

Practice of Infection Prevention and Control Strategies in Risk Departments during the COVID-19 Epidemic

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Abstract

Objective: To explore the practice and application of infection prevention and control strategies in risk departments during the COVID-19 epidemic, and to formulate the infection prevention and control measures to provide advice and guidance in risk departments. **Methods:** According to the latest plan of diagnosis and treatment, prevention and control issued by the National Health Commission, expert advice and consensus, combined with the actual situation in our hospital, a series of infection prevention and control measures of COVID-19 in risk department was formulated. **Results:** During the epidemic period, the prevention and control measures of nine risk departments including emergency operation, anesthesiology, endoscopy center, blood purification center, otolaryngology, stomatology, medical imaging department, medical cosmetology department and pulmonary function room were established from six aspects, including pre-examination and screening, medical technology control, personnel management, personal protection, environmental disinfection, medical waste disposal, etc. **Conclusion:** During the epidemic period, the infection prevention and control strategy of risk de-

partments is one of the key links to control the spread of the epidemic, and risk departments must pay attention to and strictly implement various infection prevention and control measures.

Keywords

COVID-19, Risk Department, Infection Prevention and Control, Strategy, Practice

1. Introduction

In recent years, there have been recurring public health events such as seasonal influenza, new coronavirus pneumonia, and monkeypox. These events have had a significant impact, lasting for extended periods, and have presented challenges in terms of prevention, control, and public crisis management [1]. The outbreak of Corona Virus Disease 2019 (COVID-19) has rapidly spread worldwide. Its strong capacity and wide range of transmission have posed a great threat to global public health security [2]. This epidemic has severely hampered global economic and social development, causing extensive damage and far-reaching consequences for the world. It can be considered a serious disaster for humanity as a whole [3] [4]. Therefore, our attention is focused on finding scientific and accurate approaches for its prevention and control.

During the period when COVID-19 was classified as a Class B infectious disease and managed according to the Class A infectious disease, the flow of people in the hospital has increased significantly, and the risk of cluster infection has also increased due to the resumption of work and school. This increase in flow also led to an increased risk of cluster infections. In many areas, cluster epidemics have occurred, with the majority of nosocomial infections happening in general wards rather than fever clinics and isolation wards. In order to effectively prevent and control hospital infections during the COVID-19 epidemic, it is crucial to establish a comprehensive and rational prevention and control system process [5] [6]. Therefore, apart from fever clinics, isolation and observation wards, and critical isolation wards, it is important to focus on infection prevention and control measures in other departments such as operating rooms (emergency), anesthesiology departments, endoscopy centers, blood purification centers, otolaryngology departments, dental departments, medical beauty centers, and pulmonary function rooms. These departments have a higher risk of infection due to the nature of their diagnosis and treatment. To ensure effective prevention and control, we have formulated infection prevention and control strategies for these high-risk departments during the COVID-19 epidemic. In this article, based on the diagnosis, treatment, prevention and control plans issued by the National Health Commission, expert guidelines, suggestions, and consensus, as well as our own experiences in epidemic prevention and control [7] [8] [9] [10], these strategies were designed to benefit everyone.

2. Practice of Prevention and Control Strategies in Risk Departments

This article focuses on the implementation of prevention and control strategies in various risk departments, such as operating rooms (emergency), anesthesiology departments, endoscopy centers, blood purification centers, otolaryngology departments, stomatology departments, medical imaging departments, medical beauty centers, and pulmonary function rooms. The protection levels in these departments are categorized into three levels: first-level protection (associated with low risk), second-level protection (associated with high risk), and third-level protection (associated with extremely high risk) [10] [11] [12].

2.1. Prevention and Control Measures in Operating Rooms (Emergency) during the COVID-19 Epidemic (Operating Rooms, Interventional Departments)

Pre-operative screening (**Figure 1**): 1) Conduct blood routine, CT examination, new coronavirus nucleic acid and antibody testing before surgery, and consult and evaluate by an expert panel. 2) Patients who have not been consulted by the expert group should be treated as suspected COVID-19 cases and undergo surgery in a dedicated negative pressure operating room or a relatively independent (endmost) operating room with an independent purification system [13]. Medical technology control: a) Strictly implement time-based and orderly opening, control the number of surgeries, and arrange them at staggered times. b) Reduce the patient's stay in the operating room. c) Prioritize high-quality surgeries.

Personnel management: Personnel not related to the operation are not allowed to enter the operating room. Personal protection (**Table 1**): 1) Implement standard precautions when COVID-19 is ruled out. 2) In cases where COVID-19 cannot be ruled out, implement third-level protection, including postoperative transportation.

