
The Effectiveness of Enhanced Clinical Microbiological Testing in Hospital Infection Control at the Centers for Disease Control and Prevention

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Abstract: *Objective:* To explore the effect of enhanced clinical microbiological testing in hospital infection control at the Centers for Disease Control and Prevention. *Methods:* 100 cases of inpatients were screened and carried out from January 2023 to December 2024. The subjects were divided into groups with the assistance of the random number table method. The control group (50 cases) adopted routine infection control, while the research group (50 cases) underwent enhanced clinical microbiological testing to compare the incidence and degree of nosocomial infection between the groups. *Results:* The incidence of nosocomial infection in the experimental group (4.00%) was significantly lower than that in the control group (20.00%) ($P < 0.05$). The incidence of nosocomial mild infection in the experimental group (2.00%) was lower than that in the control group (14.00%) ($P < 0.05$). *Conclusion:* Strengthening the application of clinical microbiological testing can improve the effectiveness of hospital infection control at the Centers for Disease Control and Prevention, reduce the incidence of nosocomial infections, and improve the effectiveness of infection prevention and control, which has high clinical application value.

Keywords: Centers for Disease Control and Prevention; Clinical microbiology testing; Hospital infection control

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1. Introduction

Nosocomial infection control is one of the important contents of the Centers for Disease Control and Prevention. Hospitals receive a large number of patients every day, and the patients' conditions are complex and varied. Coupled with the influence of multiple factors such as treatment and environment, the risk of nosocomial infection is high^[1]. Nosocomial infections refer to acquired infections caused by different pathogens in the hospital, which can invade multiple systems such as the digestive tract, respiratory tract, and skin. The occurrence of nosocomial infections will not only cause symptoms such as fever and wheezing, but also aggravate the original disease, increase the difficulty of treatment, have a serious negative impact on patients' lives and health, and easily lead to medical disputes^[2]. This makes hospital infection prevention and control the focus of clinical attention. The conventional nosocomial infection prevention and control model has certain application value, but lacks pertinence and standardization, resulting in the effectiveness of

nosocomial infection control at the Centers for Disease Control and Prevention ^[3]. Although clinical drug treatment for nosocomial infections can improve symptoms, it is affected by the abuse of antibiotics, leading to increased resistance of pathogens, making the prevention, control and treatment of nosocomial infections less than ideal ^[4]. Therefore, it is very important to choose efficient intervention methods to improve the effectiveness of CDC hospital infection identification and control. Microbial testing technology is one of the main technologies used clinically to detect the types of pathogenic microorganisms, including molds, bacteria, viruses, fungi and other microorganisms. It can not only assist in diagnosing disease types, but also assist in clinical understanding of pathogen resistance, infection causes, infection levels, etc. ^[5] Applying clinical microbiological testing to hospital infection prevention and control can better understand the risk and extent of patient infection, and implement targeted prevention and control measures, which will help improve the effectiveness of hospital infection control at the Centers for Disease Control and Prevention. In this regard, this study observed and analyzed the effect of strengthening microbial testing in hospital infection control at the Centers for Disease Control and Prevention. The report is as follows.

2. Materials and methods

2.1. General information

100 cases of inpatients were screened and carried out from January 2023 to December 2024. The subjects were divided into groups with the assistance of the random number table method. In the control group (50 cases), 27 male cases and 23 female cases were screened. The age statistics ranged from 20 to 75 years old, with an average age of (47.39 ± 4.52) years old. In the study group (50 cases), 28 male cases and 22 female cases were screened and screened. The age statistics ranged from 21 to 75 years old, with an average age of (47.63 ± 4.81) years old. Baseline data were compared item by item, $P > 0.05$, indicating comparability between groups.

Inclusion criteria: (1) Agree to participate after reading relevant information; (2) Completeness of clinical data after review one by one; (3) Mental state symptoms.

Exclusion criteria: (1) Those who were complicated by infectious and infectious diseases before enrollment; (2) Those who were complicated by malignant tumors; (3) Those who were pregnant or had given birth.

2.2. Method

The control group adopted routine infection control.

- (1) Medical operation management: various treatments and nursing work were carried out under the guidance of aseptic principles. Regularly inspect the sterility and standardization of medical operations.
- (2) Hand hygiene management: Hands should be cleaned and disinfected according to hand hygiene standards before and after contact with patients in medical care. Especially for patients with a higher risk of infection, hand hygiene should be strengthened and hand hygiene should be ensured according to the seven-step handwashing method.
- (3) Medical device management: According to the current management regulations of the hospital, medical devices and items should be cleaned and disinfected regularly. Replace the pipeline in time and perform sterilization and disinfection.
- (4) Infection treatment: If the patient develops nosocomial infection, he or she should receive routine anti-infective treatment.

The research team implemented enhanced clinical microbiological testing.

