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Editorial Board Member of *World Journal of Clinical Cases*, Jing Liu, MD, PhD, Chief Doctor, Professor, Department of Neonatology and NICU, Beijing Chaoyang District Maternal and Child Healthcare Hospital, Beijing 100021, China. liujingbj@live.cn

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Retrospective Study

Management and implementation strategies of pre-screening triage in children during coronavirus disease 2019 pandemic in Guangzhou, China

Xuan Shi, Yu-Tao Cai, Xian Cai, Xiu-Lan Wen, Jing-Yan Wang, Wen-Cheng Ma, Jun Shen, Jin-Xia Wu, Hai-Yan Liu, Jing Sun, Pei-Qin He, Yan Lin, Dan-Yang Zhao, Pei-Qing Li

ORCID number: Xuan Shi 0000-0003-0977-9746; Yu-Tao Cai 0000-0002-2151-9325; Xian Cai 0000-0002-1037-6365; Xiu-Lan Wen 0000-0002-8156-4291; Jing-Yan Wang 0000-0002-7939-481X; Wen-Cheng Ma 0000-0003-1167-5292; Jun Shen 0000-0003-2270-0203; Jin-Xia Wu 0000-0002-8929-9461; Hai-Yan Liu 0000-0002-0672-5091; Jing Sun 0000-0001-9423-8930; Pei-Qin He 0000-0001-7075-4463; Yan Lin 0000-0002-7055-3183; Dan-Yang Zhao 0000-0002-9974-5728; Pei-Qing Li 0000-0002-2186-1331.

Author contributions: Shi X, Cai Y, and Cai X carried out the studies, participated in collecting data, and drafted the manuscript; Wen X, Zhao D, Lin Y, and Li PQ performed the statistical analysis and participated in its design; Wang J, Ma W, Shen J, Wu J, Liu H, Sun J, and He P participated in data acquisition, analysis, and interpretation of data and drafted the manuscript; All authors read and approved the final manuscript.

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Xuan Shi, Jing-Yan Wang, Wen-Cheng Ma, Jin-Xia Wu, Pei-Qin He, Pei-Qing Li, Department of Pediatric Emergency, Guangzhou Women and Children's Medical Center, Guangzhou Medical University, Guangzhou 510000, Guangdong Province, China

Yu-Tao Cai, Hai-Yan Liu, Outpatient Department of Pediatrics, Guangzhou Women and Children's Medical Center, Guangzhou Medical University, Guangzhou 510000, Guangdong Province, China

Xian Cai, Jing Sun, Emergency General Ward, Guangzhou Women and Children's Medical Center, Guangzhou Medical University, Guangzhou 510000, Guangdong Province, China

Xiu-Lan Wen, Yan Lin, Department of Nursing, Guangzhou Women and Children's Medical Center, Guangzhou Medical University, Guangzhou 510000, Guangdong Province, China

Jun Shen, Dan-Yang Zhao, Department of Disease Control and Prevention, Guangzhou Women and Children's Medical Center, Guangzhou Medical University, Guangzhou 510000, Guangdong Province, China

Corresponding author: Pei-Qing Li, MD, Chief Physician, Director, Department of Pediatric Emergency, Guangzhou Women and Children's Medical Center, Guangzhou Medical University, No. 9 Jinsui Road, Guangzhou 510000, Guangdong Province, China.

annie_129@126.com

Abstract

BACKGROUND

Emerging infectious diseases are a constant threat to the public's health and health care systems around the world. Coronavirus disease 2019 (COVID-2019), which was defined by the World Health Organization as pandemic, has rapidly emerged as a global health threat. Outbreak evolution and prevention of international implications require substantial flexibility of frontline health care facilities in their response.

AIM

To explore the effect of the implementation and management strategy of pre-screening triage in children during COVID-19.

Informed consent statement:

Patients were not required to give informed consent to the study because the analysis used anonymous clinical data that were obtained after each patient agreed to treatment by written consent.

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METHODS

The standardized triage screening procedures included a standardized triage screening questionnaire, setup of pre-screening triage station, multi-point temperature monitoring, extensive screenings, and two-way protection. In order to ensure the implementation of the pre-screening triage, the prevention and control management strategies included training, emergency exercise, and staff protection. Statistical analysis was performed on the data from all the children hospitalized from January 20, 2020 to March 20, 2020 at solstice during the pandemic period. Data were obtained from questionnaires and electronic medical record systems.

RESULTS

A total of 17561 children, including 2652 who met the criteria for screening, 192 suspected cases, and two confirmed cases without omission, were screened from January 20, 2020 to March 20, 2020 at solstice during the pandemic period. There was zero transmission of the infection to any medical staff.