Disposal of reusable items: The use of disposable instruments and items should still be recommended for COVID-19 patients. After cleaning the blood stains from the reused equipment, they should be soaked in a 1000 mg/L chlorine-containing disinfectant for 30 minutes. Then, they should be placed in a double-layer special garbage bag, securely tied, and labeled as "COVID-19" on the outside. These bags should be placed in a designated area for "special infection equipment" and recycled separately using the designated routes [14].

Disinfection of lead clothing: The lead clothing used during operations should be wiped and disinfected with disinfectant wipes containing quaternary ammonium salts for 30 minutes. Then, it should be hung to dry naturally before reuse.

2.2. Prevention and Control Measures for Anesthesiology Departments during the COVID-19 Epidemic

Pre-operative screening involves collecting the patient's epidemiological history and clinical manifestations, as well as conducting blood routine and lung CT

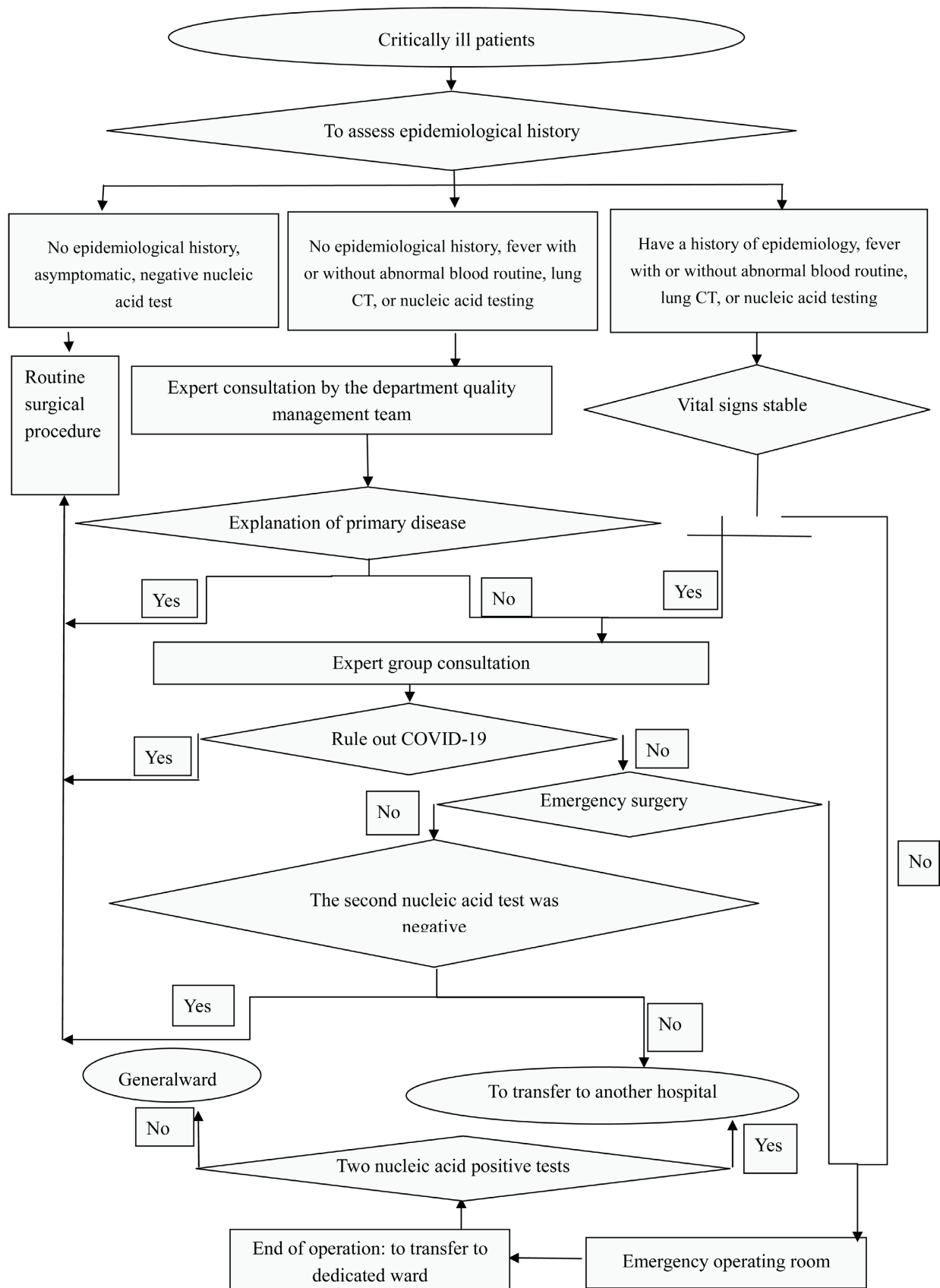


Figure 1. Surgical management process for critically ill patients.

examinations [15]. Patients with an epidemiological history or those who require intubation due to respiratory failure should undergo the following screening procedures: being treated as suspected COVID-19 cases.