- (1) Intensive microbial testing: The ATBG-5 tester was used to assist in clinical drug susceptibility testing and determine the type of bacteria. The ATB Expression instrument assists clinical identification of microorganisms, and ESBLs assist in screening microorganisms, and the MIC method is used to determine sensitivity. Instruct the patient to adjust his or her body position, mainly in a sitting position, assess his or her vascular condition, select a

suitable vein, and instruct the patient's hand to adjust to a fist-clenching posture. The disinfection center point is the needle insertion point, and disinfection is performed around it. After collecting the samples, place them into sterile tubes for testing. Instruct patients on effective oral cleaning methods before collecting sputum samples. Instruct patients on how to cough up sputum during collection. After taking a deep breath, cough out the sputum forcefully and put it into a sterile container. Select the appropriate blood sample testing method based on the patient's clinical manifestations. When testing sputum samples, mix them evenly with sterilized physiological saline, continuously shake the test tube for 5–10 seconds, and then extract the thick sputum and put it into the culture medium for inspection.

- (2) Improve the sterilization and disinfection management system: Set standardized sterilization and disinfection processes and standards based on the nature of medical items and instruments, and regularly inspect the number and types of bacteria on the surfaces of instruments and objects. Clear regulations on hand hygiene and sterility standards for medical and nursing operations, improve the management system, and establish a reasonable reward and punishment system. Regularly inspect the sterility, cleaning, and disinfection of items, hand hygiene and medical and nursing operations, and punish those who do not meet the standards accordingly. This can be linked to a performance-based salary to increase the attention of medical staff.
- (3) Strengthen the prevention and control of nosocomial infections: Regular microbial testing should be performed on those with a higher risk of nosocomial infection. If the risk of infection is high or nosocomial infection occurs, reasonable antibacterial drugs should be selected based on the microbial test results, and pathogen resistance should be regularly checked during treatment to evaluate the treatment effect. The treatment plan should be adjusted based on the microbial test results. To enhance the effectiveness of hospital infection control. In addition, we should strengthen the control of pathogen infection sources and transmission routes, and improve the standardization of sample collection and medical care operations. Strengthen environmental management, rationally divide the layout of hospitals and departments, clearly divide sterile areas, operating areas, isolation areas, etc., set corresponding environmental management standards according to the functions of each area, and post area names, management regulations, etc. in conspicuous places. Set up hospital infection prevention and control management personnel to regularly inspect the maintenance of the hospital environment and the standardization of medical and nursing operations.

2.3. Observation indicators

Incidence of nosocomial infections: covering respiratory tract infections, urinary tract infections, incisional infections, and blood infections.

Degree of nosocomial infection: mild: mild inflammatory reaction; moderate: obvious inflammatory reaction, accompanied by mild to moderate complications; severe: strong inflammatory reaction, damage to organ function, and worsening of complications.

2.4. Statistical analysis

Data were processed with SPSS 26.0 standard software. Counting data: n (%), χ^2 test, measurement data: mean \pm standard deviation (SD), t test. There are differences in the description of statistical dimensions: $P < 0.05$.

3. Results

3.1. Incidence of nosocomial infection

The incidence rate in the experimental group was lower, $P < 0.05$, see **Table 1**.

Table 1. Comparison of the incidence of nosocomial infection n (%)

Group	n	Respiratory tract infection	Urinary tract infection	Incision infection	Blood infection	Overall incidence
Experimental group	50	0 (0.00%)	1 (2.00%)	1 (2.00%)	0 (0.00%)	2 (4.00%)
Control group	50	4 (8.00%)	3 (6.00%)	2 (4.00%)	1 (2.00%)	10 (20.00%)
χ^2	--	--	--	--	--	6.061
<i>P</i>	--	--	--	--	--	0.14

3.2. Degree of nosocomial infection

The incidence of mild disease in the experimental group was lower, $P < 0.05$, see **Table 2**.

Table 2. Comparison of nosocomial infection levels n (%)

Group	n	Mild	Moderate	Severe
Experimental group	50	1 (2.00%)	1 (2.00%)	0 (0.00%)
Control group	50	7 (14.00%)	3 (6.00%)	1 (2.00%)
χ^2	--	4.891	1.042	1.010
<i>P</i>	--	0.027	0.307	0.315

