What patients “see” doctors in online fever clinics during COVID-19 in Wuhan?

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ABSTRACT

Objective: In December 2019, coronavirus disease 2019 (COVID-19) occurred in Wuhan, China. Online fever clinics were developed by hospitals, largely relieving the hospital's burden. Online fever clinics could help people stay out of crowded hospitals and prevent the risk of cross infections. The objective of our study was to describe the patient characteristics of an online fever clinic and explore the most important concerns and question of online patients.

Materials and Methods: Our study extracted data from fever clinic records in medical information systems from January 24 to February 18, 2020 in a tertiary hospital in Wuhan. We described the characteristics of patients in fever clinic, then we extracted and classified questions of patient consultations through the online fever clinic dataset.

Results: For the 64,487 patients who attended the online fever clinic, the average age was 30.4 years, and 37,665 (58.4%) were female patients. The current state of patients from online were home without isolation (52,360 [81.2%]), home isolated (11,152 [17.29%]), and outpatient observation (975 [1.51%]). From the 594 patient questions analyzed, confirming diagnosis and seeking medical treatment account for 60.61% and 38.05%, respectively, followed by treating (25.59%), preventing (4.38%), and relieving anxiety (1.68%).

Discussion: Online fever clinics can effectively relieve patients' mood of panic, and doctors can guide patients with suspected of COVID-19 to isolate and protect themselves through online fever clinic. Online fever clinics can also help to reduce the pressure of hospital fever clinics and prevent cross infection.

Conclusions: This study indicated the importance of online fever clinics during the COVID-19 outbreak for prevention and control.

Key words: COVID-19, consumer health informatics, online health, online fever clinic, descriptive research

INTRODUCTION

In December 2019, an increasing number of cases of novel coronavirus–infected pneumonia occurred in Wuhan, Hubei Province, China.1–3 On January 7, 2020, Chinese authorities confirmed that a new type of coronavirus, tentatively named by World Health Organization as coronavirus disease 2019 (COVID-19), had caused the outbreak.2,4 This disease was linked to a seafood and wet animal wholesale market in Wuhan.5 Existing evidence has shown that the COVID-19 could be transmitted from human to human because of
close contact.6–9 Even the Chinese health authorities took prompt public health measures, including intensive surveillance, epidemiological investigations, and closure of the market on January 1, 2020, and Wuhan has been in lockdown since January 23, the disease has rapidly spread from Wuhan to other areas. On January 30, 2020, the World Health Organization declared a public health emergency of international concern over the global outbreak of COVID-19.11 As of May 5, 2020, a total of 84 404 COVID-19 cases in China have been confirmed. In 213 other countries, a total of 3 432 941 COVID-19 cases have been reported.12

Owing to the lack of effective therapies or vaccines for COVID-19,1 the rapid spread of the disease has caused panic, and people are anxious to seek medical help if they have a fever or flu-like symptoms. This panic caused overcrowding in many hospitals in Wuhan with fever clinics. However, there have been many cross-infection cases at hospitals where people running a fever and having common cold flooded in out of concern and were infected by the new coronavirus.

Fortunately, in recent years, China’s healthcare industry has made a series of significant improvements, and the use of information and communication technologies to provide remote health services has become increasingly popular.13 To relieve the pressure of hospital fever clinics and prevent cross infection, online fever clinics, an Internet-based clinic system, have been utilized by hospitals and third-party service platforms. In total 18 hospitals and platforms provided online fever clinics between January 24th and February 9th, such as JD Online Healthcare (https://care.jd.com/sh/home) and the WeDoctor website (www.guahao.com). On January 24, 2020, Wuhan Tongji Hospital became the first public tertiary hospital to provide online fever clinics aims to help people stay out of crowded hospitals and reduce the risk of further infections. People could obtain appointment diagnosis services through hospitals’ APP (Mobile Tongji Hospital) and Tongji hospitals’ WeChat public platform. This study aims to describe the characteristics of online fever clinic patients during COVID-19 prevention and control, and explored the most frequent questions of online patients.