CONCLUSION

The effective strategies for pre-screening triage have an essential role in the prevention and control of hospital infection.

Key Words: COVID-19; Pre-screening triage; Management; Implementation; Strategies; Pandemic

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Core Tip: As the designated treatment center for children with severe acute respiratory syndrome coronavirus 2 infection in Guangdong Province during the pandemic period, we developed standardized triage screening procedures to assist health care providers with next steps; a simple but crucial questionnaire was designed to assist diagnosing patients. All interventions, including multi-point temperature monitoring and screening, extensive screenings, and two-way protection, effectively prevented the spread of the epidemic. There were no infected patients missed, and there was zero transmission of the infection to any medical staff.

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INTRODUCTION

Emerging infectious diseases are a constant threat to the public's health and health care systems around the world^[1]. Coronavirus disease 2019 (COVID-19), which was defined by the World Health Organization as pandemic^[2], has rapidly emerged as a global health threat^[3]. The virus was officially named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)^[4]. To curb the transmission of the virus, health care professionals, committees, and governments have combined many approaches, such as extensive COVID-19 screening, effective patient triage, the transparent provision of information, and the use of information technology^[5].

Compared with the adult cases, most of the cases found in children are obviously mild, where children tend to recover quickly and have a good prognosis. Currently, the incubation period of the virus in children has been reported to be 1 d to 14 d, most of which are 3 d to 7 d. Early general symptoms include fever, fatigue, cough, nasal congestion, runny nose, cough sputum, nausea, vomiting, diarrhea, headache, dizziness, and similar, most of which disappear in 1 wk. If the condition worsens, dyspnea and cyanosis may appear. These often appear 1 wk after the illness and may



be accompanied by systemic poisoning symptoms such as malaise or restlessness, difficulty in feeding, loss of appetite, reduced crying, and reduced body movement^[6]. Mild and atypical presentations of the infection in children may make the identification of the disease challenging^[7].

Outbreak evolution and prevention of international implications require substantial flexibility of frontline health care facilities in their response^[8]. Guangzhou Women and Children's Medical Center, located in Guangzhou, Guangdong Province, China, is a specialized tertiary pediatric hospital caring for children under 18 years of age, which is the designated treatment center for children with SARS-CoV-2 infection in Guangdong Province during the epidemic period. To respond effectively to the epidemic prevention and control, this hospital has done a lot of work in the prevention of virus transmission, cross-infection, and medical staff infection. The effective strategies for pre-screening triage have an essential role in the prevention and control of hospital infection. The aim of this study was to explore the effect of the implementation and management strategy of pre-screening triage in children with the COVID-19 pandemic who consulted the Guangzhou Women and Children's Medical Center.

MATERIALS AND METHODS

Standardized triage screening procedures

Development of a standardized triage screening questionnaire: Standardized triage screening procedures are shown in [Figure 1](#). Standardized triage screening questionnaire was designed to assist health care providers with the next steps, which was about symptoms of fever, respiratory symptoms, fatigue, diarrhea, conjunctival congestion, and their travel history and any history of contact with people with confirmed cases of COVID-19.

All patients who visited the hospital, regardless of the reason for their visit, were required to fill out this questionnaire before entering the hospital. People with a mobile phone could fill out the questionnaire by scanning the QR code, which reduced the time of collecting information, minimized the risk of potential contamination by touching the pen and paper, and also shortened the waiting time. After this step, people were allowed to enter the hospital, depending on their symptoms. If the symptoms were combined with epidemiological risk, the patients were isolated, appropriate infection prevention and control measures were implemented, and testing for SARS-CoV-2 was initiated.

