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EDITORIAL

Intensive care during the coronavirus epidemic

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In late December 2019, a cluster of patients with pneumonia of unknown cause was reported to local healthcare authorities, while a novel coronavirus (SARS-CoV-2) was identified as the etiology [1–3]. As of February 4, 2020, 20,471 confirmed cases, including 2788 severe cases and 425 deaths, were reported in China [4].

As a response to the epidemic, the local government had appointed several designated hospitals for patients with SARS-CoV-2 infection. Despite a common coping strategy for mass casualty (earthquake and blast injury) in China, SARI epidemic has proposed a new challenge for healthcare workers, especially intensivists. About 15–20% of suspected and confirmed patients with SARS-CoV-2 infection in fever clinics developed severe hypoxemia (since the second week of disease course), and required some form of ventilatory support such as high-flow nasal cannula, and non-invasive and invasive mechanical ventilation. In addition, other complications might occur, including, but not limited to, shock, acute kidney injury, gastrointestinal bleeding, and rhabdomyolysis. No antiviral agents have been proven to be effective against the coronavirus. Therefore, management of critically ill patients with SARS-CoV-2 infection still remains supportive rather than definitive, indicating remarkable workload for intensive care physicians and nurses. This surge of critically ill patients in designated hospitals as well as fever clinics represents urgent demands for intensive care with regards to space, supplies, and staff (Table 1) [5–8]. Response to these demands requires cooperation between the medical rescue team, infection control specialists, local health authorities, and center for disease control and prevention [9].

Another important strategy is the centralization of critically ill patients with SARS-CoV-2 infection, i.e., transfer of patients requiring intensive care unit (ICU) admission into some designated hospitals with adequate specialist services. Potential benefits of centralized provision of intensive care might include better and more efficient utilization of scarce resources, and improved clinical outcome [10]. However, these benefits should be balanced against the risk of inter-hospital transfer, delay in access to intensive care, and de-skilling of staff in other designated hospitals [10]. In addition, intensivists are also involved in the inter-hospital transfer such as design of transfer plan, patient screening and evaluation, and escort of patients.

Like any natural disasters, epidemics, or other kinds of mass casualties, local healthcare capacity became overwhelmed by the COVID-19 epidemic, which necessitated a request for external assistance at the national level [11]. As part of the national response to inadequate local intensive care resources, 31 deployed support medical teams including 598 intensivists and 2319 ICU nurses from other cities have been dispatched to ICUs of the designated hospitals since early January 2020. However, it is not uncommon for them to spend some time to get familiar with colleagues, environment, and local hospital administration before working as a team. Furthermore, different personal experience and lack of knowledge of this novel disease often result in different, and sometimes conflicting, treatment plans within the same team. Therefore, a national intensive care expert team has been developed, with some experts working in ICUs as attendings, while other more senior experts make regular inspections of all hospitals and fever clinics with critically ill patients

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Table 1 Demand for emergency mass critical care and possible solutions in designated hospitals during SARI epidemic

	Demands	Difficulties	Potential solutions
Space	Double or triple ICU beds to cope with the surge of critically ill patients requiring mechanical ventilation and other supportive care	Limited physical space with specific functionalities such as electricity, medical gas, and suction Not designed for infectious diseases spreading via respiratory droplets or contact	Post-anesthesia care unit and ED as primary backup space General wards with adequately ventilated rooms as secondary backup space after remodeling Infection prevention and control measures designed by infection control professionals
Supplies	Bedside monitors, ventilators, CRRT machine, ECMO, portable X-ray equipment PPE, such as N95 mask, googles, face shields, long-sleeved gowns, and gloves	Information about epidemic less predictable during the initial phase Information about patient characteristics unavailable during the initial phase	Provision of update and predicted estimates of the epidemic by public health authorities List of PPE and medical devices/equipment for stockpiling Prediction of supply based on patient volume, staffing, and real-time consumption of PPE
Staff	Staffing of the medical rescue team, including intensivists, intensive care nurses, and respiratory therapists	Lack of knowledge about infection control and prevention Heavy workload and associated risk of contamination Burnout	Training provided by infection control professionals Duration of every shift no longer than 6–8 h Preparation of reserve medical rescue team for substitution Psychological consultation for healthcare workers

CRRT continuous renal replacement therapy, *ECMO* extracorporeal membrane oxygenation, *ICU* intensive care unit, *PPE* personal protection equipment, *SARI* severe acute respiratory infection

with SARS-CoV-2 infection, providing consultation for some difficult cases, discussing strengths and weaknesses of the patient management strategy, and providing suggestions to the national and local health authorities. In addition, the volume of critically ill patients with SARS-CoV-2 infection has surpassed the intensive care supply for quite a long period of time, meaning that only a small proportion of critically ill patients could get access to intensive care services. Under these circumstances, patient triage and provision of essential rather than limitless intensive care would be very important [7].

Last, but not least, the COVID-19 epidemic has provided clinicians an opportunity to answer some important questions: is lopinavir/ritonavir or remdesivir effective against the SARS-Cov-2 infection? Does corticosteroid therapy improve lung injury in viral pneumonia? What is the effect of immune checkpoint inhibitors or thymosin in immunosuppression induced by the SARS-CoV-2 infection? There are some ongoing clinical trials in Wuhan and other cities in China, and we hope that results from these studies will help us to fight against the COVID-19 epidemic and other viral infections.

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Compliance with ethical standards

Conflicts of interest
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