MATERIALS AND METHODS
Research context and available data
We drew data from the Wuhan Tongji Hospital in Central China. This 5500-bed hospital is a tertiary referral hospital that covers more than 60 million people and serves patients from all over the country.14 Tongji Hospital has become the designated hospital in Wuhan for the centralized treatment of severe COVID-19 patients. Meanwhile, Tongji Hospital was the first public tertiary hospital to provide online fever clinics in Tongji Hospital. Third, we classified the questions of patient consultations through the online fever clinic, and in order to give a comprehensive understanding of patients’ concerns, we also described the characteristics of in-person fever clinic patients’ diagnostic results.

RESULTS
Characteristics of online fever clinic patients
In order to give a comprehensive assessment of the patient numbers in fever clinics, we used the initial dataset (including 78 219 online fever clinic and the records of 18 518 in-person fever clinic before we removed the invalid samples) to plot a line chart. From Figure 1, a drop can be witnessed from January 24 (n = 10 577) to February 18 (n = 438). As for an in-person fever clinic, the number of patient number at in-person fever clinics has been stable at around 700 between January 24 and February 18. In order to prevent the spread of COVID-19, Wuhan was closed on January 23, but various policies and safeguards were not immediately followed up, which led to the lack of medical resources in Wuhan. The hospital was overcrowded, and it was difficult for patients to go in person to the hospital to get medical treatment, so patients started seeking medical services through the online fever clinic. With the initial control of the epidemic, the patient numbers in the online fever clinic gradually decreased.

From Table 1, our study included 64 487 patients with complete records of online consultations through the Tongji Hospital online fever clinic. For those patients, the average age was 30.4 years, and 37 665 (58.4%) were female patients, and the age groups (≤15, 16–30, 31–45, 46–60, and >60 years of age) account for 2.1%, 52.5%, 39.2%, 5.5%, and 0.7%, respectively. The current state of patients from the online fever clinic were home without isolation (52 360 [81.2%]), home isolated (11 152 [17.29%]), and outpatient observation (975 [1.51%]), with hospitalization and concentrated isolated were not included (Table 1). The possible reason for this situation is that the role of online consultation is mainly to understand and judge the condition, which is usually a preconsultation for in-person fever clinic consultation. The number of patients from the online clinic who had Wuhan exposure was 34 478 (53.47%), and there were only 199 (0.3%) online fever clinic patients with Huanan seafood wholesale market exposure. The waiting time is the amount
patients need to wait for the doctor, with an average waiting time of 7.19 hours, as the number of patients was very large and doctor resources were limited, and thus many patients were not able to get an assessment. The average consultation time was 1.21 hours, and the average total time for patients to consult online, including the waiting and consultation time, was 8.41 hours.

The main symptoms self-described by patients from the online fever clinic were fever (26,975 [41.83%]), cough (22,965 [35.61%]), pharyngalgia (17,120 [26.55%]), headache (12,562 [19.48%]), runny nose (10,728 [16.64%]), expectoration (10,208 [15.83%]), chest distress (8,562 [13.28%]), and abdominal pain (7,238 [11.22%]). It can be seen that patients from the online fever clinic had more than 1 symptom and were more likely to ask for consultation and help because of some major symptoms. Also, the doctor in the online fever clinic had the COVID-19 diagnosis and treatment plan and related diagnosis and treatment guidelines issued by the National Health Commission of the People’s Republic of China, which stated that if the patient in the online fever clinic had a fever, and other symptoms such as headache, runny nose, cough, gasping, chest tightness, diarrhea, nausea, and vomiting, and had a history of epidemiological exposure, they were to be advised to immediately visit a fever clinic and wear a mask for protection.

