Nursing management at a Chinese fever clinic during the COVID-19 pandemic

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\textbf{Background:} The rampant spread of the novel coronavirus disease (COVID-19) has assumed pandemic proportions across the world. Attempts to contain its spread have entailed varying early screening and triage strategies implemented in different countries and regions.

\textbf{Aim:} To share the experience of scientific and standardized management of fever clinics in China, which provide the first effective checkpoint for the prevention and control of COVID-19.

\textbf{Introduction:} A fever clinic was established at our hospital in Tianjin, China, for initially identifying suspected cases of COVID-19 and controlling the spread of the disease.

\textbf{Methods:} The management system covered the following aspects: spatial layout; partitioning of functional zones; a work management system and associated processes; management of personnel, materials and equipment; and patient education.

\textbf{Results:} Within two months of introducing these measures, there was a comprehensive reduction in the number of new COVID-19 cases in Tianjin, and zero infections occurred among medical staff at the fever clinic.

\textbf{Discussion:} The fever clinic plays an important role in the early detection, isolation and referral of patients presenting with fevers of unknown origin. Broad screening criteria, an adequate warning mechanism, manpower reserves and staff training at the clinic are essential for the early management of epidemics.

\textbf{Conclusion:} The spread of COVID-19 has been effectively curbed through the establishment of the fever clinic, which merits widespread promotion and application.

\textbf{Implications for nursing and health policies:} Health managers should be made aware of the important role of fever clinics in the early detection, isolation and referral of patients, and in the treatment of infectious diseases to prevent and control their spread. In the early stage of an epidemic, fever clinics should be established in key areas with concentrated clusters of cases. Simultaneously, the health and safety of health professionals require attention.

\textbf{Keywords:} COVID-19, fever clinic, health, infection control, nursing management, nursing roles, safety

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\textbf{Introduction}

Recently, the spread of the novel coronavirus disease or COVID-19 has been rampant, reaching pandemic proportions. In January 2020, the Chinese government implemented measures intended to control and prevent the spread of ‘Class A’ infectious diseases. Fever clinics played a key role in the initial identification of suspected COVID-19 cases and in controlling the spread of the disease. A scientific and
standardized management regime has been implemented based on the known transmission pathway and epidemiological characteristics of COVID-19 in fever clinics. It encompasses the following dimensions: spatial layout; partitioning of functional zones; institutional processes; management of personnel, materials and equipment; infection prevention and control; and health education. A fever clinic is a suitable venue for the nursing care and management of patients with fever and respiratory symptoms, such as coughs, sore throats and other common symptoms. Triage and referral policies should be based on local policies on epidemic prevention and control, medical levels, and regional economic and human resource contexts. However, the architectural layout, overall functions and implementation process developed for our fever clinic can be applied in primary, secondary and tertiary health facilities in other regions with different policies and service components within their healthcare systems. In this paper, we outline policy-relevant experiences gained through nursing management strategies established at our fever clinic, with the aim of providing inputs for nursing colleagues working to prevent and control the spread of COVID-19.

Background
The world is facing one of the worst public health crises through the rapid spread of the novel coronavirus, with major impacts on economies and on the health and quality of life of communities. After the virus was isolated and identified, its gene sequence number was promptly conveyed to the World Health Organization (WHO) (Li et al. 2020). The novel coronavirus was originally named 2019-nCoV, and was subsequently renamed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the Coronavirus Study Group, while the WHO officially named the disease as COVID-19 (WHO 2020a). With the global spread of the pandemic, the WHO declared the outbreak as a public health emergency of international concern on 30 January 2020 (WHO 2020b). COVID-19 is highly contagious, and it spreads quickly. As there is currently no effective treatment, the focus should be on the early prevention and control of the pandemic (Chatterjee et al. 2020).

