ORIGINAL RESEARCH

Enhancing Nosocomial Infection Control through the Implementation of High-Quality Nursing Practices

Chunyan Chen, BD; Jiao Liu, BD

ABSTRACT

Background • Nosocomial infections pose a significant global health challenge. Effective nursing management plays a pivotal role in hospital administration, with the quality of nursing closely linked to nosocomial infection rates.

Objective • This study explores the impact of implementing high-quality nursing practices on nosocomial infection control.

Design • A randomized controlled experiment was conducted.

Setting • The study was conducted at the Fourth Affiliated Hospital of Nanjing Medical University.

Participants • Between December 2021 and December 2022, 120 hospitalized patients were selected and randomly assigned to the control and research groups, each comprising 60 patients.

Interventions • The control group received routine nursing, while the research group received high-quality nursing.

Primary Outcome Measures • (1) Infection incidence rate, (2) psychological state of patients, (3) bacterial culture qualified rate, (4) health knowledge awareness, (5) nursing quality, (6) quality of life, and (7) patient satisfaction.

Results • The research group exhibited a significantly lower infection incidence rate compared to the control group ($P < .05$). No significant differences were observed between the groups before nursing ($P > .05$). Post-nursing, SAS, and SDS scores decreased in both groups, with a more pronounced reduction in the research group ($P < .05$). The research group demonstrated an increased qualified rate of bacterial culture in various environments compared to the control group ($P < .05$). After nursing, both groups showed higher scores in disease knowledge, nosocomial infection knowledge, treatment and rehabilitation knowledge, and self-care management knowledge, with the research group scoring higher than the control group ($P < .05$). Quality of life scores, nursing quality scores, and nursing satisfaction were all higher in the research group compared to the control group ($P < .05$).

Conclusions • High-quality nursing practices emerge as the preferred choice in nosocomial infection control and prevention. It prioritizes patients' wishes and needs, offers comprehensive services, and respects patient autonomy; these measures contribute to a substantial reduction in nosocomial infections. (*Altern Ther Health Med.* [E-pub ahead of print.])

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INTRODUCTION

Nosocomial infections, commonly known as hospital-acquired infections, pose a significant challenge within healthcare settings. These infections specifically afflict patients during their hospitalization, adding an additional layer of complexity to the already demanding landscape of medical care.[1,2] The prevalence of nosocomial infections has been notably influenced by factors such as the concentration of pathogenic microorganisms in hospital environments, dense patient populations, and the misuse of antibiotics. This increased rate correlates with increased mortality attributable to nosocomial infections.[3,4]

Nosocomial infections encompass a range of healthcare-associated conditions, including wound infections, urinary system infections, septicemia, and lower respiratory and tract infections.[5,6] The etiological factors contributing to nosocomial infections predominantly involve fungal, bacterial, viral, chlamydial, and mycoplasmal agents. Therefore, hospitals must enhance stringent control measures for nosocomial infections, with a concurrent emphasis on the quality of hospital nursing.[7,8]

Nursing management plays a crucial role in overall hospital administration.[9] The quality of this management

significantly correlates with the incidence of nosocomial infections.[10] While routine infection prevention and management contribute to a certain reduction in nosocomial infection rates, meeting the evolving demands of modern hospital management poses challenges in achieving optimal preventive outcomes.

Quality nursing services, as an evolving patient-centered nursing model, embody the fundamental principles of modern nursing. These services aim to optimize care practices, demonstrating significant clinical applicability in the healthcare setting.[11] Previous studies highlighted the efficacy of high-quality nursing in reducing inflammation and improving outcomes for postoperative patients with non-small cell lung cancer.[12] However, the application of high-quality nursing in the context of nosocomial infection control remains unclear.

In this study, we investigated the impact of implementing high-quality nursing on nosocomial infection control. The primary objective of our research is to offer a novel perspective on the relationship between high-quality nursing measures and their impact on healthcare outcomes. Specifically, this study aims to investigate how the adoption of high-quality nursing practices is associated with a significant reduction in nosocomial infections and a simultaneous enhancement in patient satisfaction.