In terms of medical technology control, the number of surgeries should be regulated.

Personal protection measures should be implemented, as outlined in **Table 1**. Standard precautions should be followed if COVID-19 is excluded, while third-level protection should be implemented when COVID-19 cannot be ruled out.

In terms of surface disinfection, after tracheal intubation in the general ward, the surface of carried items should be wiped and disinfected using quaternary ammonium salt disinfectant wipes or 75% alcohol wipes. When tracheal intubation is performed in the isolation ward or fever clinic, the required items and equipment should be left in the intubation area, and terminal disinfection should be conducted based on the surface of items in this area.

2.3. Prevention and Control Measures of the Endoscopy Center during the COVID-19 Epidemic

Pre-screening: Inquire about the individual's epidemiological history, take their body temperature, verify their health code, and conduct a lung CT scan, blood routine, and COVID-19 antibody test to determine if they are suspected COVID-19 cases.

Medical technology control: strictly adhere to the appointment system. 1) To establish dedicated diagnosis and treatment rooms for patients who have not been ruled out for COVID-19 or who still have a fever after being ruled out for COVID-19. 2) For patients undergoing anesthesia, ensure that resuscitation is completed in a single room and wearing a medical surgical mask when conditions allow. 3) All diagnosis and treatment rooms should be used by only one person and should be thoroughly disinfected.

Personnel management: To limit the number of individuals in the diagnosis and treatment room to the minimum required personnel [16]; to strictly enforce the one-patient-one-accompaniment system in the waiting area; to require each patient to disinfect their hands with quick-drying hand disinfectant before entering the endoscopy center.

Personal protection (**Table 1**): to implement standard precautions at the appointment desk; to apply first-level protection in the diagnosis rooms, treatment rooms and decontamination rooms.

2.4. Prevention and Control Measures of the Blood Purification Center during the COVID-19 Epidemic

Pre-screening: complete the epidemiological survey form and monitor body temperature. If COVID-19 cannot be ruled out, conduct two checks for new coronavirus nucleic acid results.

Table 1. List of protection classification and material allocation for different risk departments.

Risk Department	Protection level	Suggestions on the allocation of protective materials
Operating room (emergency), anesthesiology department	COVID-19 has been ruled out	Standard precautions Disposable work caps, medical surgical masks, work clothes, disposable sterile surgical gowns, gloves, quick-drying hand disinfectants, and disinfectant wipes.
	COVID-19 needs to be checked	Level three protection Disposable work caps, medical protective masks, work clothes, goggles, comprehensive respiratory protectors, or positive pressure hoods, protective clothing, gloves (double layer), disposable shoe covers, disposable sterile surgical gowns, quick-drying hand disinfectants and disinfectant wipes are required. Additionally, the interventional department should also wear a full set of lead clothing.
Endoscopy center	Reservation desk	Standard precautions Disposable work caps, medical surgical masks, work clothes, gloves, quick-drying hand disinfectants, and disinfectant wipes.
	Treatment room	Level 1 protection Disposable work caps, medical surgical masks, overalls, isolation gowns, gloves, quick-drying hand disinfectants, disinfectant wipes; medical protective masks, goggles or protective visors when necessary.
	Washroom	Level 1 protection Disposable work caps, medical surgical masks, overalls, waterproof isolation gowns, protective masks, gloves, quick-drying hand disinfectants, disinfectant wipes; medical protective masks and goggles if necessary.
Blood purification center	General area	Standard precautions Disposable work caps, medical surgical masks, work clothes, isolation gowns, quick-drying hand disinfectants, and disinfectant wipes.
	Dedicated area	Level 1 protection Disposable work caps, medical protective masks, work clothes, isolation gowns, goggles or protective visors, gloves, shoe covers, quick-drying hand disinfectants, and disinfectant wipes.
Otolaryngology	Daily diagnosis and treatment activities or ward rounds	Level 1 protection Disposable work caps, medical protective masks, work clothes, goggles or protective masks, isolation gowns, gloves, quick-drying hand disinfectants, and disinfectant wipes (surgical masks are sufficient for non-aerosol operations).
Stomatology		Level 1 protection Disposable work caps, medical protective masks, work clothes, goggles or protective masks, isolation gowns, gloves, quick-drying hand disinfectants, and disinfectant wipes (surgical masks are sufficient for non-aerosol operations).
Medical imaging department	Special room for fever patients	Secondary protection Disposable work caps, medical protective masks, work clothes, goggles or protective masks, isolation gowns, gloves, disposable shoe covers, quick-drying hand disinfectants, and disinfectant wipes.
	General patient room	Standard precautions Disposable work caps, medical surgical masks, work clothes, quick-drying hand disinfectants, and disinfectant wipes.
Medical aesthetics department	General consulting office	Standard precautions Disposable work caps, medical surgical masks, work clothes, quick-drying hand disinfectant, disinfectant wipes; gloves if necessary.