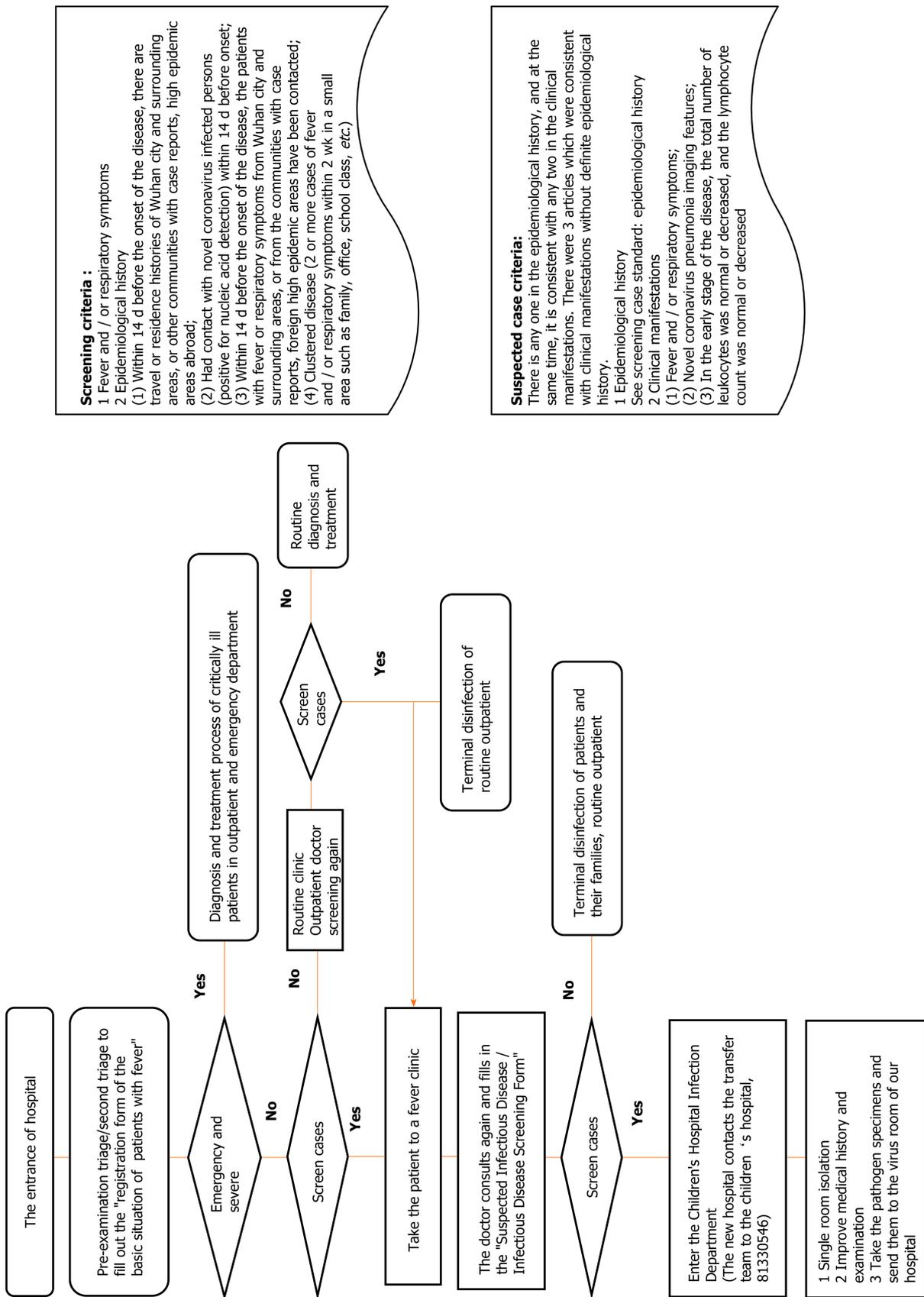
Setup of pre-screening triage station: The triage station was located outside the entrance of the outpatient hall with highlighted signs. All patients had to enter the hospital from the pre-screening triage office. The medical guide nurse guided the patients to the pre-screening station for screening first and then to the corresponding general department after the initial exclusion of specific infectious diseases. The suspected cases were registered, and the patient was escorted to the fever clinic by designated routes.

Multi-point temperature monitoring and screening: Temperature monitoring was performed three times: First, when the children and their relatives reached the entrance of the hospital, the security guard used the mobile infrared thermometer to measure their body temperature. Second, when they went to the pre-screening triage station, the triage nurse measured the body temperature again while they were filling out of the standardized triage screening questionnaire. Third, they needed to stop at the secondary triage table before the doctor's visit presenting the registration report and taking the temperature, where the nurse would also ask about the epidemic history.

When the doctor received a pediatric patient, he would again carefully ask about the epidemic history and comprehensively evaluate the symptoms of the child. In any of the four links, if the child's situation was consistent with the suspected case, he/she was escorted to the fever clinic for further treatment.

Extensive screenings

To respond effectively to the epidemic prevention and control work, all children with fever or respiratory symptoms were tested for SARS-CoV-2 during the pandemic.