In addition to measures such as avoiding large gatherings and close contact, maintaining hand hygiene, and self-isolating at home, efficient triaging of patients at all levels of health institutions is essential for controlling the infection through early detection, isolation and treatment. The WHO emphasizes the importance of triage and patient referrals within different categories of medical institutions (WHO 2020c). In line with their national policies and norms, various countries have implemented early screening and triage strategies. The National Health Commission of the People’s Republic of China (NHCPRC) issued a directive for the rapid establishment of fever clinics in key areas with clusters of cases, and the public was informed of the addresses and contact information of all fever clinics, enabling individuals with suspected COVID-19 symptoms as well as asymptomatic individuals with a history of contact with confirmed cases to visit the nearest fever clinic (NHCPRC 2020).

The Centers for Disease Control and Prevention (CDC) in the United States have introduced multiple screening procedures and protocols in medical facilities, such as reminding visitors to report fever or other possible COVID-19 symptoms before arriving. Moreover, staff members are positioned near all entrances or in the waiting room area before visitors enter the treatment floor to monitor their temperature and ask about symptoms, accordingly sending them to appropriate waiting areas organized in a manner that separates symptomatic and non-symptomatic individuals (CDC 2020a). Casas et al. (2020) developed a risk assessment for the triage process to screen symptomatic patients without exposing them directly to high-risk patients. Suspected COVID-19 cases are sent to designated residents or testing personnel for follow-up. The application of triage strategies in low-income settings, for example in parts of Africa, would not be feasible for many reasons (Ayebare et al. 2020). Although the triage methods adopted in different countries may vary according to health policies and government directives, screening and isolation tailored to local healthcare systems and medical conditions, that is triage and isolation, are essential. However, methods for effectively managing nursing in fever clinics have not been established.

Aim
In this paper we intend sharing experiences acquired in the scientific and standardized management of a Chinese fever clinic, which may offer insights and inputs that can be applied by international organizations in the fight against the COVID-19 pandemic.

Methods
The spatial layout of the fever clinic

The architectural layout
The fever clinic was established in a relatively independent building located along the main hospital path at a considerable distance from the outpatient and inpatient buildings. Eye-catching signposts make it conspicuous. The floors and areas of the fever clinic are clearly marked and standardized following the ‘three zones and two routes’ principle of
separating clean, semi-contaminated and contaminated areas, with buffer rooms located between these areas. Figure 1 depicts the layout of the fever clinic.

Partitioning of functional zones

A fever clinic should have an independent area for receiving suspected COVID-19 patients, enabling febrile and non-febrile patients to be separated, thereby minimizing cross-infection and transmission of the virus within the hospital. The fever clinic at our hospital has three functional areas. The first area is an outpatient consultation area where patients can complete the following functions: medical treatment, registration, payment and collection of medical reports. It comprises pre-examination and triage areas, a consultation room, a registration and billing office, a blood collection room, a laboratory, an X-ray/CT room, a pharmacy and a patients’ toilet.

The second area is an isolation area for observing patients that includes a nurse station, a treatment room, a disposal room, 20 isolated observation wards, a temporary garbage storage area and a cleaning room. The observation room is a negative pressure ward with one-way interlocking double doors. It is equipped with an independent toilet and air exchange system, special vehicles, an ECG monitor, infusion pumps, an intercom system, and other necessary equipment and materials. There is ultraviolet disinfection lighting within the rooms, and windows have been installed between the observation ward and the outer corridor for the transfer of food and medicine. Patients with suspected COVID-19 are isolated and observed in this area to ensure that they have no contact with the outside world.

The third functional zone is a work area that provides clean and adequate resources for medical staff. It comprises a duty room, a storage room, a lounge, a changing room, a shower and toilet, and a cleaning room.

Work management at the fever clinic

The management system

The work system, flow and job responsibilities at the fever clinic have been developed to enable systematic diagnosis and treatment of patients. For example, nurses’ responsibilities are differentiated according to their posts in the pre-examination and triage areas, outpatient clinic, observation room, disinfection and isolation area, storeroom, and their roles in supervision and management. In addition, working systems have been formulated in the areas of disinfection and isolation, epidemic reporting, community inspections, investigations of infection sources, transportation of specimens, health education, procuring food supplies and the disposal of bodies. They have also been established for areas that include occupational protection, registration, and reporting and handling of iatrogenic occupational exposure. The operating costs of fever
clinics established at primary, secondary and tertiary health facilities across China range between 0.1 and 3 million yuan per clinic.