METHODS

Study Design

A randomized controlled trial was conducted from December 2021 to December 2022, involving 120 hospitalized patients as research subjects. The random allocation method was employed to assign patients to the control group (CG) and research group (RG), each consisting of 60 cases. Randomization was achieved through a digital network tool (http://tools.medsci.cn/rand), generating 120 random numbers and assigning the first 60 to the CG and the last 60 to the RG. General data analysis indicated no significant differences between the two groups ($P > .05$). All participants were fully informed about the study and provided informed consent for their participation.

Inclusion and Exclusion Criteria

Inclusion criteria for participants were as follows: (1) patients meeting the indications for hospitalization, and (2) possessed effective communication skills. Exclusion criteria were: (1) the presence of mental illness, (2) unclear consciousness, (3) incomplete clinical data, and (4) difficulty in cooperating with the research objectives.

Nursing Interventions in Control Group

Patients in the CG received standard nursing care, comprising conventional medical practices and established healthcare procedures tailored to their specific conditions. The care provided followed standard protocols and did not include the specialized interventions introduced in the RG.

High-Quality Nursing Practices in Research Group

In the RG, the patient underwent high-quality nursing interventions with specific components outlined as follows:

Environmental Management. Patients with open airways were instructed to regulate indoor air humidity within the range of 55%-75%, ensure ventilation twice daily, and maintain room temperature at 20-24°C. Additionally, indoor air quality was enhanced through the use of air purifiers. Weekly ward fumigation with vinegar and monthly bacterial culture assessments of indoor objects were implemented to ensure a hygienic environment.

Surface Disinfection Protocol. Daily, indoor medical equipment and surfaces underwent thorough wiping and disinfection. Specific bedside treatment instruments, such as the blood pressure monitor and sputum suction device, were carefully wiped using fluorine disinfectant, ensuring a strict disinfection protocol for optimal hygiene.

Visitor Management and Infection Control. Nurses were responsible for elucidating to family members the necessity for limiting visits. Visits occurred at a designated daily time, accommodating 1 to 2 visitors for a duration not exceeding 30 minutes. Strict infection control measures were enforced, including thorough disinfection, changing shoes, stringent handwashing, and the mandatory use of disposable masks and hats before entering the ward. Patients with severe illnesses were exempted from the family escort system to mitigate potential infection risks.

Oral Hygiene and Infection Control. Oral care procedures involved cleaning the oral cavity 3-5 times a day, with the use of mouthwash. Patients with fungal infections specifically utilized sodium bicarbonate mouthwash. Daily perineal disinfection was administered for bedridden patients. Those with indwelling catheters underwent daily observations of the urethral orifice condition and were instructed to maintain dryness post-disinfection with iodophor. This comprehensive approach was aimed at minimizing the risk of oral and perineal infections.

Invasive Procedure Nursing. For patients with tracheotomy or intubation, sputum suction was conducted following aseptic principles, emphasizing gentle movements to prevent mucosal damage. Additionally, patients undergoing noninvasive sequential ventilation were advised to minimize intubation time to reduce the risk of airway damage. This approach aimed to ensure safe and effective invasive procedures while prioritizing patient well-being.

Disinfection Protocol for Respiratory Equipment. To ensure optimal hygiene, a disposable breathing circuit and nasal mask were utilized during ventilator use. Each ventilator was equipped with two sets of devices, facilitating seamless transitions. Following use, rigorous disinfection measures were applied to therapeutic instruments. The coil and accessories of the instrument underwent cleaning every three days, with hardware accessories, particularly the instrument coil, subjected to weekly microbial testing. This detailed disinfection management was aimed at maintaining a sterile environment for respiratory interventions.

Observation Indexes

Assessment of Infection Incidence. Incidence rates of incision infection, respiratory infection, gastrointestinal infection, and urinary system infection were compared between the two groups.