Screening criteria :

- 1 Fever and / or respiratory symptoms
- 2 Epidemiological history
 - (1) Within 14 d before the onset of the disease, there are travel or residence histories of Wuhan city and surrounding areas, or other communities with case reports, high epidemic areas abroad;
 - (2) Had contact with novel coronavirus infected persons (positive for nucleic acid detection) within 14 d before onset;
 - (3) Within 14 d before the onset of the disease, the patients with fever or respiratory symptoms from Wuhan city and surrounding areas, or from the communities with case reports, foreign high epidemic areas have been contacted;
 - (4) Clustered disease (2 or more cases of fever and / or respiratory symptoms within 2 wk in a small area such as family, office, school class, etc.)

Suspected case criteria:

There is any one in the epidemiological history, and at the same time, it is consistent with any two in the clinical manifestations. There were 3 articles which were consistent with clinical manifestations without definite epidemiological history.

- 1 Epidemiological history
- See screening case standard: epidemiological history
- 2 Clinical manifestations
 - (1) Fever and / or respiratory symptoms;
 - (2) Novel coronavirus pneumonia imaging features;
 - (3) In the early stage of the disease, the total number of leukocytes was normal or decreased, and the lymphocyte count was normal or decreased

Figure 1 Guangzhou Women and Children Medical Center pediatric outpatient emergency treatment process and triage screening procedures.

Two-way protection

Based on the prevention and control measures of contact isolation and droplet isolation and air isolation, an intensive preventive and control of hospital infection strategy for novel coronavirus were adopted to prevent both transmissions of the disease from the patient to the medical staff and from the medical staff to the patients and cross-infection among the patients by emphasizing the "two-way protection". Trained physicians and nurses wearing personal protective equipment worked together for initial assessment and the differential diagnosis of the fever. Routine hand sanitizers were made ready to be used at any time. Hands were washed, or a quick hand disinfectant was used after each contact with the patient, and the outpatient environment was kept clean and well ventilated. A prompt reminder was given to those not wearing masks, and timely distribution of masks was provided for those not wearing masks.

Prevention and control management strategy

Training and emergency exercise: In order to cope with the changing situation of the epidemic, the prevention and control measures were also accordingly adjusted. The emergency work manual at our hospital was updated from the first edition to the 18th edition. For each edition, the staff was organized to study and take exams. On the basis of training and examination, the emergency exercises were organized, and all of the staff was enabled to master the triage screening process through repeated simulation drills.

Staff protection: According to the outpatient flow, and flexible scheduling, it was assured for triage nurses to take turns to rest and avoid overwork. Managers strived to understand the psychological activities of employees and timely conduct psychological counseling.

The department's infection control team was set up to monitor the physical health of all employees, and the staff was monitored, and their body temperature was recorded twice a day, while the abnormal symptoms were reported on time. Once the employee was found to have a fever (above 37.3 °C), cough, and other symptoms related to COVID-19, he/she immediately stopped working. The virus pathogen samples were collected for inspection at the department twice within 24 h, and the observation was performed in the designated areas.

Data collection

Statistical analysis was performed on the data from all children hospitalized from January 20, 2020 to March 20, 2020 at solstice during the epidemic period. The age, gender, clinical manifestation, epidemic history, time of onset, and other relevant data were collected by questionnaires and electronic medical record systems.

Ethics approval

Ethics approval was obtained from the Ethics Committee of Guangzhou Women and Children's Medical Center.

RESULTS

A total of 17561 children, including 2652 who met the criteria for screening, 192 suspected cases, and two confirmed cases without omission, were screened from January 20, 2020 to March 20, 2020 at solstice during the pandemic period (Table 1).

Forty-two point six seven percent of the children were female with a median age of 48 mo, 68.9% were from local areas, 20.2% had a history of prevalence, and the median onset time was 1 d. The average time to fill out the questionnaire was 2.9 ± 3.5 min. There has been a zero transmission of the infection to any medical staff.

DISCUSSION

It has been reported that COVID-19 can spread through droplets, aerosols, contact, or digestive tract^[9,10]. The hospital is a high-risk area for nosocomial transmission, and the most vital strategy for minimizing the risk of nosocomial infection starts from the triage stations^[11].

As the designated treatment center for children with SARS-CoV-2 infection in

Table 1 Screening data of hospitalized children

Variables		n (%)	mean ± SD	Median (IQR)
General characteristics	Sex (female)	7493 (42.7)		
	Age, mo			48 (56)
	Patients' residence (local)	12091 (68.9)		
	Epidemiology (have)	3547 (20.2)		
	Onset, d			1 (2)
	Minutes to complete the screening WeChat		2.9 ± 3.5	
Clinical manifestations	Fever	5134 (29.2)		
	Cough	2229 (12.7)		
	Diarrhea	909 (5.2)		
	Shortness of breath	273 (15.6)		
	Fatigue	417 (23.8)		
Diagnosis	Screening cases	2652 (15.1)		
	Suspected case	192 (10.9)		
	Confirmed case	2 (0.01)		
Distribution	Fever isolation clinic	2652 (15.1)		
	Non-isolation fever clinic	3091 (17.6)		
	General outpatient and emergency	11818 (67.3)		

IQR: Interquartile range; SD: Standard deviation.