Online fever clinic consultations of patient concerns

We further explored the number and proportion of question categories for patients in online fever clinics. The sample size was 594, and a patient’s query can have multiple intents, it could be classified into more than 1 category, so the sum of proportion is not 1. Confirming diagnosis is primarily associated with some symptoms appearing to the patients as COVID-19. Seeking medical treatment contains a series of questions that based on the current situation of the patient, should they take measures to go to the hospital or isolation? Treating concerns regards whether patients should pay attention to diet and medication when they feel any physical discomfort in this spe-
I have been home from Wuhan for four days. What is my temperature abnormal because of infection or menstruation, or I didn’t take a good rest last night? Still caused by diarrhea? I’m so worried now. I have a fever for two days, and my throat is irritated. What should I do? Should I stay at home or go to the hospital for a chest radio graph? I have been home from Wuhan for four days. What medicine should I take for this symptom? At present, according to the treatment plan in Photo 2, I have made a tea drink, taken pharyngitis tablets and cough tablets for cough, do I need other operations or take other medicine? I had Wuhan exposure briefly 14 days ago, and have no symptoms to this day. May I ask if I am still in the incubation period? What precautions will be taken in the next day? I have a fever for two days, and the highest temperature is 37.5°C. Taking the medicine orally can lower the temperature. When I came into contact with a person from epidemic area, he had been away from Wuhan for a month (Over the incubation period of 14 days), and he has no symptoms to this day. May I have the possibility of infection?

From Table 4, the study also reported the characteristics of 16 537 in-person fever clinic patients in Tongji Hospital in order to provide a comprehensive picture. For these patients, the average age was 49.2 years, and 8471 (51.2%) were female patients. The 5 age groups accounted for 0.5%, 10.6%, 30.4%, 32.6%, and 25.9%, respectively. The diagnostic results of patients from the in-person fever clinic were fever (7589 [45.9%]), pulmonary infections (4254 [25.72%]), cough (1172 [7.08%]), viral pneumonia (838 [5.07%]), and others (2684 [16.23%]). Others included a number of conditions causing discomfort that were excluded from the previous diagnostic results. Confirmed viral pneumonia accounted for a relatively small proportion. Patients diagnosed with viral pneumonia just can be served as suspected COVID-19 or flu or another infection, and they need further testing.

DISCUSSION

We investigated the importance of online fever clinics during COVID-19. By using data from Tongji Hospital, we explored the characteristics of patients from an online fever clinic and sought to better further understand the questions and patient concerns in online fever clinics. As of February 18, 2020, the 64 487 online fever clinic patients were included in this study; 1.51% were outpatient observations, 17.29% were isolated at home, and 81.2% were at home and were not isolated. Compared with patients from the in-person fever clinic, online patients were younger (average age 30.4 years vs 49.2 years) and more likely to report multiple signs and symptoms.

Our study indicated that the online fever clinics can effectively relieve patients’ mood of panic. A previous study had suggested that rapid person-to-person transmission of COVID-19 may have occurred. This fact caused panic among the general public. From the characteristics of online patients, most patients’ current state was home without isolation (52 360 [81.2%]), and those patients seeking medical services due to a mood of panic. Through online fever clinics, patients can communicate directly with the doctor at home, thereby helping them have a better understanding of their own health status and relieve their panic. In this study, most patients did not have the main symptoms of COVID-19 demonstrated in the diagnostic results. Confirmed viral pneumonia accounted for a relatively small proportion. Patients diagnosed with viral pneumonia just can be served as suspected COVID-19 or flu or another infection, and they need further testing.

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many COVID-19 patients with a history of Huanan Seafood Wholesale Market exposure had already been identified by the relevant authorities.

During the continuation of the COVID-19, many hospitals in Wuhan that provided fever clinics were overcrowded. From January 24 to February 18, 2020, there were 78,219 patients who consulted with doctors through the Tongji Hospital online fever clinic. Online fever clinics can effectively assist in-person fever clinics and play an important role in diverting patient load from in-person fever clinics, helping to reduce the pressure at in-person fever clinics and reducing the possibility of cross infection. Through an online fever clinic, some patients who are not COVID-19–positive can get corresponding diagnosis and treatment advice at home, avoiding the risk of infection from attending the in-person fever clinic. At the same time, the in-person fever clinic can focus on the COVID-19–positive patients, which helps the fever clinic to efficiently treat the patients with COVID-19 and maintains the normal order of medical treatment in the hospital.

