

TO THE EDITOR:

A report of clustered COVID-19 in a hematology ward

Yaohui Wu,* Fang Liu,* Yun Fang, Xuan Lu, Yingying Wu, Linghui Xia, and Mei Hong

Institute of Hematology, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China

A novel coronavirus resulted in an outbreak of COVID-19 in China and has rapidly become a global pandemic due to its very high infectivity. Patients with hematologic diseases, especially malignancies, are more susceptible to infection than the general population because of their systemic immunosuppressed state caused by the underlying disease with neutropenia, lymphopenia, and impaired innate and adaptive immunity, as well as the impact of chemotherapy and other immunosuppressive therapies.^{1,2} Patients with hematologic malignancies may therefore be at increased risk of COVID-19 infection and have a poorer prognosis. These patients may also spread the virus more efficiently due to increased viral loads and slow clearance of infection. We report here a cluster of COVID-19 infections within a hematology ward in Wuhan, China, the initial center of the epidemic, that involved 2 rooms, 6 patients, 5 nurses, and 1 doctor.

Between 16 January and 23 January 2020, we investigated 14 persons, including 6 patients, 6 nurses, and 2 doctors with fever or respiratory symptoms in 1 hematology ward of Union Hospital, Wuhan, China. COVID-19 was diagnosed on the basis of the World Health Organization interim guidance.³ A confirmed case of COVID-19 was defined as a positive result on severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) reverse transcription polymerase chain reaction (RT-PCR) assay of nasal and pharyngeal swab specimens. Laboratory confirmation of COVID-19 was performed at the Wuhan Center for Disease Prevention and Control. Only laboratory-confirmed cases were included in the analysis. Although all symptomatic individuals had multi-focal ground-glass opacities on chest computed tomography scan, 1 doctor and 1 nurse were not included because of negative results on SARS-CoV-2 RT-PCR assay.

The health-care providers with COVID-19 included 1 doctor and 5 nurses, aged 23 to 37 years. One nurse had Hashimoto's thyroiditis (treated with thyroxine); the others had no preexisting conditions. The 6 patients with COVID-19 ranged in age from 14 to 54 years; 4 had acute lymphoblastic leukemia, 1 severe aplastic anemia, and 1 multiple myeloma. All hematology patients had received recent chemotherapy or immunosuppressive therapy. Four of 6 patients had neutropenia during the week before initial symptoms of COVID-19 appeared. Initial symptoms of all cases, including patients, the doctor, and nurses, occurred within an 8-day time span. The 6 hematology patients were all housed within 2 rooms in the same ward. The infected doctor and 5 nurses were the medical staff responsible for these patients.

The initial symptoms of the health-care providers were similar to those in the general population, including fever (mild to moderate), dry cough, diarrhea, and muscle aches. The patient group had higher fevers and dry cough. Participants with COVID-19 did not receive steroids or anti-inflammatory drugs to treat other symptoms, except for temperature control with anti-inflammatory drugs. Four of 6 patients developed dyspnea within 1 week and required oxygen. None of the health-care providers developed dyspnea. C-reactive protein levels were increased in all 6 hematology patients and 2 nurses with COVID-19. All the health-care providers had complete recovery and, other than bacterial super-infection in one, there were no other complications. In the patient group, 5 of 6 developed bacterial infections, and 2 developed liver dysfunction. Three of 6 patients survived, and 3 died, all of respiratory failure, hypotensive shock, and disseminated intravascular coagulation (Table 1). Of the 3 patients who died, patient 2, patient 4, and patient 5 died on day 23, day 21, and day 14 from illness onset, respectively. Secondary bacterial infections mainly occurred in the patient group. *Klebsiella pneumoniae* isolates were obtained from blood samples, and *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, and *Stenotrophomonas maltophilia* isolates were obtained from sputum samples.

Table 1. Clinical characteristics, initial symptoms, laboratory index, complications, and clinical outcomes of participants with COVID-19