Continued

Medical aesthetics department	Close range operation	Level 1 protection	Disposable work cap, medical surgical mask or medical protective mask, goggles or protective face shield, work clothes, gloves, quick-drying hand disinfectant, disinfectant wipes (When carrying out activities where there is a possibility of being splashed by blood, body fluids, secretions, etc., to wear an impermeable isolation gown).
	Operation	Level 1 protection	Disposable work caps, medical protective masks, goggles or protective visors, work clothes, disposable sterile isolation gowns, gloves, quick-drying hand disinfectants, and disinfectant wipes.
Pulmonary function department		Level 1 protection	Disposable work caps, medical protective masks, goggles or protective face shields, isolation gowns, gloves, quick-drying hand disinfectants, and disinfectant wipes (surgical masks are sufficient for non-aerosol operations).

Medical technology control: For patients with a new onset of the disease, it is recommended to undergo peritoneal dialysis treatment first, unless there are absolute contraindications [17].

Personnel management: 1) Patients must perform hand disinfection before entering the blood purification center and wear medical surgical masks throughout the process. Family members are not allowed to enter the blood purification center. 2) Patients with green cards, who have returned to Hangzhou from other places and have ruled out COVID-19 but still have fever, can enter the general area for dialysis treatment after being treated in a dedicated area (the end partition area) for 2 weeks and showing no abnormal symptoms. 3) Staff in general areas and dedicated areas should not be shared.

Personal protection (**Table 1**): Standard precautions should be implemented in general areas, while first-level protection should be implemented in dedicated areas.

2.5. Otolaryngology Prevention and Control Measures during the COVID-19 Epidemic

Pre-examination screening includes the responsibility system of first-diagnosis, inquiry about epidemiological history, and assessment of epidemic risks. CT scans and COVID-19 nucleic acid testing are conducted as necessary to enhance the ability to identify and diagnose diseases.

In terms of medical technology control, measures such as reducing the admission of non-emergency patients and suspending high-risk diagnostic and treatment procedures are implemented. These high-risk procedures include negative pressure nasal replacement surgery, video nasal endoscopy, video laryngoscopy, hearing-related tests, and indirect laryngoscopy [18]. Upon downgrading to level three response, certain diagnostic and treatment procedures like hearing-related tests, indirect laryngoscopy, and video laryngoscopy will gradually resume. However, for invasive operations like nasal negative pressure replacement surgery, it is mandatory to complete new coronavirus nucleic acid testing and anti-

body testing, and additional tests such as lung CT may be performed depending on the condition.

Personnel management involves strictly implementing the “one person, one clinic” system.

Personal protection should follow first-level protection measures as outlined in **Table 1**.

2.6. Dental Prevention and Control Measures during the COVID-19 Epidemic

Pre-examination screening includes asking for epidemiological history, seeing a doctor with a green code, and performing a lung CT examination before undergoing a turbine operation. Medical technology control involves strengthening the appointment system. For level, 1 - 2 responses, high-risk projects such as elective surgeries, complex tooth extractions, crown and bridge repairs that require tooth preparation, and scaling should be suspended [19]. After downgrading to level 3 response, invasive operations such as dental implant surgeries, complex tooth extractions, ultrasonic tooth cleaning, and minor outpatient surgeries in the dental department are allowed. However, before the operation, patients must first complete the COVID-19 nucleic acid test and antibody test, and undergo a lung CT if necessary. Only those with negative COVID-19 nucleic acid and antibody test results can make an appointment with a doctor for treatment.

Personnel management should strictly implement the “one person, one clinic” system with 15 minutes between patients and 30 minutes between turbine operations.

Personal protection should follow first-level protection measures (**Table 1**).

2.7. Medical Imaging Department of CT Examination Prevention and Control Procedures during the COVID-19 Epidemic

Medical technology control: to establish a dedicated computer room for patients with fever, COVID-19 waiting list, or suspected COVID-19 cases.