Guangdong Province during the epidemic period, we developed standardized triage screening procedures to assist health care providers. A simple, questionnaire addressing crucial points was designed to assist diagnosing patients. The multi-point temperature monitoring and screening, extensive screenings, and two-way protection are all effective methods for preventing the spread of the pandemic. There were no missed infected patients or transmission of the infection to any medical staff.

Similar studies have shown that, in Western Chongqing, COVID-2019 has been rapidly and well controlled in all of the counties, which was mainly due to qualified triage station and fever clinics in combination with community isolation, quarantine, and medical support^[12]. The initiated first fever screening system has an important role in the prevention and control of hospital infection in the third people's hospital of Shenzhen China^[13].

Compared with the adult cases, most of those found in children were obviously mild^[6]. Mild and atypical presentations of the infection in children may make the infection challenging to detect^[7]. Extensive screenings allowed the early identification of asymptomatic or mild patients who had viral loads.

Infectious disease risk screening, similar to other disaster plans, must be flexible enough to adapt to specific emergency situations^[14]. In order to cope with the changing situation of the pandemic, the prevention and control measures are also being adjusted accordingly. Recent research have shown that obesity plays an important role in the pathogenesis and transmission of COVID-19 infection^[15] and may be a risk factor for COVID-19-related mortality, while thrombotic events were an aggravating cause of death^[16]. An endothelial damage was found in obese children, which was confirmed by increased carotid intima-media thickness values^[17]. These outcomes recommend that we should pay extra attention for patients with obesity in the screening of COVID-19 during this pandemic.

This study has a few limitations. First, this is a retrospective single-center study. Second, the pre-screening triage process is not unique, and it is based on national or local policies to a large extent.

CONCLUSION

The effective strategies of pre-screening triage have an important role in the prevention and control of hospital infection. As the situation with epidemic changes, it is necessary to timely adjust preventive and control strategies.

ARTICLE HIGHLIGHTS

Research background

Coronavirus disease 2019 (COVID-19), which was defined by the World Health Organization as pandemic, has rapidly emerged as a global health threat. Compared with the adult cases, most of the cases found in children are obviously mild, where children tend to recover quickly and have a good prognosis. Mild and atypical presentations of the infection in children may make the identification of the disease challenging. The implementation and management of pre-screening triage in children played an important role in the prevention and control of the pandemic.

Research motivation

The hospital is a high-risk area for nosocomial transmission, and the most vital strategy for minimizing the risk of nosocomial infection starts from the triage stations. The effective strategies for pre-screening triage have an essential role in the prevention and control of hospital infection. Outbreak evolution and prevention of international implications require substantial flexibility of frontline health care facilities in their response. The prevention and control measures need to adjust accordingly, in order to cope with the changing situation of the pandemic.

Research objectives

To explore the effect of the implementation and management strategy of pre-screening triage in children during COVID-19 pandemic.

Research methods

The standardized triage screening procedures included a standardized triage screening questionnaire, setup of pre-screening triage station, multi-point temperature monitoring, extensive screenings, and two-way protection. In order to ensure the implementation of the pre-screening triage, the prevention and control management strategies included training, emergency exercise, and staff protection. Statistical analysis was performed on the data from all the children hospitalized from January 20, 2020 to March 20, 2020 at solstice during the pandemic period.

Research results

A total of 17561 children, including 2652 who met the criteria for screening, 192 suspected cases, and two confirmed cases without omission, were screened from January 20, 2020 to March 20, 2020 at solstice during the pandemic period. There has been zero transmission of the infection to any medical staff.

Research conclusions

We developed standardized triage screening procedures to assist health care providers. A simple, questionnaire addressing crucial points was designed to assist diagnosing patients. The multi-point temperature monitoring and screening, extensive screenings, and two-way protection are all effective methods for preventing the spread of the epidemic. There were no missed infected patients or transmission of the infection to any medical staff. The effective strategies for pre-screening triage have an essential role in the prevention and control of hospital infection.

Research perspectives

Recent research has shown that obesity plays an important role in the pathogenesis and transmission of COVID-19 infection. Extra attention for patients with obesity in the screening of COVID-19 during this epidemic is the direction of future research.

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