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Reflection on the Infection Management of Primary Hospitals during the COVID-19 Pandemic

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Abstract: The outbreak of COVID-19 at the end of 2019 is a major global public health emergency. After the outbreak of the epidemic, the Chinese government quickly formulated targeted policies and strategies, including the management of COVID-19 as a Class A infectious disease, Thoroughly treatment of patients, isolation and observation of suspected infected patients, demarcation of the epidemic area, and restriction of social activities in the epidemic area. A mobile cabin hospital was established to collect all the patients due, and implement the "dynamic clearing to zero" strategy; The residents' activity track traceability system was innovatively established, and the nucleic acid test results were corresponding to the "health code", so as to realize the risk judgment of exposure or infection in each place or institution. Practice has proved that this set of systems and strategies to deal with COVID-19 has reduced the number of infections and deaths. For medical and health institutions, the challenge of COVID-19 involves many aspects, such as epidemic prevention and control, medical treatment, and patient management. Effective prevention and control measures of nosocomial infection are necessary to ensure the stable operation of medical institutions. Since the outbreak of the epidemic, the National Health Commission of China has successively formulated three versions of technical guidelines for the prevention and control of SARS-CoV-2 infection in medical institutions, and put forward the prevention and control strategy of "internal and external prevention, doctors and patients prevention, personnel prevention, and integration of three prevention". The prevention and control of nosocomial infection through respiratory infectious diseases is difficult to identify during the incubation period, insufficient materials and hardware facilities, insufficient full-time staff for infection control, and insufficient number of medical staff. In order to better cope with potential adjustments and protect people's health, it is necessary to strengthen the surveillance and early warning capacity of emergency diseases, optimize the medical treatment process and work link, establish and improve the emergency response mechanism, and prepare personnel and materials.

1. Introduction

The outbreak of COVID-19 at the end of 2019 is a major global public health emergency, with the characteristics of rapid transmission, wide range of infection, and great difficulty in prevention and control, revealing some shortcomings and deficiencies in the medical and public health management of various countries and regions. For medical and health institutions, the challenge of COVID-19 involves many aspects, such as medical treatment, patient management, and adaptation problems caused by the opening of the epidemic and breaking the routine operation of medical institutions.

2. China's COVID-19 response policies and hospital response

From January 2020 to July 2023, the National Health Commission issued 238 relevant documents, of which 182 were released in 2020, and 62 were released in just one month in the early 20 years of the epidemic. These include: Prevention and control of COVID-19 infection, medical treatment and isolation, medical staff support, infection control personnel allocation, management of patients and asymptomatic persons, community infection prevention and control, use of protective equipment, laboratory management, public environmental disinfection, management of children and pregnant women, psychological counseling, disposal of the remains of infected patients, resumption of work and childbirth after the epidemic, guidance of the public to use masks, vaccination and traditional Chinese medicine Treatment and other aspects. At the beginning of the outbreak, the mortality rate of infected patients was probably between 2.3 and 4.3% [1], and the R0 was estimated to be about 3.06 (95%CI: 3.51-4.05) [2], indicating a strong ability of transmission. In January 2020, the National Health Commission of the People's Republic of China issued a notice that COVID-19 was included in the management of Category B infectious diseases. The measures included: compulsory isolation, observation and treatment of patients and suspected infected persons, demarcation of epidemic areas and restriction of social activities in epidemic areas, closure of places that may spread pollution, and recruitment of various personnel and resources [3]. Hospitals in Wuhan are actively treating and exploring strategies and methods for the management and protection of COVID-19, and medical teams from all over the country are coming to support. At the same time, other hospitals began to carry out diagnosis and treatment knowledge training and infection prevention and control exercises.

China implements the practice of "dynamic clearing" of cases [4], and all patients should be received and treated as much as possible. In order to relieve the pressure on hospitals, concentrate on patients and limit the spread of the epidemic, mobile cabin hospitals transformed from stadiums, newly built mobile cabin hospitals and public health centers have been put into use one after another [5-6], and medical resources from all provinces across the country have been deployed to build teams to support the epidemic areas. This mode of mobile cabin treatment and non-local medical resource deployment support is still implemented in other provinces and cities where the subsequent spread of infection is serious.