Patient identifier	Sex	Age, y	Primary disease	Neutropenia during the week before initial symptoms				Initial symptoms				Laboratory				Complications					Outcomes					
				Yes	No	High	Mild/moderate	Dry cough	Diarrhea	Muscle soreness	CRP	Lymphocytes	Dyspnea within 1 wk	Respiratory failure	Hypo tension shock	Liver dysfunction	Coagulation disorder	Secondary bacterial infection								
																			Fever	Yes		No	Yes	No	Yes	No
Patient 1	F	35	B-ALL	Yes	No	Yes	No	Yes	No	Yes	No	↑	—	—	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Recovery
Patient 2	M	31	B-ALL	Yes	No	Yes	No	Yes	No	Yes	No	↑	—	—	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Death
Patient 3	M	51	SAA	Yes	No	Yes	No	Yes	No	Yes	No	↑	—	—	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Recovery
Patient 4	M	14	T-ALL	Yes	No	Yes	No	Yes	No	Yes	No	↑	—	—	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Death
Patient 5	F	54	MM	No	No	Yes	No	Yes	No	Yes	No	↑	—	—	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Death
Patient 6	M	27	B-ALL	No	No	Yes	No	Yes	No	Yes	No	↑	—	—	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Recovery
Doctor 1	M	37	No	No	No	Yes	No	Yes	No	Yes	No	↑	—	—	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Recovery
Nurse 1	F	29	No	No	No	Yes	No	Yes	No	Yes	No	↑	↓	↓	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Recovery
Nurse 2	F	25	No	No	No	Yes	No	Yes	No	Yes	No	↑	↓	↓	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Recovery
Nurse 3	F	30	No	No	No	Yes	No	Yes	No	Yes	No	↑	↓	↓	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Recovery
Nurse 4	F	32	HT	No	No	Yes	No	Yes	No	Yes	No	↑	—	—	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Recovery
Nurse 5	F	23	No	No	No	Yes	No	Yes	No	Yes	No	↑	—	—	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	↘	Recovery

—, lymphocyte variation of patients is not available for evaluation because of hematologic disease; B-ALL, acute B-lymphocytic leukemia; CRP, C-reactive protein; DIC, disseminated intravascular coagulation; F, female; HT, Hashimoto's thyroiditis; M, male; MM, multiple myeloma; SAA, severe aplastic anemia; T-ALL, acute T-lymphocytic leukemia.

This report of a cluster of COVID-19 infections in a hematology ward over a short time period shows characteristics of spread of a respiratory infectious disease. The secondary attack rate, defined as the probability that an infection occurred among susceptible people within a specific group, can provide an indication of transmission risk from interactions. COVID-19 reportedly has a very high secondary attack rate among close contacts, up to 35% of short-term exposure events.⁴ In our cluster, 12 persons in the same ward within 8 days developed COVID-19. There were a total of 12 patients, 10 nurses, and 3 doctors in a ward of 4 rooms. It shows the strong infectivity of COVID-19 in a hematology ward.

In our experience, the health-care providers had clinical characteristics and outcomes similar to those of the general COVID-19 population.⁵ However, COVID-19 is a highly dangerous infection for hematology patients, particularly after chemotherapy or immunosuppressive therapy. Initial symptoms, such as fever and dry cough, cannot be distinguished from other infectious and noninfectious complications caused by the primary disease and its treatment, resulting in failure to promptly diagnosis COVID-19. One-half of the patients had multiple complications and organ system failure leading to death. Patient 6, who had no complications and recovered quickly from COVID-19, was in remission from his underlying disease and did not have marrow suppression from chemotherapy at the time of infection. We believe that extreme measures to protect hematologic patients from COVID-19 are required, and postponement of chemotherapy for stable blood cancer patients should be considered in endemic areas.

Standard infection control procedures play an essential role in preventing the nosocomial spread of COVID-19. We applied preventive methods, including quarantine of patients, disinfection of the ward area, active and early surveillance, strict hand hygiene, and contact and droplet isolation. Treatment strategies were also adjusted to reduce the risk of SARS-CoV-2 infection. For patients with stable disease, we deferred chemotherapy and imposed a watch-and-wait strategy. For patients in need of urgent treatment, oral chemotherapy or targeted agents were substituted whenever possible. This clustered COVID-19 event occurred at the beginning of the epidemic in Wuhan. After that, no further infections occurred in the hematology ward.

*Yaohui Wu and F.L. contributed equally to this work.

Contribution: M.H. was responsible for conception and design; M.H., L.X., Y.F., and X.L. were responsible for provision of patients; Yingying Wu, X.L., and Y.F. collected and assembled the data; M.H. and F.L. analyzed and interpreted the data; Yaohui Wu, F.L., and M.H. wrote the manuscript; and all authors provided final approval of the manuscript.

Conflict-of-interest disclosure: The authors declare no competing financial interests.

Correspondence: Mei Hong, Institute of Hematology, Union Hospital, Tongji Medical College, Huazhong University of Science and Technology, 1277 Jiefang Ave, Wuhan 430022, China; e-mail: meihongcncn@aliyun.com.

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DOI 10.1182/bloodadvances.2020001982

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