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Original Article

Hospital emergency management plan during 2019 novel coronavirus (SARS-CoV-2) pandemic in non-epidemic areas

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Abstract: The outbreak of the acute respiratory syndrome coronavirus 2 has spread around the world and poses a challenge to clinical frontline nursing staff. In the early stage of the epidemic, our hospital responded promptly and added pertinent prevention measures on the basis of the existing fever clinic (FC) to ensure zero infection of medical staff and patients. The experience of the fever screening site establishment, epidemiologic investigation procedure amelioration, and integrated fever management will be introduced in the communication.

Keywords: Emergency department, hospital management, COVID-19

Introduction

The ongoing pandemic of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections has led to more than 4,692,797 cases and 195,920 deaths globally as of April 25, 2020 [1]. The pathogen of 2019 novel coronavirus, was confirmed to have human-to-human transmission [2]. Therefore, the spread of the epidemic has brought tremendous pressure to medical institutions. It also has posed a great challenge to clinical frontline nursing staff. Under the circumstance, the Centers for Disease Control and Prevention (CDC) of the US recommended qualified personal protection equipment (PPE) for healthcare workers fighting SARS-CoV-2, including the use of gloves, protective clothing, N95 masks, and protective screens [3]. However, this protective equipment is not commonly used in clinical practice, so there was no larger reserve to meet the needs of all emergency doctors and nurses. A fever clinic (FC) was established to avoid cross-infection among emergency patients. The Fever-respiratory Outpatient Disease Clinic (abbreviated as Fever Clinic) is a rescue mode of screening and diagnosis of infectious diseases. It was initiated by the instruction of the State Ministry of Health in 2003 when SARS broke out in China [4, 5]. The purpose of Fever Clinic (FC) is to achieve early detection, isolation, and reporting [6], which play a significant role in preventing the spread of virus, cross-infection and ensuring the safety of patients and emergency medical staff. The routine medical procedures may cause some fever patients to enter the emergency area by mistake, increasing the risk of infection of emergency medical staff and other patients. So in the early stage of the epidemic, our hospital responded promptly and carried out pertinent prevention measures on the basis of the existing FC to ensure zero infection of medical staff and patients. According to reports, up to now, using our hospital's improved new management system for new pneumonia, zero infection of medical staff and patients has been achieved. Now we will introduce the experience as follows.

First, the fever screening site was established. The Emergency Department (ED) is the most advanced department for the treatment of numerous critical patients. From January 2019 to

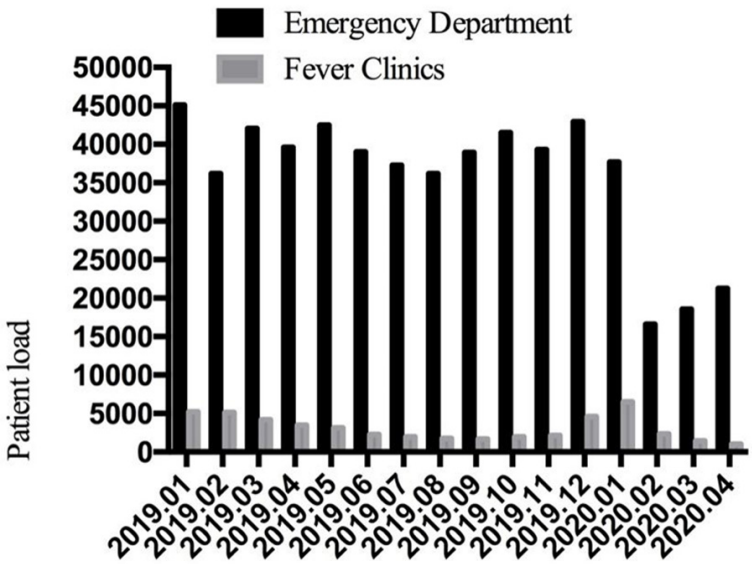

Figure 1. Monthly visits to the emergency department and fever clinic in our hospital.

