CONSTRUCTION OF EFFECTIVE NOSOCOMIAL INFECTION PREVENTION AND CONTROL MEASURES IN DESIGNATED HOSPITALS FOR COVID-19 - TAKING THE TEMPORARY EMERGENCY HOSPITAL OF BOISE CITY AS AN EXAMPLE

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Abstract

Based on the practice of nosocomial infection prevention and control of the novel coronavirus pneumonia epidemic in Baise Temporary Emergency Hospital, the prevention and control practices of nosocomial infection prevention and control in designated hospitals are explored and formulated according to the prevention and control policies of Chinese governments at all levels, in order to provide reference for nosocomial infection prevention and control of the novel coronavirus pneumonia epidemic. It is clear that effective NOsocomial infection prevention and control in hospitals requires precise efforts in improving organizational structure, environmental transformation, material support, training and assessment, system mechanism, supervision and evaluation, continuous improvement and other aspects, and precise policies can be scientific prevention and control and achieve results.

Keywords: COVID-19; Designated hospitals; Hospital infection prevention and control

Introduction

The novel coronavirus is highly contagious, rapidly changing, and spreads insidiously, making it susceptible to people and affecting public life, health and safety (Li,2020; Martinez,2021). Scientific and standardized prevention and control is the main way to control the spread of the novel coronavirus. In February 2022, the local outbreak of COVID-19 occurred in Baise City, Guangxi. The government ordered that Baidong Hospital of Youjiang Affiliated Hospital be used as the temporary emergency hospital of Baise and the designated medical institution for the treatment of COVID-19. Designated hospitals are general hospitals designated by governments at all levels or health administrative departments with strong comprehensive capacity, severe treatment conditions, and high level of hospital infection control and management. The main task is to treat COVID-19 patients and suspected infected patients. (Zhou, B., Jiang, Q., Zhang, J., & et al. 2022). As a hospital that has not yet been formally put into operation, after receiving the task, the hospital district quickly cleaned the environment and reformed the layout, prepared wards and staff, established and improved logistics and other auxiliary support systems, established and improved systems and procedures, and welcomed patients to hospital for treatment on time. During this period, 206

confirmed patients were admitted to the hospital, and after 69 days of epidemic prevention and control, all patients were cleared, achieving the goal of "zero infection, zero death and zero spillover", and ensuring the safety of the hospital. This article takes the prevention and control of COVID-19 in Baidong Hospital as an example to discuss the nosocomial infection prevention and control strategies in designated hospitals for the treatment of patients with the novel coronavirus.

Research Objectives

To establish an infection control system for designated hospitals based on China's policies and national conditions to ensure hospital safety, surrounding environment and social security.

Scope of the Research

1. Scope of contents: Construction and implementation of Nososomal infection prevention and control system in Baise Temporary Emergency Hospital under COVID-19 epidemic. Including China's policy, organizational system construction, environmental transformation, personnel, equipment and materials preparation, personnel training and assessment, management system. The epidemic prevention and control data and information of designated hospitals refer to the nosocomial infection prevention and control data of Baise Temporary Emergency Hospital. And mechanism establishment, supervision and evaluation, etc.

2. Time frame.

2.1 Time range of general epidemic-related information and data: November 2019 to December 2022

2.2 Time range of raw data and data of designated hospitals for cases: February to May 2022

Research Methodology

1. Research methods.

1.1 Case analysis method. Take the nosocomial infection prevention and control practice of the COVID-19 epidemic in Baidong Hospital as an example. By analyzing the prevention and control measures in the aspects of organizational structure, environmental transformation, material guarantee, training and assessment, system mechanism, supervision and evaluation, the experience, practices and references of this case are summarized to provide reference for designated hospitals to deal with the nosocomial infection prevention and control of the novel coronavirus pneumonia epidemic or similar infectious diseases.

1.2 Literature analysis. Literature and materials on NOsocomial infection prevention and control of COVID-19 at home and abroad were consulted by means of libraries, Chinese and English databases, the Internet and other tools, and statistical data, policies and regulations were collected. It mainly includes: First, the relevant policies, data and measures of nosocomial infection prevention and control at home and abroad were analyzed. The second is to make use of CNKI and other databases to conduct research and analysis on Nosocomial infection prevention and control measures and responses to the novel coronavirus outbreak. In the process of writing, on the basis of literature research, theoretical analysis and practical analysis were combined to fully grasp the basic concepts and theories involved in the study of this paper, and then accurately grasp the issues to be studied

1.3 Field research method. Participate in the prevention and control of nosocomial infection in hospitals, as the organizer of primary materials and implementer of some decisions,

follow the latest policies, combine academic research with practical experience, and summarize and put forward feasible countermeasures that meet the needs and fit the reality.