As for patient concerns, confirming their diagnosis was the most common concern in online fever clinic consultation, followed by seeking medical treatment (38.05%). However, the assessment of the doctors was that the vast majority of the patients had simply panicked. Some patients had ordinary fever, common cold, or just underlying illnesses. Many people were vulnerable to the common flu in winter, but they thought that they were infected by the new virus, and thus many patients sought an online consultation due to the panic; most online patients did not have the suspected symptoms of COVID-19. For patients suspected of having COVID-19, doctors could guide them to isolate and protect themselves through the online fever clinic, and also advise them to go to the hospital as soon as possible. In order to control the epidemic as soon as quickly, many cities in China have begun to regulate traffic. This may lead to difficulties for patient living in areas with limited medical resources; however, the online fever clinic can overcome geographical boundaries and provide effective access to medical services for patients with suspected of COVID-19 in rural and remote areas. Owing to their particularity, online fever clinics can also help to relieve the pressure of medical personnel and supplies while reducing the pressure on the in-person fever clinic.

Limitations
First, the data used in this study were provided by 1 specific hospital. The representation of patients in online fever clinic may be limited. Also, owing to the limitation of data collection time, we did not confirm the future health status of the patients with suspected of COVID-19. Also, our understanding of the symptoms of COVID-19 has evolved substantially since January 2020, and current diagnostic guidelines are likely more accurate.

CONCLUSION
We used the dataset from Tongji Hospital and explored the characteristics of patients in an online fever clinic; we subsequently explored the questions and most concerns of online clinic patients. We found that compared with patients from in-person fever clinic, the patients from the online fever clinic were younger and more likely to report multiple signs and symptoms. However, most patients in the online fever clinic were not considered to have obvious symptoms of COVID-19. We also indicated the importance of online fever clinics in supporting COVID-19 prevention and control, especially as the number of cases rapidly expanded.

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AUTHOR CONTRIBUTIONS
GL, GF, YC, and ZD discussed and designed the study. GL, GF, and ZD participated in data analysis. GF and ZD performed the statistical analysis and drafted the manuscript. GL, YC, and ZD helped to revise the draft. All authors read and approved the final manuscript.

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CONFLICT OF INTEREST STATEMENT
None declared.

REFERENCES
1. Wang D, Hu B, Hu C, et al. Clinical characteristics of 138 hospitalized patients with 2019 Novel coronavirus–infected pneumonia in Wuhan, China. JAMA 2020; 323 (11): 1061–9.
2. Lu H, Stratton CW, Tang Y-W. Outbreak of pneumonia of unknown etiology in Wuhan China: the mystery and the miracle. J Med Virol 2020; 92 (4): 401–2.
3. Paules CI, Marston HD, Fauci AS. Coronavirus infections—more than just the common cold. JAMA 2020; 323 (8): 707–8.
4. World Health Organization. Novel coronavirus 2019. https://www.who.int/emergencies/diseases/novel-coronavirus-2019 Accessed February 12, 2020.
5. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. N Engl J Med 2020; 382 (8): 727–33.
6. Li Q, Guan X, Wu P, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. N Engl J Med 2020; 382 (13): 1199–207.
7. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. Lancet 2020; 395 (10223): 497–506. doi: 10.1016/S0140-6736(20)30183-5.
8. Chan J-W, Yuan S, Kok K-H, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. Lancet 2020; 395 (10223): 519–24.
9. Phan LT, Nguyen TV, Luong QC, et al. Importation and human-to-human transmission of a novel coronavirus in Vietnam. N Engl J Med 2020; 382 (9): 872–4.
10. Huo DS, Ashar EJ, Madani TA, et al. The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health—The latest 2019 novel coronavirus outbreak in Wuhan, China. Int J Infect Dis 2020; 91: 264–6.
11. IHR Emergency Committee on Novel Coronavirus (2019-nCoV). https://www.who.int/dg/speeches/detail/who-director-general-s-statement-on-ihr-emergency-committee-on-novel-coronavirus-(2019-ncov) Accessed February 14, 2020.
12. COVID-19 situation reports. https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports Accessed May 6, 2020.
13. Zhang X, Lai K, Guo X. Promoting China’s mHealth market: a policy perspective. Health Policy Technol 2017; 6 (4): 383–8.
14. Tongji Hospital. About TJH. https://english.tjh.com.cn/About-TJH/index.shtml Accessed October 30, 2019.