In order to find and eliminate social infection, during the epidemic period, china has established a human activity tracking system, using health code [7] to obtain personal activity information, and conducting nucleic acid screening of key groups and populations in coverage areas according to the risk of the epidemic. Residents can scan the health code to register their access to the site, and the recent nucleic acid test results can also be displayed after scanning the code.

In the case of limited spread of the epidemic in the early stage, medical institutions could maintain normal operation. Practice has proved that this management mode has achieved good results. From 2020 to 2021, the growth rate of the number of COVID-19 cases in each quarter was basically less than 5% ,the number of COVID-19 cases in the fourth quarter of 2021 increased by 6%

compared with the third quarter, Figure 1. After 2022, the cumulative reported number of confirmed COVID-19 patients increased significantly (Figure 2).

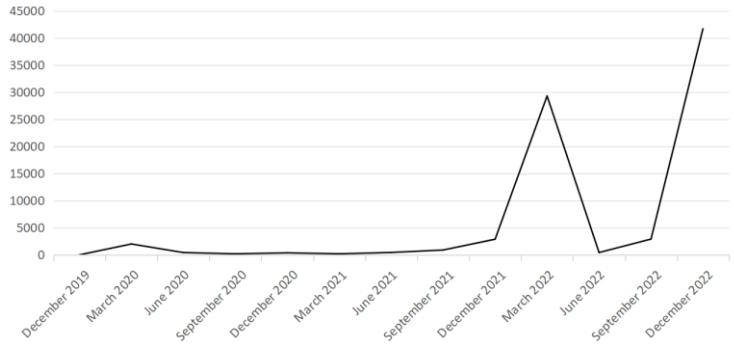

Figure 1: The number of confirmed COVID-19 cases per quarter was reported in China from 2019 to 2022

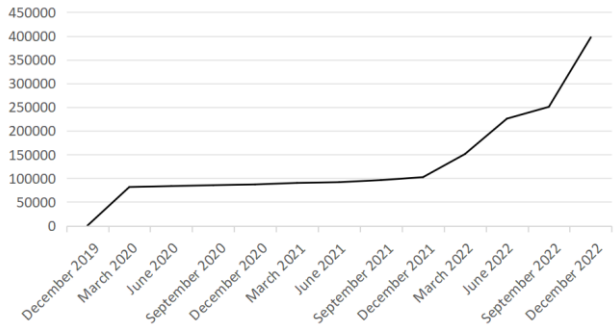

Figure 2: The cumulative number of confirmed COVID-19 cases from 2019 to 2022 was reported

Data from: National Health Commission of the People's Republic of China

During this process, the novel coronavirus pneumonia (COVID-19) virus gradually mutated, including Alpha, Delta and Omicron, which also showed different pathogenic manifestations in the population. With the changes in the epidemic situation and the continuous clarification of the understanding of SARS-CoV-2, the Comprehensive Group of the Joint Prevention and Control Mechanism of The State Council for COVID-19 Epidemic (hereinafter referred to as the Comprehensive Group) issued a notice on the issuance of five documents, including the "Monitoring Plan for Category B and B Pipe Epidemic of SARS-cov-2 Infection", announcing the opening of the epidemic in December 2022. Since then, many measures, such as vaccination, have been introduced to reduce the fatality rate and severity of the disease. At this time, the daily diagnosis and treatment order of medical institutions was slowly restored, and they also undertook part of the vaccination work according to the national policy requirements.

In this campaign, which mobilized the forces of almost all walks of life, hospitals at all levels and medical personnel played the main role of the army, taking on important responsibilities such as medical treatment, patient management, and nucleic acid testing. During the epidemic, the whole country has been devoted to the prevention and control of the epidemic and worked hard to protect the health of the Chinese people. As of December 7, 2022, the World Health Organization reported 640 million infections and more than 6.6 million deaths globally [8]. China ranked 15th in the number of diagnosed cases and 36th in the number of deaths in the world, which could not be attributed to the epidemic prevention and control strategies in China and the implementation of

local governments and primary medical and health institutions.