2. Research steps

2.1 Study and absorb literature on the premise of following China's prevention and control policy.

2.2 Carry out environmental transformation and make overall plans for material reserves.

2.3 Establish working system, process and working mechanism, and establish hospital infection management manual.

2.4 Carry out intensive training and education.

2.5 Strictly strengthen supervision, standardize the implementation of all measures, and continue to improve management measures.

2.6 Summarize, analyze and judge in time to ensure hospital safety.

3. Data collection

3.1 WHO data. All of the WHO's COVID-19 prevention and control policy guidelines come from its official website and other public sources.

3.2 China's Policies and Guidelines. All COVID-19 prevention and control policies and Nosocomial infection guidelines come from public sources such as the official websites of the Chinese government such as the COVID-19 Prevention and Control Headquarters or the NHC.

3.3 Data on COVID-19 infection prevention and control in Baidong Hospital. The staff of the temporary Joint COVID-19 Control Office is responsible for collecting and summarizing the COVID-19 prevention and control data of the hospital in Baidong Hospital, including hospital notices, system and other documents, hospital prevention and control manuals, medical record monitoring, health monitoring, training and assessment, disinfection registration, equipment list, etc.

3.4 Other public information. Information on the COVID-19 outbreak and other materials can be obtained through news or information searches on various public online platforms.

4. Data analysis.

The implementation and effects of nosocomial infection prevention and control measures in designated hospitals for the novel coronavirus pneumonia were analyzed in a descriptive way, and problems existing in nosocomial infection control measures were found, so as to provide a basis for improving and effective infection control measures.

Research Results

1. Improve the infection prevention and control organization system, and comprehensively promote epidemic prevention and control management.

Organization, system, infrastructure and hard and soft technical support are the prerequisites (Xiao, P. Y., He, D. D., Gong, X., & et al. ,2012) for more efficient nosocomial infection management, and a sound organizational structure for infection prevention and control is the prerequisite (Wang, J. Y., Yu, W. C., Hu, Z. L., & et al. ,2019) for infection prevention and control. The tertiary nosocomial infection management framework system of Nosocomial infection Management Committee -- Temporary Joint Office of Infection Control -- Nosocomial infection control experts and infection control management team stationed in ward provides organizational guarantee for hospital safety. National infection control experts serve as advisers and technical guidance, and the committee's leadership team makes overall supervision. The temporary joint office consists of a backbone of provincial infection control experts, who are responsible for the specific work of the hospital's regional layout, people flow

and logistics, design and transformation, and the establishment of prevention and control systems and processes. Innovative independent management of ward sites. 8 ward sites, 1 contaminated area peripheral disinfection team and key infection prevention and control departments each arranged 2 hospital infection prevention and control experts to be stationed to carry out front-line work of ward infection prevention and control, and supervise the implementation of prevention and control measures.

2. Build a strong physical barrier for epidemic prevention and control, and quickly transform the prevention and control environment.

It is an urgent task to renovate hospitals and isolation wards in a short period of time to meet the requirements for treating COVID-19 patients, and to achieve strict physical isolation of people, logistics and air flow. According to national policies, the hospital has conducted scientific analysis and research on the basic buildings of the hospital, and standardized the setting of "three zones and two passageways" to distinguish contaminated areas, potentially contaminated areas and clean areas. There are physical partitions between each zone, and scientific setting of patients-only passageways and medical-staff passageways as well as the exits of contaminated goods. The entrances and exits of each zone and passageway are equipped with eye-catching signs to realize physical isolation.

2.1 Set up the division of hospital areas and wards.

The hospital is open to administrative research teaching building, multi-functional lecture hall, inpatient building B, C, D, fever clinic area, ambulance killing area and medical waste temporary storage room, and standardized "three districts and two channels" management. (1) Contaminated area: inpatient building B, the concentration of positive cases; (2) Potential contaminated area: from the entrance of receiving patients to the entrance of isolation ward; (3) Clean area: administrative research building and multi-functional lecture hall, which is the office and living area of logistics management personnel and material support area. (4) "Two channels" : a special channel for patients is set up from the main entrance to building B of the inpatient building, another channel for medical staff and administrative logistics staff is set up in building B of the inpatient building, and the side door of the hospital area is set up as a special channel for medical staff, completely separated from the medical waste transfer channel and the special channel for patients. (5) The isolation ward is managed in three areas, including clean area (green), semi-contaminated area (yellow) and contaminated area (red). Each isolation ward has a separate sanitary passage area, and the wall between the three zones is cut off to the top, to achieve rapid conversion, the combination of peace and war, and to minimize the risk of doctor-patient cross infection. Eye-catching signs and reminders are posted in each area, channel, location and room. See Figure 1 for the general plan of Baidong Hospital, Figure 2 for the distribution of "three districts and two channels" in the hospital, and Figure 3 for the distribution of three districts of isolation wards.

