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Letter to the Editor

Makeshift hospitals for COVID-19 patients: where health-care workers and patients need sufficient ventilation for more protection

Sir,

As of February 19th, the Chinese government has converted 13 large-scale public places in Wuhan City, Hubei Province into makeshift hospitals for patients in the coronavirus disease 2019 (COVID-19) with mild symptoms and such conversion will continue to contain the spread of the COVID-19 (Table I). However, insufficient ventilation in these makeshift hospitals may increase infection risk of opportunistic airborne transmission.

This was seen in the spread of Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) [1], similar to the current novel coronavirus (SARS-CoV-2). According to the regulations in Hubei Province, the exhaust air volume in ventilation systems for makeshift hospitals is approximately 150 m³ per hour per person now [2], much lower than the guideline of 288 m³ per hour per person advised by World Health Organization (WHO) for infection control in health care for natural or mechanical ventilation system [1].

Opportunistic airborne transmission usually occurs during aerosol-generating medical procedures, but a nurse wearing protection equipment was infected with SARS-CoV by the airborne virus generated from patient's coughing during treatment [3]. Although the transmission potential of SARS-CoV-2 by coughing is still unclear, 1716 health-care workers have been infected with SARS-CoV-2 and the protection for health-care workers in these makeshift hospitals is urgent [4]. Personal protective equipment and sufficient resting time may be the basic procedure.

Table I

Information about makeshift hospitals in Wuhan from 236 news articles collected by Health Knowledge Graph for COVID-19* and Health Commission of Hubei Province until February 19th [5]. Values in yellow represent numbers of beds provided by makeshift hospitals on the first day of patient admission, values in red represent numbers of patients, and values in blue represent numbers of health-care workers

Temperature (°C)		Date\NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	...
minimum	maximum															
5	15	5-Feb	800	1600												
3	6	6-Feb	2337													
1	5	7-Feb			2000											
1	9	8-Feb														
2	14	9-Feb	465	1400	1100											
			>235 per day		>700											
5	11	10-Feb			1213											
5	11	11-Feb	437			305	1000	300								
			520			>130										
6	14	12-Feb		>1500					720	1100						
										340						
										650						
			3971													
			4966													
12	18	13-Feb						80			400					
			5208													
4	16	14-Feb	550							685	718					400
			>500													50
			240 per day**													>206
-2	4	15-Feb														
-2	8	16-Feb														
-1	12	17-Feb								1000				805	990	932
4	13	18-Feb					992									
							778									
2	15	19-Feb									>300					
...														?

* An information collection and evaluation system developed by the group of Prof. Bin Xu from Tsinghua University (website address: edukg.cn/fy).

** The number includes hospital cleaners.

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On the other hand, the patients may also contract other diseases in the hospitals when they are being treated for COVID-19. This cross-contamination of patients should also be prevented and is also closely related to ventilation conditions inside the hospitals.

Therefore, the ventilation rates in makeshift hospitals should be increased to as high as the system can support. With more ventilation, current low outdoor temperature will increase the need for heating inside the hospitals. Air conditionings and electric blankets are necessary to keep the patients warm. There remain challenges in energy consumption to exhaust such high-volume air for hundreds of people, and risks in potential unventilated zones in the large space buildings. An alternative to increasing dilution of contaminated air is to use air purifiers to reduce the possible virus-laden aerosols. And all the filters should be collected and disposed as medical waste or disinfected thoroughly to prevent secondary contamination.

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Authorship

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- (1) Chen Chen drafted the manuscript.
- (2) Bin Zhao designed the conception, and revised the manuscript for the important intellectual content.

Conflict of interest statement

None.

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