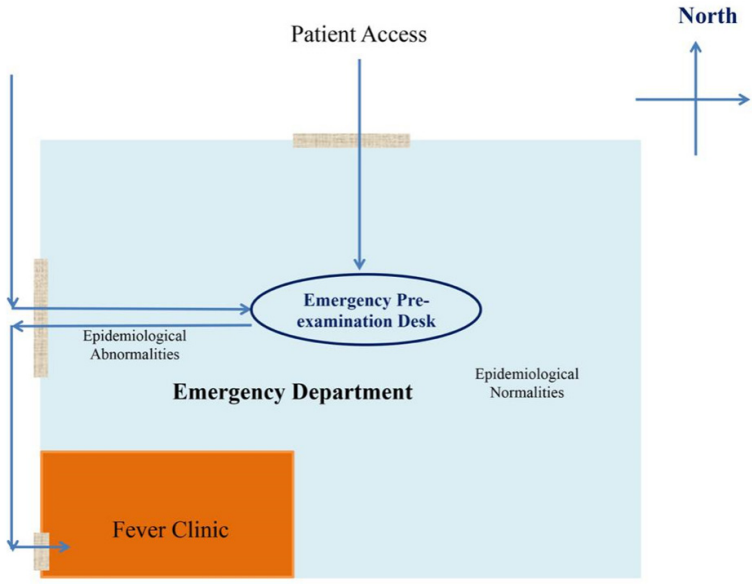

Figure 2. Original mode of all patients entering ED for screening.

March 2020, the monthly visits to the ED and FC in Changhai hospital are shown in **Figure 1**.

The excessive workload increased the risk of cross-infection between doctors and patients. Therefore, it was particularly important to improve the original mode of direct admission of all patients to the emergency room for screening (**Figure 2**), and to advance the screening process for fever (**Figure 3**). In the original mode, patients could go to the pre-examination desk directly. If the patient was infected with SARS-CoV2, this patient would infect other patients at the pre-examination desk, and the possibility of causing nosocomial infection is very high. Moreover, many patients evaluated at the pre-examination desk are injured or weak, with poor immune resistance, which further increases the risk of the spread of the epidemic. The establishment of fever screening sites can screen out patients with anomalous epidemiologic history effectively, guide patients to FC directly, and decrease the risk of cross-infection caused by suspected patients hanging in the emergency room, which helps insure the safety of patients at the pre-examination desk.

There are two paths for patients to enter the emergency department. Both paths pass through the pre-examination desk for preliminary disease diagnosis and evaluation. Two areas are set in the emergency department: fever clinic (shown in orange rectangle) and emergency pre-examination desk (shown in oval); the others are functional areas of the emergency room. Arrow line shows the patients' treatment routine, and both fever screening and routine referral are conducted at the pre-examination desk. At the pre-examination desk evaluation, if the patient has a fever, he/she will go to the fever clinic. If the temperature is normal, the patient will be told to go to the corresponding functional clinic.

One of the two entrances was closed to confirm the unidirectional channel. Two areas were set in the emergency department: fever clinic (shown in orange rectangle) and emergency pre-examination desk (shown in oval). The

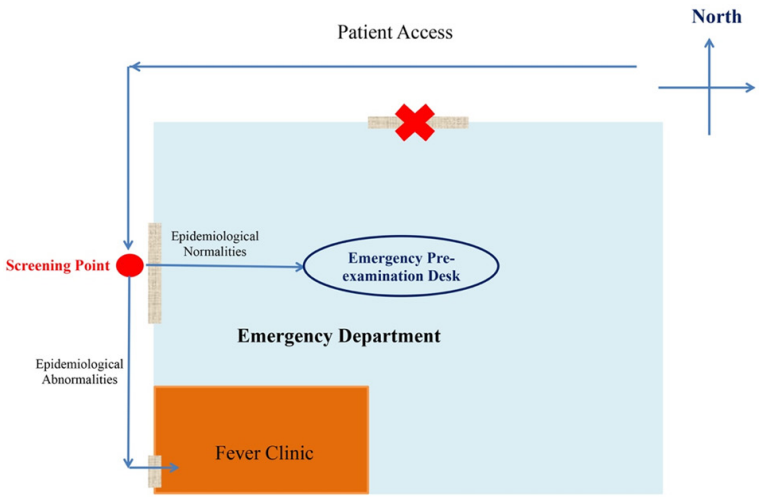

Figure 3. Modified entry to the ED for fever screening.