Personnel management: implement a strict examination calling system to control the flow of people for examination and the number of people waiting for treatment.

Personal protection (**Table 1**): to implement secondary protection in dedicated computer rooms for heating, and standard precautions in ordinary computer rooms.

Environmental disinfection management of the fever-specific computer room: Before the patient enters, the technician activates the air disinfection machine, sets up the position, and waits in the corridor outside the computer room. After the examination, the technician uses quaternary ammonium salt disinfectant wipes to clean and disinfect the equipment and surfaces in the computer room. Additionally, air disinfection continues for 30 minutes, ensuring one person, one

use, and one disinfection.

2.8. Prevention and Control Measures for Medical Aesthetics Departments during the COVID-19 Epidemic

Pre-examination screening involves asking about the epidemiological history, checking the health code and valid certificates, and measuring body temperature.

In terms of medical technology control, before carrying out invasive diagnosis and treatment procedures such as eye plastic surgery, rhinoplasty, liposuction, and body surface tumors, it is mandatory to conduct COVID-19 nucleic acid testing and antibody testing. When hospitalization is required for diagnosis and treatment procedures, a lung CT examination must be performed.

Personnel management includes assigning a dedicated person to maintain order in the waiting area and ensuring that patients maintain a safe distance of 1 meter.

Personal protection measures (**Table 1**): First-level protection is implemented during close operations and surgeries, while standard precautions are implemented in general clinics.

2.9. The Examination and Prevention and Control Measures of Pulmonary Function Room during the COVID-19 Epidemic

Pre-examination screening is conducted to gather information about patients' epidemiological history and clinical manifestations, in order to exclude suspected cases.

In terms of medical technology control, pulmonary function tests are not conducted on confirmed or suspected patients. Outpatients with fever and respiratory symptoms can only be tested after specialists or fever clinics rule out the possibility of new coronavirus pneumonia [20].

Personal protection measures should be implemented at the first level (**Table 1**).

2.10. Environmental Disinfection of Risk Departments during the COVID-19 Epidemic

According to the guidelines which are set forth in the *Technical Specifications for Disinfection of Medical Institutions*, we carry out cleaning and disinfection, including cleaning and disinfecting medical equipment, contaminated items, object surfaces, and floors. Additionally, air disinfection is conducted in accordance with the *Hospital Air Purification Management Specifications* [10].

For environmental surface disinfection, it is recommended to use a chlorine-containing disinfectant with a concentration of 500 - 1000 mg/L. If the surface is not corrosion-resistant, quaternary ammonium salt disinfectant wipes or 75% alcohol can be used instead. In case of contamination with blood or body fluids, it is advisable to first remove the contaminants with a dry towel and then proceed to wipe and disinfect using a chlorine-containing disinfectant with a concentration of 2000 mg/L or disinfectant wipes. (2) For air disinfection, it is

recommended to ensure good natural ventilation in a room by opening windows at least three times a day for a minimum of 15 minutes each time. In areas with poor natural ventilation, the use of an air disinfection machine is recommended [21].

2.11. Medical Waste Management in Risk Departments during the COVID-19 Epidemic

Medical waste generated by patients suspected of or pending novel coronavirus pneumonia must comply with the requirements of *Medical Waste Management Regulations* and *Medical Waste Management Measures for Medical and Health Institutions*. To properly load the medical waste, it is recommended to use double-layer packaging bags and secure them with a gooseneck knot. Additionally, the packaging bags should be sealed in layers and the surface should be sprayed and disinfected with a chlorine-containing disinfectant with a concentration of 1000 mg/L before leaving the contaminated area (ensuring even spraying). Alternatively, an additional layer of medical waste packaging bag can be added outside the original bag [22].

3. Summary

During COVID-19 epidemic, risk departments play a crucial role in infection prevention and control. The scientific, accurate, reasonable, and feasible processes are developed to prevent and control infections within the risk department. These measures are strictly implemented to ensure the successful execution of prevention and control work during the COVID-19 epidemic, reducing the risk of exposure for all hospital personnel. It is essential to focus on both “external prevention of input” and “internal prevention of spreading” [23]. This involves implementing pre-screening and screening processes and managing outpatient and emergency patients, their families, and all hospital personnel at various levels. As our understanding of COVID-19 deepens and our experience in diagnosis and treatment accumulates, the hospital’s prevention and control strategies and management methods will be adjusted accordingly. By summarizing our experience in combating the epidemic, we can develop practical, effective, economical, and appropriate prevention and control plans. These plans can serve as solutions for China and the world in dealing with infectious diseases of this scale and nature [24].

Conflicts of Interest

The authors declare no conflict of interest.

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