Workflow
Initially, a nurse conducts a basic consultation and screening process, which includes taking a patient’s temperature, recording the patient’s information, namely name, sex, age, family address, identity card number, body temperature, main clinical symptoms and history of epidemiological exposure. The patient is then instructed on how to wear surgical masks correctly and is given a red fever sign if fever is present. The nurses always maintain a distance of 1.5 m from patients. After this process has been completed, a specially assigned individual guides the patient through the registration process and takes this individual to the doctor’s office.

Patients with suspected COVID-19 are immediately transferred to the isolation and observation room, and the office for the prevention and control of COVID-19 at the hospital is informed. The nurses then file contact information for the patient’s family members and the already signed informed consent form and conduct a routine physical examination along with blood, urine, stool and other tests; a chest X-ray; or a CT examination. They also monitor changes in the patient’s body temperature. During this phase, nurses provide patients with life care and appropriate psychological counselling in line with their health conditions and self-care abilities. They are proficient in providing patients with explanations and health education to alleviate their tension, anxiety and uneasiness resulting from their isolation from their relatives.

If the result of a patient’s consecutive nucleic acid test is positive, this case will be immediately reported to the office for the prevention and control of COVID-19 at the hospital and to the Center for Disease Control and Prevention in Tianjin, and the concerned patient will be transferred to the designated hospital for treatment. Patients whose nucleic acid test results are negative and who do not have respiratory symptoms are treated in the general area, which is distinguished by green markings. Those who test negative but have respiratory symptoms continue their treatment in the outpatient clinic. They are accommodated in a separate area distinguished by yellow markings. Figure 2 depicts the entire workflow process.

Data archiving
The data compiled in the outpatient consultation area comprises information extracted from the pre-examination triage registration form, medical records, information recorded in the epidemiological questionnaire, examination reports (e.g. blood tests and CT images) and inputs from expert consultations.

Information that is recorded during the care of patients in the isolation area includes their informed consent forms, dynamic monitoring reports and details entered in the ward shift register. In addition, daily reports in the reception area are maintained and managed by a specially designated person. This information, which includes the total numbers of diagnosed and isolated patients and a brief description of the disease, is filed, and kept under lock and key.

Protection of professionals

Personal protection
Secondary protection is applied in the general area of the fever clinic (NHCPRC 2020). Personal protective equipment includes medical caps, protective masks, protective clothing, goggles or protective screens, latex gloves, and boot or shoe covers if necessary. When medical staff members are performing operations such as sputum suction, respiratory specimen collection, endotracheal intubation and tracheotomies, which may entail respiratory secretions or spillage of internal substances, they are required to implement three levels of protection. They should wear secondary protective equipment, notably isolation clothing and a comprehensive respiratory protector, or positive pressure headgear. After finishing their work, they should use disposable toiletries and bathe thoroughly, washing out their eyes, oral and nasal cavities, and external auditory canals. Protection training is ongoing at the fever clinic, aimed at strengthening knowledge-based vigilance and ensuring that the clinic personnel always adhere strictly to the various operating procedures to avoid cross-infection as far as possible.

Disinfection and isolation
A special post was introduced at the fever clinic, entailing responsibility for disinfection and isolation, which covers the cleaning and disinfecting of the ground, object surfaces, and the air. Disinfectant wipes, ultraviolet light, and air disinfectors or sprays should be used not less than twice daily. When contamination from the source of the disease is suspected, the frequency of disinfection should be increased appropriately. The ground or object surfaces should be wiped with a chlorine-containing disinfectant diluted to 1000 mg/L, and used medical supplies, such as thermometers, should be cleaned with a chlorine-based disinfectant (1000 mg/L). Medical waste is sealed in double yellow garbage bags marked
with the words ‘special infection’, thus ensuring that the handler has proper records and that the handover procedure is conducted safely.