Figure 1: (Top left)General Plan of Baidong Hospital

Figure 2: (Top right)Distribution map of "three districts and two channels" in the hospital area

Figure 3: (below)Distribution map of three zones in isolation ward

2.2 Strengthen the management of people flow.

Strictly abide by the principle of diversion management, and prohibit all types of personnel from cross-regional activities. The hospital has three entrances and exits for transferring patients, medical personnel and medical waste. The medical staff and administrative logistics management staff of the isolation ward walk into the inpatient building to the left of the B and D buildings, the administrative scientific research teaching building and the multi-functional lecture hall through the entrance of the medical staff respectively. The patients pass through the entrance to the fever CT and go directly to the first floor of the B /D building of the inpatient building for handover, and take the special elevator to the isolation ward. Moreover, each ward is independently managed by an independent medical team and independently uses its own means of transportation.

2.3 Strengthen logistics management.

The delivery of meals and medicines for patients shall be delivered by the material distribution team in the contaminated area to the isolation ward through the patient channel. Other cleaning goods shall be delivered from the medical staff channel to the relevant areas by the material distribution team in the clean area. Medical waste is transported by special personnel and special ladder for harmless treatment. All wastes in hospitals shall be treated as medical waste.

2.4 Strengthen the management of ventilation, cleaning and disinfection.

Medical vacuum system is an important part of life support system. In the prevention and treatment of respiratory infectious diseases, the pipeline and vacuum pump group are susceptible to contamination, resulting in high risk of nosocomial infection.

Therefore, the hospital pays special attention to the separation, disinfection and isolation of steam and water in the negative pressure suction station room of the hospital center to avoid increasing the risk of infection due to airflow confusion and aerosol re-suspension caused by dust. Pay attention to the whole disinfection management.

3. Build solid support for sensory control and protection, and implement protection materials.

3.1 Implement equipment and materials allocation.

The allocation of infection prevention and control equipment shall be studied in accordance with the list of medical equipment for reference reserve of emergency treatment materials for major epidemic prevention and treatment bases in the national Diagnosis and Treatment Plan for Novel Coronavirus Pneumonia and the Plan for Capacity-building of Public Health Prevention and Treatment Capacity. The allocation of equipment and materials should be comprehensively considered, and divided according to the allocation of protective materials, disinfection instruments and disinfection drugs, to meet the allocation and use of medical equipment and materials during the epidemic prevention and control period.

3.2 Strengthen supervision and control of equipment allocation.

In order to grasp the all-round and whole-process supervision, 105 intelligent dialogue cameras have been installed in the hospital wards, fully covering the important wards, nurses' stations and workplaces in the outpatient building. The implementation of hospital infection prevention and control measures is supervised by the whole region, the whole staff and the whole process.

3.3 Strictly grasp the disinfection management of equipment.

Disinfection of the environment and surfaces is an important measure (Zhang, S. J., Wang, Y., Zhang, Y., & et al. ,2022). for infectious disease control. Strictly abide by the requirements of the disinfection system, and do a good job of cleaning and disinfecting medical instruments.

4. Strengthen training and assessment to improve infection prevention and control capacity.

Scientific training is an important measure (Gan, T. E., Zhang, L. J., Jiang, X. H., & et al. ,2019) to improve the knowledge, skills, awareness and competence of full-time hospital infection staff and related staff. In accordance with the requirements of China's epidemic prevention and control policy and the Technical guidelines for Nosocomial infection prevention and control, training on knowledge and skills of infection prevention and control and personal protection shall be conducted for all staff entering designated hospitals, especially the training on wearing and removing personal protective equipment. All staff must pass the assessment before they can take up their posts. The staff of the temporary Joint Office of Infection Control and Prevention are responsible for the sector-level training and assessment, and all staff are trained on prevention and control plan, action guide, hospital layout process, personnel, goods, vehicle work flow, protective equipment and other contents in a way that combines theory and practice. Personalized training was also carried out according to the actual work of the post, and the ward was assessed by the APP of the sensory control work room. Finally, the hospital-level assessment team also assessed one by one until they were qualified. Strict and standardized training and assessment to ensure that all staff master personal protection and other prevention and control knowledge, skills, systems, processes, to ensure the safety of the hospital.