Psychological State Assessment. The Self-rating Depression Scale (SDS) and Self-rating Anxiety Scale (SAS) were employed to evaluate patients' psychological states.[13] The SDS, comprising 20 items scored from 1 to 4 points each, categorized total scores into normal depression, mild depression, moderate depression, and severe depression (< 53, 53-62, 63-72, and > 72 points, respectively). These scores were positively correlated with anxiety levels. Similarly, the SAS, also consisting of 20 items with scores ranging from 1 to 4 points, delineated total scores into normal, mild anxiety, moderate anxiety, and severe anxiety (< 50, 50-60, 61-70, and > 70 points, respectively). The scores were positively correlated with the degree of depression.

Comparison of Bacterial Culture Qualified Rates. The qualified rates of bacterial culture in both groups were compared.

Health Knowledge Assessment. The self-made health knowledge questionnaire was employed to evaluate awareness scores, encompassing disease knowledge, hospital infection knowledge, treatment and rehabilitation knowledge, and self-care management knowledge.

Nursing Quality Evaluation. A self-made evaluation table was utilized to assess patients' nursing quality, covering infection assessment, disinfection, and isolation practices, prevention ability, antibacterial drug management, and nursing operations.

Quality of Life Assessment. The Generic Quality of Life Inventory 74 (GQOL-74) was employed to assess patients' quality of life across four dimensions: physical function, psychological function, social function, and material life status.[14] The total score, with a maximum of 100 points, indicated a higher score corresponding to a better quality of life.

Nursing Satisfaction Assessment. The nursing satisfaction rate for both groups was determined using a self-designed hospital questionnaire comprising three categories: very satisfied, basically satisfied, and not satisfied, with corresponding values of >90 points, 70-90 points, and <70 points, respectively. The total nursing satisfaction rate was calculated as (very satisfied + basically satisfied)/total cases ×100%.

Total Nursing Satisfaction Rate = (Very Satisfied + Basically Satisfied)/Total Cases ×100%.

Statistical Analysis

The data were analyzed using SPSS 21.0 software (IBM, Armonk, NY, USA), with measurement data presented as mean ± standard deviation ($\bar{x} \pm s$), analyzed using the t test. Count data were expressed as [n (%)], and analysis was conducted using the χ^2 test. A significance level of $P < .05$ was considered statistically significant.

Table 1. Comparison of Demographic Characteristics of Patients in Both Groups

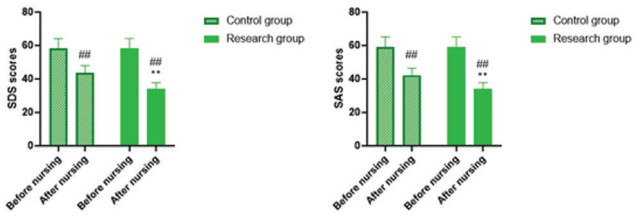
Index	Control Group (n = 60)	Research Group (n = 60)	t/χ^2	*P* value
Gender (male/female)	36/24	35/25	0.03	.85
Average Age (years)	47.56±4.75	47.61±4.68	0.06	.95

Table 2. Incidence of Infection in Both Groups [n (%)]

Groups	Incision Infection	Respiratory Infection	Gastrointestinal Infection	Urinary System Infection	Total Incidence Rate (%)
Research Group (n = 60)	1 (1.67%)	1 (1.67%)	1 (1.67%)	0 (0.00%)	3 (5.01%)
Control Group (n = 60)	3 (5.00%)	4 (6.67%)	3 (5.00%)	1 (1.67%)	11 (18.34%)
χ^2	5.18				
P value	.02				

Note: χ^2 denotes the chi-square statistic. $P < .05$ are considered statistically significant.

Figure 1. SDS and SAS Scores in Both Groups



Note: The figure illustrates the Self-rating Depression Scale (SDS) and Self-rating Anxiety Scale (SAS) scores in both groups. Significance levels are indicated as follows: $^{\#\#}P < .01$, compared with scores before nursing; $^{**}P < .01$, compared with the control group.

RESULTS

Incidence of Infection in Both Groups

In comparison with the CG, the RG exhibited a significantly lower incidence of infection (18.34% vs 5.01%) (P=0.02), refer to Table 2.