**Management of materials**

Centralized and unified management of medical protective materials is conducted at the fever clinic. This process entails...
fixed point and sorting placement, storage, management by the assigned person and the securing of protective equipment. Specially assigned personnel count and register materials used daily, and supplies of these materials are replenished in a timely manner according to their consumption. The number of pieces of protective equipment is calculated as the product of the number of individuals working on one day and the frequency of replacement. This number can change by ±20%.

**Patient education**

Health education is critical for improving patients’ compliance levels and ensuring the effective implementation of various diagnostic and treatment measures, especially for patients in isolation and observation rooms. Timely health education can relieve patients’ feelings of anxiety, tension and helplessness from being in an unfamiliar environment without family members. The content of health education, which is usually imparted by trained nurses, includes the visit process, cough etiquette, hand hygiene, and management procedures that are required to be performed in the isolation and observation room, and key points relating to isolation at home.

**Personnel management at the fever clinic**

**Allocation of human resources**

Nurses at the fever clinic must demonstrate strong professional abilities, a sense of responsibility, excellent communication abilities, rich clinical experience and nursing knowledge. The fever clinic personnel have been recruited through voluntary registration and directional transfer of personnel from personnel at the main hospital. Most of the nurses are from the intensive care unit and from emergency, respiratory and other related departments and have undergone rigorous pre-job training and passed the assessment test. Their work at the fever clinic is separate from the clinical health services offered in their home departments.

There are two types of posts for nurses at the clinic, entailing, respectively, inspections of outpatients and observations of the isolation detention area. The outpatient inspection nurse is responsible for taking patients’ temperature, recording their information and treating them on a priority basis. This nurse also manages and monitors waiting patients, assists doctors to receive patients, performs intramuscular injections and skin test procedures, conducts environmental disinfection, and generally manages patients through coordination, communication and helping them to solve problems. The work of the nurses in the isolation detention area includes assisting patients to complete various nursing operations, such as specimen collection and inspection; distribution of drugs; infusion, oxygen inhalation and necessary rescue procedures; collection and distribution of materials; providing assistance to patients; and life care. These nurses also perform various kinds of disinfection and sensory control work, treatment of medical waste, and transmission of collected samples. In principle, during the early stage of the epidemic, the nurses occupying these two posts were independently responsible for their respective posts.

A 24-h working system has been implemented in the fever clinic. In response to the workload in different districts, a 6-h shift has been implemented in the outpatient department and a 4-h shift in the isolation and observation rooms. Because of the temporal variability of patients’ visits, flexible schedules have been implemented. At the same time, the nurses’ abilities and their professional congruence have been considered in matching them with each post, and arrangements have been made, enabling two nurses to prepare for the peak-hour day shift. These arrangements ensure that each nurse has a lunch break and a mealtime of one and a half hours each day and receives two days off every week. At the beginning of the epidemic, the hospital’s nursing department quickly assembled the first batch of nurses for the fever clinic comprising 21 regular nurses and one head nurse. The second and third reserve teams were subsequently dispatched quickly to deal with the public health emergency. After they had worked for four weeks, a rotation system was established, and the first batch nurses and head nurses were replaced by the second and third batches. The new nurses and head nurses entered the fever clinic two days in advance to familiarize themselves with the workflow and environment and to ensure that the rotation and handover procedures were conducted in an orderly manner.