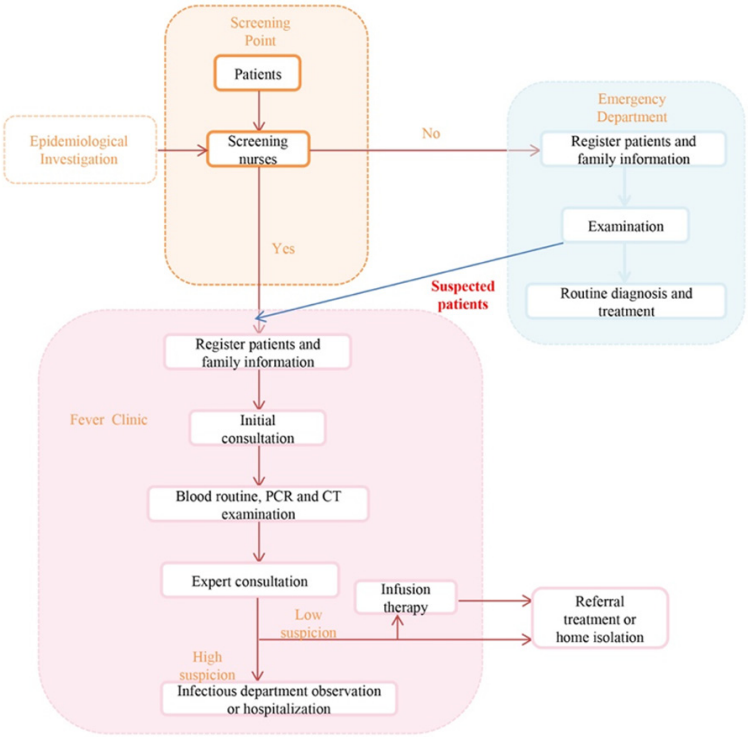

Figure 4. Flowchart of epidemiologic investigation.

others are functional areas of the emergency room. Arrow line shows the patients' treatment routine, screening point (shown in red circle) was set forward outside the emergency department. Patients who were detected with epidemiological abnormalities were sent to the fever clinic directly, and the others were evaluated at the pre-examination desk normally.

Second, the epidemiologic investigation procedure was ameliorated. Comprehensive epidemiologic investigation played a positive role in the screening of patients and their families. The screening point at our hospital contains two entry screening and information registration areas for all personnel. The first step is to use the screening evaluation sheet designed by us to evaluate the patients (Supplementary 1). The patients and their families should report whether there is any suspected situation. If there is any suspected situation, they will be guided to the FC. The second step is to use information technology to query the patient's travel trajectory within 14 days. Those who had abnormal trajectories need to be directed to a FC for screening. The third step is information registration. Whether entering the ED or FC, the contact information and identity of the patient and their family members need to be registered in order to conduct epidemiologic investigations on people likely to be infected in the future. The flowchart of epidemiological investigation is shown in **Figure 4**.

Third, integrated fever management was implemented. Once the patients visited the fever clinic, all suspected patients' charges, diagnosis and treatment were completely carried out in the fever clinic before they were completely excluded. The FC basically includes a Toll Office, a Clinic Room, a Laboratory, a Radiology Department, a Treatment Room, and an Infusion Room. In the early stage of the outbreak, due to the accuracy of chest CT for diagnosis, a CT Examination Room for suspected patients affiliated with the fever clinic was prepared. The full-time medical staff was arranged for inspec-

tion, escort, and disinfection during the CT examination.

As a result of the increasing infusion volume of fever outpatients, the original fever infusion room could not meet the needs. A special area was set up for transfusion of fever patients to accomplish physical isolation from the ordinary transfusion patients. The space between the seats of fever infusion room was ensured to be greater than 1.5 m. Meanwhile, a special nursing station was set up in the new fever infusion room, which was equipped with an information infusion system to meet the treatment demand. Integrated fever management can help to completely distinguish suspected patients from emergency patients, and effective physical isolation can ensure the safety of all patients.

By retrospectively reviewing reports, we found that most of the hospital's relevant protective materials inventory could not meet the requirement of one week's epidemic prevention work [7]. Although large-scale hospitals urgently carry out procurement, the impact of complex factors puts pressure on procurement [8]. Therefore, with our limited protection resources, it was imperative that we should rescue patients to the greatest extent, block the transmission routes, and avoid cross-infection of medical staff and patients. Our hospital set up fever screening points to screen out suspected fever patients; established a complete epidemiological investigation and registration system to provide real and objective epidemiological data for later CDCs investigation; and adopted integrated fever management. This can centralize treatment and management in the fever clinic, allow physical isolation from general emergency patients, and avoid cross-infection between patients. We believe that effective procedures can resolve the dilemma of insufficient materials, and better demonstrate the flexibility of the management in our hospital. In conclusion, a reasonable emergency layout can effectively save protective items, avoid cross-infection, and ensure timely treatment of patients.

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Disclosure of conflict of interest

None.

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Screening Evaluation Sheet

1. Have fever or respiratory symptoms? Yes/No

2. Within 14 days before the onset of the disease, there is a history of residence/travel in the Wuhan area and surrounding areas, or from a community with a case report? Yes/No

3. Within 14 days before the onset of contact with patients from Wuhan or surrounding areas, or have reported cases of fever or respiratory symptoms in the community? Yes/No

4. Focused onset? Yes/No

5. History of contact with patients with 2019 Novel Coronavirus (SARS-Cov-2)? Yes/No

6. Is it from or through countries with serious epidemics such as the United States, Italy, France, and Germany? Yes/No