4. Discussions

Due to the high daily flow and turnover rate in hospitals, the microbial content in the hospital is high. Coupled with the complex conditions of patients, medical staff are more likely to spread pathogens after contact with patients. If medical care operations are not standardized, it is easy to cause nosocomial infections, causing pathogens to invade multiple organ systems and trigger inflammatory reactions^[6,7]. In addition, patients' body resistance is weak after illness, and some medical care operations are invasive, making them more susceptible to microbial invasion and thus suffering from nosocomial infections. Bacteria, viruses, fungi, etc., are the main causes of nosocomial microbial infections^[8]. Typical clinical symptoms of nosocomial infection include cough, sputum, nausea, diarrhea, and other symptoms. The specific manifestations are closely related to the invasion site of the pathogen. If it is a urinary tract infection, it will cause symptoms such as painful urination, urgency, and frequency of urination. If it invades the respiratory tract, it will cause symptoms such as wheezing and coughing^[9]. After the patient becomes ill, the resistance is reduced. If nosocomial infection occurs, it will affect the treatment effect of the original disease and cause great psychological pressure and discomfort to the patient. It will not only reduce the overall medical level of the hospital, but also cause medical disputes^[10]. Routine nosocomial infection prevention and control measures can play a role in infection prevention and control through hand hygiene management and other measures, but they lack forward-looking and scientific support. Moreover, patients with nosocomial infections are mostly treated with drugs based on clinical experience, which is prone to irrational drug use. Not only are they ineffective in antibacterial medicine, but they also increase pathogen resistance, making treatment more difficult^[11]. Therefore, it is very important to strengthen infection control in CDC hospitals and improve the reliability and safety of medical services.

The results of this study showed that the incidence of nosocomial infection was lower in the experimental group ($P < 0.05$). In the measurement of the degree of nosocomial infection, the mild rate in the experimental group was lower ($P < 0.05$). The reason is that clinical microbiological testing refers to the monitoring and analysis of microorganisms contained in samples to determine whether specific microorganisms are present. This not only provides support for clinical

diagnosis of diseases, but also assists clinical identification of microbial types, understands disease transmission routes and sources of pathogens, and provides strong support for nosocomial infection prevention and control and the formulation of treatment plans. The transmission media of pathogens are diverse, including air, objects, instruments, blood, hands, etc. In the past, the Centers for Disease Control and Prevention's hospital infection prevention and control focused on hand hygiene and medical care operation management, but the implementation of the intervention lacked purpose, scientificity, and lack of comprehensiveness, resulting in unsatisfactory overall results. By strengthening clinical microbiological testing and regularly testing the bacterial load on medical devices, items, air, the hands of medical staff and individual patients, the clinic can better understand the reasons for the high risk of nosocomial infections, and formulate prevention and control strategies based on this, which will help improve the purpose and effectiveness of hospital infection control at the Centers for Disease Control and Prevention. Microbial testing is a comprehensive testing technology involving multiple steps and methods, including the establishment of a microbial classification system, microbial culture, isolation, type identification, genetic analysis and other key measures. Through the above measures, clinical practice can use gene sequence analysis technology to deeply study the genetic sequence of microorganisms, understand their growth characteristics, and the various products produced during the metabolism of pathogens. A comprehensive analysis of the information obtained during microbial testing can provide an objective basis for accurate clinical identification of the type of microorganisms. At the same time, with the assistance of biochemical testing and other technologies, the drug resistance and sensitivity of microorganisms can be tested, providing a favorable basis for clinical treatment of nosocomial infections.

Once a nosocomial infection occurs, it is extremely important to quickly carry out anti-infective treatment and control of the source of infection. In this process, microbial testing plays a prominent role. Rapid microbial testing can clarify the types of infectious pathogens and their responsiveness to different drugs. Based on these test results, doctors can be assisted in selecting appropriate drugs for treatment, thereby more effectively curbing the spread of the disease. At the same time, implementing effective isolation measures and cutting off transmission routes are equally important to control infections in hospitals. With the assistance of strengthened clinical microbiological testing, comprehensive control measures can help better prevent and control nosocomial infections, prevent the spread of pathogens, and avoid further expansion of the scope of infection. In addition, regular microbial testing and drug sensitivity testing during the treatment process can assist in clinical evaluation of treatment effects and provide support for adjustment of clinical treatment plans. However, when using clinical microbiology testing technology, it should be noted that the test results are easily affected by sample quality and testing operations, which makes clinical microbiology testing have higher requirements for the comprehensive ability of inspectors. In this regard, we should focus on strengthening clinical microbiology testing, refining the various processes of sample collection and testing, and setting corresponding standards, to improve the accuracy of clinical microbiology testing and enhance its clinical application value. Regular microbiological testing can better identify the risk of nosocomial infection among high-risk groups and understand the high-risk factors for nosocomial infection. Based on this, more effective prevention and control strategies can be formulated to strengthen the management of personnel, environment, patients, etc. In particular, in personnel management, reasonable reward and punishment systems and standardized prevention and control procedures can be set up to reduce human factors and improve the effectiveness of hospital infection prevention and control at the Centers for Disease Control and Prevention.

5. Conclusion

In summary, strengthening clinical microbiological testing and applying it to the prevention and control of nosocomial infections at the Centers for Disease Control and Prevention can reduce the incidence of nosocomial infections and reduce the degree of nosocomial infections in patients, which has significant implications.

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Disclosure statement

The author declares no conflict of interest.

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