**Job training**

To ensure the safety of the medical staff and achieve effective prevention and control of COVID-19, all of the staff working in the fever clinic undergo special training one week before they enter the fever clinic. The training usually covers the following areas. The first is protective techniques, notably wearing and removing protective clothing and positive pressure breathing devices, collecting nose and pharynx swabs, and implementing hand hygiene. The second area is disinfection and isolation techniques, entailing daily disinfection of regular ground and object surfaces, the air, and terminal disinfection. The third area is protection from COVID-19 and its prevention and treatment. The fourth area relates to the work system and flow, covering the pre-examination and triage process, the responsibilities associated with each post, the process of transporting patients or specimens, epidemic...
monitoring and the reporting system. To facilitate learning, the training programme is mainly conducted through online teaching on the APP platform and includes online communication via a WeChat group, face-to-face teaching and on-site demonstrations at different times. At the end of the one-week training period, an assessment is carried out via an online questionnaire administered along with a theoretical test and an evaluation of operations performed in the ward. The highest attainable score is 100; nurses attaining an average score of more than 90 are selected to work in the fever clinic.

Health management
There is a high risk of occupational exposure in the fever clinic. The International Council of Nurses has estimated that 8% of all COVID-19 cases (almost two million cases) involve healthcare workers because of occupational exposure (ICN 2020). During this pandemic, nurses throughout the world are under great pressure both physically and psychologically (Turale et al. 2020). In addition to their professional abilities and protective skills, nurses’ self-management of their health requires consideration and entails the following components. As a first step, to increase nurses’ confidence about working at a fever clinic, graded protection should be implemented in line with standard prevention procedures, with nurses undergoing rigorous and standardized training and assessments before taking up their posts. Moreover, they require special training on how to apply and remove protective equipment.

Second, health management files should be maintaining for medical staff at the fever clinic, with staff reporting daily on their temperature and any symptoms of discomfort via a WeChat group. In our clinic, an administrator compiled and reported this information to the head nurse in a timely manner, and the head nurse subsequently reported it to the medical office. Staff experiencing any physical discomfort at work, such as hypoxia, dizziness, thirst, urine retention and other conditions while wearing protective clothing, should immediately be prescribed rest or symptomatic treatment, and in case of occupational exposure, nucleic acid testing and targeted treatment should be administered as soon as possible.

Other important steps are as follows. Direct contact with patients should be avoided unless this contact is strictly necessary. Nurses should be instructed to shorten the time of contact with patients and to try to use paper-based instructional materials or, alternatively, to use telephones, walkie-talkies or video apps to communicate with patients when nursing operations are not feasible. Ensuring a constant supply of necessary protective materials in the fever clinic should be prioritized. Scientific and reasonable schedule planning is required to provide nurses with sufficient time for mental and physical relaxation. Strong logistical support and adequate food delivery and nutritional support should be provided. Dormitories should be set up for fever clinic staff to enable them to rest during shifts. Nurses should be accommodated in separate buildings (single rooms) after work and isolated from others. Two or more persons should not be allowed to remove their masks for dinner at the same time. Lastly, nurses’ psychological status should be regularly monitored via an online self-assessment questionnaire, and depending on the results, they should receive psychological guidance or consider changing their positions.

Results
Considering the tremendous challenges associated with routine patient diagnoses and treatment induced by the rapid spread of COVID-19, a primary task for controlling the epidemic entails establishing fever clinics in critical areas. From February to March 2020, more than 3000 patients who came to the fever clinic were triaged; of these patients, 108 suspected COVID-19 cases and one confirmed case were diagnosed. Within two months of the clinic’s establishment, there was a comprehensive reduction in the number of new COVID-19 cases and zero infections occurred among medical staff at the fever clinic.

Discussion
We have discussed key management requirements in a fever clinic relating to its spatial layout, the partitioning of its functional zones, institutional processes, and the management of personnel and materials. By developing effective processes that met these requirements, the spread of the epidemic was effectively curbed and zero infections occurred among medical staff.