Psychological States in Both Groups

SDS and SAS scores in the RG were 58.29±5.90 and 59.27±5.98, respectively, while in the CG, they were 58.26±5.87 and 59.25±6.01 before nursing, with no significant differences observed in both groups ($P = .98$ and $P = .99$), as presented in Figure 1. After nursing, the SDS and SAS scores in the RG were 34.18±3.45 and 34.13±3.49, compared to the CG with scores of 43.51±4.36 and 42.16±4.23. Both SAS and SDS scores in both groups showed a significant decrease after nursing ($P < .01$), with the RG demonstrating a greater reduction compared to the CG ($P < .01$).

Qualified Rate of Bacterial Culture in Both Groups

In the RG, the qualified rate of bacterial culture in the air, pillow, operating table, and rescue instrument was 96.67%, 98.33%, 98.33%, and 100.00%, respectively. This result demonstrated a significant increase compared to the CG, where the rates were 85.00%, 86.67%, 85.00%, and 88.33%, respectively ($P = .03$, $P = .02$, and $P < .01$), refer to Table 3.

Awareness of Health Knowledge in Both Groups

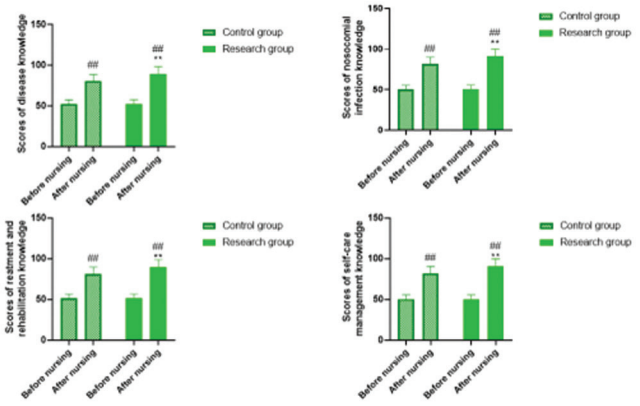
Before nursing, the scores of disease knowledge,

Table 3. Qualified Rate of Bacterial Culture in Both Groups [n (%)]

Groups	Air	Pillow	Operating Table	Rescue Instrument
Control Group (n = 60)	51 (85.00%)	52 (86.67%)	51 (85.00%)	53 (88.33%)
Research Group (n = 60)	58 (96.67%)	59 (98.33%)	59 (98.33%)	60 (100.00%)
χ^2	4.90	5.89	6.98	7.43
P value	.03	.02	<.01	<.01

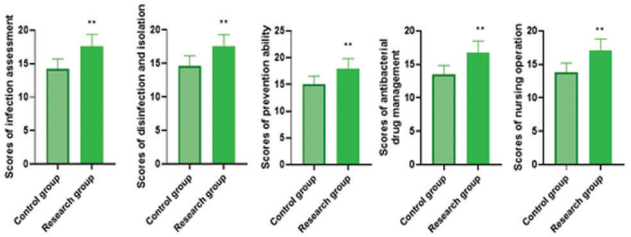
Note: χ^2 denotes the chi-square statistic. $P < .05$ are considered statistically significant.

Figure 2. Awareness of Health Knowledge in Both Groups



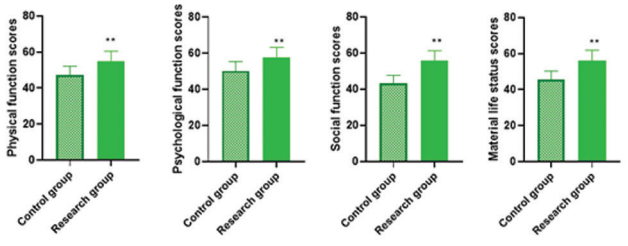
Note: The figure illustrates awareness of health knowledge in both groups, including disease knowledge, nosocomial infection knowledge, treatment and rehabilitation knowledge, and self-care management knowledge. Significance levels are denoted as follows: $^{\#\#}P < 0.01$, compared with scores before nursing; $^{**}P < 0.01$, compared with the control group.

