Red or Yellow group were assigned to 8 internal medicine physicians; the other 24 doctors worked 3 shifts alternatively and took charge of the Green group of patients (Table I). In case of clinical deterioration in the Green group—such as new onset of fever, tachycardia, low oxygen saturation below 92%, or respiratory difficulty—it was mandatory to consult the assigned physician, who then followed up on patients and changed their triage to Yellow or Red categories, as needed.

The fundamental principle for management of admitted patients was conservative treatment. Following a case report that indicated that Kaletra (Lopinavir/Ritonavir) would reduce the viral burden and shorten the symptomatic period if administered at the beginning of infection,\(^3\) it was selectively
TABLE I. Classification of Patients With Clinical Pathway

| Triage | Patient’s status | Ward allocation | Management |
|--------|-----------------|-----------------|------------|
| Red    | More than 1 of the following: | Ward available with temporary critical care | Mechanical ventilator  
1. Respiratory difficulty  
2. Oxygen saturation < 92%  
3. Severe bilateral pneumonia or pneumonia involving > 50% of total lung area | Antiviral agents  
Intravenous antibiotics  
Oxygen therapy  
Intravenous fluid therapy  
Anti-symptomatic drugs |
| Yellow | More than 1 of the following: | Ward available with oxygen therapy | Antiviral agent (as needed)  
Oral antibiotics  
Oxygen supply (as needed)  
Anti-symptomatic drugs |
| 1. Body temperature > 37.5°C  
2. Pneumonia involving > 1 lobe with respiratory symptom  
3. Old age, underlying predisposing conditions (diabetes mellitus, chronic lung disease, immunocompromised host, cardiovascular disease, etc.) | |
| Green  | All of the following: | General ward | Anti-symptomatic drugs |
| 1. Under 50-year-old  
2. No underlying predisposing conditions  
3. Afebrile  
4. No features of radiologic pneumonia for the Red or Yellow criteria | |
mild-severity patients who were at low risk of acute aggravation. However, 200 mild cases that accounted for 60% of total patients, who did not require hospitalized care and would have been better to be sent to the community treatment center nearby, had to be admitted and isolated in AFDH until they meet the criteria for discharge. Furthermore, 15 high-risk patients had acute aggravation from underlying conditions. They should have been priority allocated to advanced medical facilities. A pandemic of a novel infectious disease can easily devastate the local public health system, and it is therefore essential to evaluate patients’ severity and risk before assigning them to an appropriate medical facility to minimize transfer. In addition, it is important to maintain mutual communication between the public health authority and medical facilities with regard to admitting patients based on prior knowledge of capabilities and limitations of each facility.

Preparation for Sophisticated Medical Treatment
There were two cases of hospital-acquired pneumonia (HAP), including one patient who needed to be transferred to an advanced hospital. The treatment for HAP is based on broad-spectrum antibiotics considering the risk of multidrug-resistant pathogens. Since AFDH have mainly focused on outpatient-based treatment for young soldiers, the equipment was incapable of handling blood and sputum samples from confirmed patients and it was impossible to perform specific treatment for HAP including broad-spectrum antibiotics such as carbapenems. It is crucial to be prepared for the treatment of HAP when it comes to treat severe viral pneumonia. Furthermore, the consideration of potentials for acute aggravation of underlying medical conditions is also needed. A hyperglycemic crisis can occur among diabetes mellitus patients; chronic obstructive pulmonary disease can be exacerbated because of viral infection. Therefore, risk factors such as acute aggravation of underlying predisposing conditions must be considered.

Precautious Consideration on Use of Novel Treatments
There is no proven treatment for COVID-19 so far. Initial clinical trials focused on the potentiality of Lopinavir/Ritonavir or Hydroxychloroquine. From the 31 patients to whom Lopinavir/Ritonavir was administered, several patients experienced difficulties of oral intake such as nausea and vomiting because of side effects, accompanied by dehydration and electrolyte imbalances, and therefore required additional treatment. Specific consideration is needed for drug–drug interaction in patients with underlying predisposing conditions. The hospital should be prepared for an appropriate response to possible adverse reactions of experimentally used drugs. If it is determined not to have enough readiness, it should be considered in precaution to use novel treatment experimentally, to prevent causing any harm to the patients.

Requirement for Sufficient and Experienced Nursing Staff
Although we estimated 300 registered nurses as the minimum requirement initially, only 120 were deployed, of whom 75 were even newly commissioned nursing officers. The number of well-experienced nurses was only half of the total number nurses, and they also were required to take on the responsibility of educating inexperienced nurses. Therefore, the clinical management had to focus on reducing nursing burdens by minimizing blood sampling, prescribing oral drugs, and self-monitoring of patients. However, it was inevitable to have a situation with fatigued nursing staff because of the overwhelming number of patients and clinical deterioration of patients. As nonmedical assistant staff could not enter the contamination-zone to clean rooms or assist patients with eating, nurses had to also provide additional assistance in that regard, which led to a higher risk of exposure to infection.

The Importance of Psychiatric Intervention for Infected Patients
People with mental health disorders are generally more susceptible to infections, and there is a parallel epidemic of fear, anxiety, and depression during the COVID-19 pandemic. Patients who were confirmed with COVID-19 and admitted to the IDTFH had experienced acute stress reactions on account of enduring several situations such as being imprinted with the stigma of infection, and isolation from family and society. Some patients had also lost family members because of COVID-19. Medical staff were also in a high-risk group for psychiatric crisis from the perspective of disaster psychiatry. Therefore, establishing a psychiatric intervention team for patients and medical staff must be considered in any novel infectious disease future crisis.
CONCLUSION
There have been numerous studies on the importance of military assistance in times of crises, such as natural disasters. Although the ROK military medical personnel have been previously deployed to assist with the SARS, Ebola, and MERS outbreaks abroad and domestically, this is the first case of transforming a military hospital to the IDTFH and operating it in response to a public health crisis.

The AFMC of the ROK has proven that it can contribute immediately to overcoming a public health crisis by establishing a negative-pressured facility with 300 beds in just 1 week. The military have experienced several limitations while facing this new, invisible enemy and dealing with this pandemic crisis. The purpose of military assistance must be determined on the basis of the capability and limitation of military medical resources. Complete cooperation between the military, public health authority, and civilians is crucial to the proper management of public health crisis.

AFDH as an IDTFH was able to be rapidly created and securely operated because of sufficiently resourced and highly organized support by Armed Forces of ROK. Thus, this might not be applicable to other medical crisis in the various settings. Furthermore, we could not suggest the priority for medical supports though we presented several important lessons we learned. Sufficient experiences and further researches are needed to establish the principles of medical supports for national disaster by Armed Forces.

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CONFLICT OF INTEREST STATEMENT
None declared.

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