3. Prevention and control measures of nosocomial infection during epidemic

The implementation of hospital infection management system ensures the progress of medical treatment and epidemic prevention. During the epidemic, health administrative departments at all levels and hospitals at all levels have taken the prevention and control of nosocomial infection as the focus of hospital management. Before January 2020, more than 3000 local medical staff in Hubei Province were infected with SARS-CoV-2 [9], of which 40% were acquired in hospitals. The daily diagnosis rate of medical staff in Wuhan was also much higher than that of the general population, which was 130.5 cases /1 million people and 41.5 cases /1 million people, respectively. In January 2020, the National Health Commission of the People's Republic of China issued the "Notice of Technical guidelines for the prevention and control of COVID-19 in Medical institutions (the first edition)", requiring medical and health institutions to do well in training, standardize the protection of medical staff, and strengthen patient management. It is proposed that hospitals should build fever clinics, emergency departments should establish pre-examination and triage systems, and wards should set up isolation wards. The second edition was updated in April 2021, which formulated the procedures for medical staff to go in and out of the isolation ward, the selection method of protective equipment, disinfection scheme, and the disposal scheme of respiratory occupational exposure. The prevention and control strategy of "internal and external prevention, doctor and patient prevention, person prevention, and integration of three prevention" was put forward: They refer to paying attention to personnel inside and outside the hospital, patients and medical staff, personnel and foreign goods, strengthening personnel management, improving infection control skills, and scientific disinfection and control. The third edition of the prevention and control guidelines put forward more detailed requirements for medical machines to improve their own system processes and control of key departments.

4. Difficulties in prevention and control of respiratory infections in medical institutions

4.1 Identification of the source of infection

There is an incubation period for respiratory infectious diseases, and it is difficult to identify the disease during the incubation period. The incubation period of COVID-19 infection can be up to 21 days [10], and there are a large number of mild and asymptomatic patients. These unidentified infected persons can produce a large number of secondary cases as the source of infection. Patients with respiratory infectious diseases may have other medical conditions, which may make the respiratory disease overlooked during the initial examination, treatment, or when the symptoms are not clear. During the epidemic period, the hospital has set up fever clinics and pre-examination and triage for pre-screening, but there are limitations in risk screening, and it is difficult to accurately find potential infections. This problem has been solved to a large extent after the universal implementation of nucleic acid testing.

4.2 Patient admission screening

According to the way of medical treatment, the patients can be divided into appointment patients, general outpatients, emergency patients, and patients referred by other medical institutions. The survey results of 2018 [11] showed that 67.5% of patients' first visit units within two weeks were primary medical and health institutions such as clinics and community health service centers. In 2023, the National Health Commission reported that the average appointment rate of tertiary

hospitals was 49.2%[12], and there were more difficulties in the implementation of appointment in primary medical institutions. It is not easy to find out or investigate the patient's condition through appointment, and it is also difficult to provide personal protection guidance in advance. In the general outpatient setting, epidemiologic investigation could be initiated after patient presentation, but this would imply bringing the risk into the hospital. Patients who go to the emergency department are often more seriously ill than ordinary patients, and it is difficult to implement personal prevention and control measures, invasive operations, and epidemiological investigation. In denser and larger practice Settings, early screening by appointment may reduce risk.

4.3 Environmental surface cleaning and disinfection

In terms of the implementation of measures for nosocomial infection among medical staff, the implementation standards of various hospitals were different. For example, the hospital environment, surface, air and other clean, disinfection is a routine work of the hospital, in 2012, China issued the "technical specification for disinfection of medical institutions" [13] this national industry standard, defined disinfection as the elimination or killing of pathogenic microorganisms on the transmission media, so that it can achieve harmless treatment, and stipulates that medical institutions should keep the surface of the diagnosis and treatment environment clean and dry. In case of contamination, timely and effective disinfection should be carried out. The standard requires that high-risk departments should be regularly disinfected, and does not put forward clear requirements for the frequency of cleaning and disinfection. In addition, it stipulates that articles that indirectly contact patients, such as quilts, mattresses, and so on, should be cleaned and disinfected regularly, but cotton bedding and other fabrics will shrink and deformed after washing, which can not be used. It takes more than one hour to complete the bed sheet disinfection machine. The medical and nursing operations of critical patients are contaminated by blood, body fluids, and excreta. It is difficult to implement the principle of cleaning and disinfection at any time in case of pollution.