Figure 3. Nursing Quality Scores in Both Groups



Note: The figure illustrates nursing quality scores in both groups, encompassing infection assessment, disinfection and isolation, prevention ability, antibacterial drug management, and nursing operation. Significance level: $P < 0.01$.

Figure 4. Quality of Life in Both Groups



Note: The figure presents the quality of life in both groups, showcasing scores for physical function, psychological function, social function, and material life status. Significance level: $P < .01$.

Table 4. Nursing Satisfaction in Both Groups [n (%)]

Groups	Very Satisfied	Basically Satisfied	Unsatisfied	Satisfaction Rate (%)
Control Group (n = 60)	26 (43.33%)	24 (40.00%)	10 (16.67%)	50 (83.33%)
Research Group (n = 60)	35 (58.33%)	24 (40.00%)	1 (1.67%)	59 (98.33%)
χ^2	8.11			
P value	<.01			

Note: The satisfaction scale used for assessment includes three categories: "Very Satisfied," "Basically Satisfied," and "Unsatisfied." χ^2 denotes the chi-square statistic. $P < .05$ are considered statistically significant.

nosocomial infection knowledge, treatment and rehabilitation knowledge, and self-care management knowledge in the RG were 52.36±5.28, 50.36±5.08, 51.29±5.21, and 50.21±5.12, respectively, while those in the CG were 52.34±5.26, 50.35±5.02, 51.27±5.15, and 50.18±5.09. No significant differences were observed in the scores of disease knowledge, nosocomial infection knowledge, treatment and rehabilitation knowledge, and self-care management knowledge between the two groups before nursing ($P = .98$, $P = .99$, $P = .98$, and $P = .97$).

After nursing, the scores of disease knowledge, nosocomial infection knowledge, treatment and rehabilitation knowledge, and self-care management knowledge in the RG were 89.47±9.01, 90.64±9.06, 89.83±9.04, and 90.46±9.13, respectively, while those in the CG were 80.63±8.01, 81.68±8.15, 81.36±8.17, and 82.10±8.24. Compared with before nursing, the scores of disease knowledge, nosocomial infection knowledge, treatment and rehabilitation knowledge, and self-care management knowledge significantly increased in both groups ($P < .01$), with the RG demonstrating higher scores than the CG ($P < .01$), refer to Figure 2.

Nursing Quality Scores in Both Groups

RG exhibited higher scores in infection assessment, disinfection and isolation, prevention ability, antibacterial drug management, and nursing operation, with values of 17.62±1.76, 17.53±1.74, 17.98±1.82, 16.78±1.69, and 17.09±1.71, respectively. These scores were significantly elevated compared to those observed in the CG with scores of 14.27±1.45, 14.59±1.51, 15.04±1.51, 13.46±1.36, and 13.78±1.41 ($P < 0.05$), refer to Figure 3.

Quality of Life in Both Groups

The RG demonstrated higher scores in physical function, psychological function, social function, and material life status, with values of 54.89±5.51, 57.48±5.79, 55.74±5.58, and 56.27±5.64, respectively. These scores were significantly higher compared to those observed in the CG with scores of 47.36±4.75, 50.23±5.06, 43.28±4.35, and 45.69±4.58 ($P < .05$), refer to Figure 4.

Nursing Satisfaction in Both Groups

The nursing satisfaction rate in the RG was 98.00%, significantly higher compared to the rate of 83.33% in the CG ($P < .01$), refer to Table 4.

DISCUSSION

Nursing management plays a crucial role in overall hospital administration, and its quality is intricately linked to

the occurrence of nosocomial infection.[15] Currently, the prevention of nosocomial infections has emerged as a central focus for hospitals at various levels.[16] Routine nursing, though effective in reducing specific high-risk factors linked to nosocomial infections, is characterized by limited and singular measures, indicating inherent limitations.