The important role of fever clinics
The fever clinic was set up in a separate area of the hospital where professionally trained medical personnel were temporarily mobilized and tasked with screening, diagnosing and triaging suspected COVID-19 patients. The clinic also provides special medical services for the temporary treatment and even rescue of patients in need (Zhang et al. 2020). The position of the National Health Commission of the People’s Republic of China (NHCPRC) is that blind self-isolation at home in the absence of timely diversion of patients not only poses a threat to their lives but also entails a hidden danger associated with the epidemic’s advancement (NHCPRC 2020). In accordance with existing policies and instructions, no effort has been spared in establishing numerous fever clinics in different regions of China, with considerable investments.
of human, material and financial resources for their operation. The core objective behind these efforts has been to achieve centralized treatment and separate management of all patients in the areas under their jurisdiction. Regardless of whether COVID-19 cases are mild or severe, and whether they demonstrate typical or non-typical symptoms, all patients undergo screening and triage procedures to ensure that no cases of potential infection remain within communities.

On 22 March 2020, the WHO issued recommendations regarding triage and referral strategies. Accordingly, primary and secondary facilities should perform preliminary evaluation and screening procedures, with suspected and confirmed cases being isolated and separated. Mildly impacted patients should be isolated at home and undergo community care and home isolation, while severe/critical/high-risk cases should be referred to tertiary hospitals for treatment (WHO 2020c).

In May 2020, following its adoption and integration of foreign triage management standards, the CDC recommended a standard operating procedure for triaging suspected COVID-19 patients in non-US healthcare settings (CDC 2020b). Accordingly, specific spatial layout and regional settings have now been incorporated into triage procedures that closely resemble the management approach applied in our fever clinic. A separate registration desk has been introduced, in addition to basic screening procedures, for incoming patients with respiratory symptoms. Further, for screening purposes, patients are required to complete a triage algorithm/questionnaire in the triage area, which has physical barriers separating staff and patients. Every patient who meets the definition of a suspected COVID-19 case is immediately isolated or separated from other patients within a well-ventilated ‘respiratory waiting area’, which has single room with doors, or in other designated areas.

Key management experience acquired in the fever clinic
People in general are susceptible to the novel coronavirus, which has a long incubation period. Fever is not necessarily the first symptom in some patients, and their clinical manifestations may comprise non-specific symptoms. In addition, symptomatic carriers without any previous contact history are also contagious. Therefore, our hospital continuously revises the screening standards for the fever clinic in accordance with the national COVID-19 diagnosis and treatment plan, which is constantly updated. From the onset, all individuals with body temperatures ≥37.3 °C were triaged to the fever clinic. These individuals encompassed patients with coughs and fatigue of unknown cause, even if they had no fever; those with atypical symptoms and a history of epidemiology; and patients with atypical symptoms without a history of epidemiology. Currently, given the stable situation relating to the control of the epidemic, the fever clinic is mainly responsible for conducting routine nucleic acid detection tests and risk screening of patients before admission.

In this paper, we have outlined some strategies for managing human resources in emergency situations that can provide guiding inputs for medical staff. The first is predictive management, wherein the nursing department estimates the development trend of the epidemic and reserves human resources for emergency support in advance. The second is scientific configuration, entailing dynamic adjustments of the proportions of allocated personnel based on a consideration of their advantages, the nature of the posts and the patients’ situation. The third strategy is branch training. We quickly achieved full coverage of the training staff with the aid of an information platform. These strategies were crucial during the early stages of the outbreak.

Conclusion
Fever clinics play an important role in screening infectious diseases within general hospitals and in the rapid diversion of infectious diseases. Moreover, they provide a critical platform for the early prevention, diagnosis, treatment, isolation, and quarantine of patients with infectious respiratory diseases and merit wide-scale application and promotion.

Implications for nursing and health policies
Health managers should be made aware of the important role of fever clinics in the early detection, isolation and referral of patients and in the treatment of infectious diseases to prevent and control their spread. For highly contagious diseases, health managers should establish fever clinics in key areas with concentrated clusters of cases as soon as possible. In the early stages of an epidemic when knowledge and management experience are lacking, the development of broad screening criteria, an adequate early warning mechanism, and manpower reserves, and the provision of training are critical. Simultaneously, the health and safety of health professionals requires attention. Thus, it is essential to consider management strategies for reducing occupational exposure and ensuring the health of nurses when designing and developing fever clinics.

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