4.4 Objective conditions and material support

Weak hardware facilities and insufficient supplies. The spatial layout between the isolation of patients and susceptible infections requires the division of three areas: clean area, contaminated area, and semi-contaminated area, as well as patient channels and medical staff channels. Due to the lack of understanding of the initial construction of medical institutions and the limited development and renewal of medical institutions, some medical institutions, especially primary medical institutions, have space limitations, which make it difficult to divide the functional areas. From the perspective of medical consumables support, protective clothing, isolation gown, mask, and face screen are the necessary supplies for medical staff in epidemic protection. In the early stage of the COVID-19 epidemic, medical consumables and protective equipment could not be supplied in time due to the large population of China.

4.5 Infection control factors

The shortage of full-time staff for infection control. 2021 Comprehensive Group of Joint Prevention and Control Mechanism of The State Council[14] The "Notice on Further Strengthening the staffing and management of nosocomial infection control personnel in medical institutions" was issued, which required the number and professional background of full-time personnel for nosocomial infection control in medical institutions with different levels and beds. Medical institutions often had insufficient staffing in the implementation, part-time hospital infection

personnel performed the functions of full-time personnel, and hospital infection full-time personnel did not receive systematic training. The department has an unreasonable composition of professional staff..

4.6 Medical human resources

The number of medical staff is insufficient, the overwork is difficult to continue for a long time, and the personnel management is weak. In order to avoid infection, some hospitals need to restrict or partially restrict personal activities, and even require medical staff to be closed in the hospital for management and strict control of going out. However, the implementation of prevention and control measures will be affected by long-term continuous work and high-tension work mode. Social distancing is difficult to implement in practice in health care Settings.

4.7 The implementation status of the grassroots measures

There is a combination of inadequate response and overreaction to infected cases by primary medical institutions. "Dynamic COVID-zero" is the ideal state of infectious disease control. In the implementation, there are differences in the understanding of the policy in some regions, departments, and medical institutions, and there are cases of excessive prevention and control in some areas. How to prevent and control the epidemic scientifically, accurately, and balance the cost of epidemic control is a problem worth thinking about in the normalization of disease management.

5. Conclusion

Respiratory tract infections such as SARS-CoV-2 are the most destructive of all nosocomial infections. The transmission routes of droplets, air and even contact make respiratory tract infections more common than other nosocomial infections, and the population is generally susceptible. Respiratory infections can be controlled by: Vaccination, preventive and therapeutic application of anti-infective drugs, infection control of symptomatic infected persons, compliance with cough hygiene and respiratory etiquette, and use of protective equipment, etc., but the above measures are obviously not enough for super respiratory infectious diseases such as COVID-19. Early identification and reduction of spread are the key and difficult points to reduce the impact of sudden respiratory diseases. For various reasons, "Class B tube" was finally implemented for COVID-19, but in the early stage of the COVID-19 epidemic, it is necessary to carry out disease prevention and control management according to Class A diseases.

In the face of sudden respiratory infectious diseases, especially the invasion of pathogens that lead to poor prognosis and high mortality, it is a test of the emergency response and support capacity of medical institutions and health administrative departments. A large number of medical staff and patients are infected, resulting in the subsequent medical services, drug supply, and protective materials can not keep up. Even in the first winter and spring after the release of the policy, the pandemic of influenza and other diseases, and the medical run caused by the collective attack of people in kindergartens, primary schools and other centralized places, there are many work links that can be optimized in the process of restoring normal order. In the process of restoring normal order, the monitoring and early warning ability of sudden diseases should be strengthened, the emergency response mechanism should be established and improved, and the long-term management evaluation strategy should be formulated. Optimizing the medical treatment process under special circumstances, assessing and reducing the risk of infection, stockpiling personnel and goods, improving vaccine development capacity, and improving public health literacy can better respond to potential challenges and protect people's health by learning lessons.

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