In our study, we adopted high-quality nursing practices aligned with the requisites of contemporary medical services. The essence of high-quality nursing lies in the enhancement of fundamental nursing, incorporation of humanized care, prioritization of family-oriented nursing, and standardization of professional nursing. This approach necessitates the provision of unified and integrated nursing services right from the initiation of patient admission.[17]

High-quality nursing places the patient's needs as the priority, emphasizing attentive communication and reflecting humanistic care through precise details. The principle of high-quality nursing involves a complete understanding of the patient's condition, careful attention to daily life, the implementation of specialized nursing, continuous health education, and a thorough discharge follow-up process.[18]

Nursing personnel were tasked with continuous assessment, proactive engagement, proper disposal, and frequent observation to ensure the safety of nursing procedures and achieve satisfaction among patients, society, and the hospital. This nursing approach emphasizes the ongoing refinement of nursing protocols and the efficient enhancement of the overall competence of nursing staff.[19] This strategy ensures nursing safety through the reform or enhancement of nursing processes, subsequently contributing to the control of nosocomial infections.

High-quality nursing measures were developed on the foundation of evidence-based medicine and nursing experience, demonstrating foresight and scientific rigor. This approach allowed for real-time adjustments to nursing procedures based on the evolving nursing scenario, enabling the correction of nursing issues. Additionally, they proved effective in interrupting the source of infection, refining antibiotic usage, and preventing infections resulting from bacterial imbalances.[20]

Moreover, high-quality nursing stimulates the enthusiasm of the nursing staff, motivates them to actively learn rules and regulations, optimize nursing operation standards, correct any erroneous nursing behaviors, and proactively improve their judgment and observation of nosocomial infections. This approach ultimately led to a comprehensive enhancement of nursing skills.

In our study, the results revealed that, after nursing, the RG exhibited a lower incidence of infection compared to the CG. Moreover, the qualified rate of bacterial culture in the air, pillow, operating table, and rescue instrument in the RG increased. This finding indicated that high-quality nursing significantly contributed to nosocomial infection control, consistent with previous findings.[21-22] The SAS and SDS scores in the RG were lower than those in the CG, implying that high-quality nursing had a positive impact on alleviating negative emotions among patients.

In line with previous research,[23] high-quality nursing has been shown to alleviate the negative mood in glioma patients. After nursing, both groups demonstrated increased knowledge scores, with the RG showing higher scores, reflecting improved understanding of disease, nosocomial infection, treatment, rehabilitation, and self-care management, with RG outperforming the CG. These findings suggest that patients fully understood nosocomial infection, demonstrating self-recognition and nursing consciousness. These findings are supported by a previous study by Wang et al.[10] which presented similar results.

Quality of life scores and nursing satisfaction were also higher in the RG compared to the CG, indicating that high-quality nursing positively influences patient well-being, aligning with past research.[17] Moreover, high-quality nursing elevates the standard of hospital care, gaining strong recognition from patients due to its practical and effective implementation, aligning with conclusions from earlier research.[24]

Study Limitations

It is important to acknowledge a few inherent limitations within this study. The use of a relatively small sample size might limit the generalizability of the findings to broader populations. Additionally, the specific characteristics of the study participants and the chosen methodology may introduce biases. Furthermore, the study's temporal constraints and resource availability could impact the depth of exploration into certain aspects. To enhance the robustness and applicability of the results, future research should consider larger and more diverse samples, diverse methodologies, and an extended investigation period. These limitations should be carefully considered when interpreting and applying the study's outcomes.

CONCLUSION

In conclusion, our study highlights the pivotal role of high-quality nursing measures as the forefront strategy in controlling and preventing nosocomial infections. By prioritizing patients' wishes and needs and delivering comprehensive and high-quality nursing services, these measures prove effective in reducing nosocomial infections. The findings of this study offer valuable clinical insights and serve as a reference for healthcare practitioners and institutions engaged in the ongoing efforts to control and prevent nosocomial infections.

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None

CONFLICT OF INTERESTS

The authors report no conflict of interest.

AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of this study are available from the corresponding author upon request, subject to reasonable conditions.

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