5. Establish and improve the system and management mechanism to promote the implementation of hospital infection prevention and control.

5.1 Establish standardized systems, processes and schemes.

According to the requirements of China's national epidemic prevention and control policy and relevant technical guidelines, the management system and management process have been formulated and improved in light of the actual situation, and the Manual of COVID-19 Nosocomial Infection Prevention and Control of the Affiliated Hospital of Youjiang Medical College for Nationalities has been formulated. From scratch to excellent, 46 systems and 70 attachments covering the whole procedures of the hospital, including supervision of infection control, disinfection and isolation of isolated wards, terminal disinfection, infection monitoring, management and reporting, have been formulated. All staff follow it to ensure safety.

5.2 Establish a normal management mechanism.

Establish a meeting system to regularly study, coordinate and solve problems related to nosocomial infection management. Analyze monitoring data and coordinate problem solving every day. Set up a daily work list system, make overall planning and deal with problems.

6. Strengthen surveillance, analysis, research and judgment to improve the accuracy of infection prevention and control.

6.1 Strengthen nucleic acid detection of all personnel.

Nucleic acid testing is an effective and quick way to detect COVID-19 infection, and an important measure (Medical Hospital Authority. ,2021) to implement the four early strategies of "early detection, early reporting, early isolation and early treatment". According to the requirements of national policy, the hospital conducts nucleic acid and environmental nucleic acid testing for all staff every day. The hospital also focuses on the routine testing of the new coronavirus outside the hospital environment, so as to grasp the safety of personnel and the environment in real time.

6.2 Strengthen the health monitoring and supervision of all staff.

The hospital shall implement a daily monitoring and reporting system for the health status of all staff. If the body temperature and physical symptoms are abnormal, timely report, evacuation, recovery assessment and other work.

6.3 Strengthen the sensory data monitoring.

A real-time infection monitoring system was used to monitor the incidence of nosocomial infection, multiple sites, multiple departments, high-risk factors, etc., and put forward improvement suggestions and prevention and control measures for existing problems.

6.4 Strengthen occupational exposure monitoring.

Carry out epidemiological investigation of persons suspected of being infected, conduct risk assessment of their contacts, intensify testing, and conduct emergency treatment according to the level of risk.

6.5 Strict closed-loop management.

All closed loop management staff in designated hospitals shall implement "two points and one line" closed loop management between the resident and designated hospitals. The resident shall implement strict personnel and goods management, strengthen cleaning and disinfection, and standardize discharge management.

Conclusion and Discussion

1. A sound organizational system for infection prevention and control is a prerequisite for comprehensively promoting epidemic prevention and control management. The first-class expert team of nosocomial infection prevention and control supports the strong nosocomial

infection prevention and control organization system of the hospital, which has become the premise and key to comprehensively promote the prevention and control management of the epidemic.

2. Physical barrier is the basis of nosocomial infection. Strict physical isolation of flow of people, logistics and air flow, and scientific and standardized setting of "three areas and two channels" can minimize the risk of doctor-patient cross infection.

3. The implementation of protective materials is the basic guarantee for effective epidemic prevention and control. Protective materials, disinfection equipment and disinfection drugs are the guarantee, and the configuration of intelligent supervision equipment can help the implementation of management measures.

4. Training and assessment are an important part of improving infection prevention and control capacity. Everyone's training is in place and everyone's assessment is passed, which guarantees the overall prevention and control baseline of the hospital. The assessment of APP in the sensory control office helped improve the assessment quality during the epidemic.

5. Establish and improve the system and management mechanism to promote the implementation of nosocomial infection prevention and control. The manual on Nosocomial infection prevention and control of COVID-19 is the solidified result of the hospital prevention and control system and the main starting point for the effectiveness of nosocomial infection prevention and control.

6. Strengthen surveillance, analysis, research and judgment to improve the accuracy of infection prevention and control. Nucleic acid testing of all personnel and environmental nucleic acid testing is an important measure for epidemic prevention and control in China. Coupled with the personnel health monitoring and reporting system, hospital safety can be supported by reassuring data.

7. Closed-loop management of all staff is an important nosocomial infection prevention and control experience in China's designated hospitals for COVID-19.

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