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Original Article

Knowledge and Performance of Nurses about Environmental Cleaning Bundle in Neonatal Intensive Care Unit

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1.ABSTRACT

The hospital setting serves as a reservoir for the spread of bacteria that might cause infections. If not eliminated by cleaning, some germs can persist in hospitals for several months, creating a persistent transmission danger. Cleaning procedures can lower the risk of acquisition and emphasize how important environmental hygiene is to the prevention and control of infections. Therefore, the purpose of this study was to evaluate the environmental cleaning bundle knowledge and skills of the neonatal nurses working at Kafr-Saad General Hospital. This study was conducted on 22 on-duty nurses using a descriptive cross-sectional study design. Two structured self-administrated questionnaires were used to evaluate socio-demographic and occupational characteristics, knowledge, and performance. The current study's findings showed that 50.0% and 72.7% of nurses had fair and incompetent overall degrees of knowledge and performance, respectively. According to the study's findings, almost half of the nurses in neonatal intensive care units have fair levels of overall knowledge, and nearly three-quarters have levels of overall performance that are incompetent. The study suggests running regular, up-to-date on-the-job training sessions for neonatal nurses in environmental cleanup.

Keywords: *Performance, Transmission, Health, Neonates, and Infection.Knowledge and Performance of Nurses about Environmental Cleaning*

2.Introduction

The World Health Organization (WHO) estimates that 130 million neonates are born each year. More than 10 million of those infants die before the age of five, and about eight million do not live to see their first birthday. Four million newborns per year die within the first month of life. Most of reported newborn deaths worldwide occur in developing nations like Egypt. Currently, newborn infections are the leading cause of newborn mortality, accounting for about 1.6 million deaths annually in the developing world. One to five occurrences of newborn sepsis were recorded in studies from developed countries for every 1000 live births, while 49 to 170 cases of septicemia were documented in population-based research from underdeveloped nations (Medhat, Khashana, & El kalioby, 2017).Due to their immaturity, exposure to invasive medical devices, and the existence of multi-resistant bacteria, newborns who are admitted to intensive care units (ICUs) are at a significant risk of getting nosocomial infections (NIs). The growth of nosocomial organisms between them, which results in bacterial infections in NICU, often happens 48 to 72 hours after patients are brought to ICU and results in roughly one million fatalities annually globally (Al-Jabri et al., 2019). Because of improvements in invasive therapeutic and diagnostic techniques as well as a rise in the survival of preterm infants, healthcare-associated infections (HAIs) are becoming a greater issue in neonatal intensive care units (NICUs). According to Kumar et al. (2018), it is described as a localized or systemic illness that develops as a result of a negative response to the presence of an infectious agent(s) or its toxin but was not incubating at the time of hospital admission.

One of the most important strategies for preserving the NICU and preventing HAIs is understanding the sources of the illness and the means of transmission. There is a lot of monitoring and support equipment for organs all around the patients. Therefore, the bacteria that are contagious may come from various sources (such as hospital

patients, healthcare workers, equipment, or surfaces). The development of biofilms at the surfaces of certain medical devices frequently leads to HAIs (Al-Jabri et al., 2019).

Several important pathogens associated with healthcare, such as Methicillin-Resistant Staphylococcus aureus (MRSA), Vancomycin-Resistant Enterococcus (VRE), Acinetobacter, norovirus, and Clostridium difficile, are spread largely as a result of environmental contamination. All of these pathogens have been shown to survive in the environment for hours to days (in some cases months), to frequently contaminate the surfaces in patients' rooms who have been colonized or infected, to temporarily colonize the hands of healthcare workers, to be transmitted by healthcare workers, and to cause outbreaks in which environmental transmission was thought to be a factor. Additionally, it has been demonstrated that entering a room where a previous patient had MRSA, VRE, Acinetobacter, or C difficile colonization or infection increases the likelihood that the newly admitted patient will also acquire colonization or infection (Rutala & Weber, 2016).

The obvious intervention that has been determined to be crucial for the control of infection in the environment is cleaning and disinfecting environmental surfaces. Policies for cleaning must take into account how, where, and when to clean. Cleaning might be general or focused on particular surfaces (Lei, Jones & Li, 2017).

Physical cleaning is an important step, but it cannot completely remove all living things from an environmental surface. As a result, effective mechanical cleaning is necessary to physically remove the majority of organisms from the environment, and it is also necessary to utilize a substance with microbial killing capacity to render inactive any organisms that are still present after mechanical cleaning. The "Hospital Clean" guidance includes the use of a disinfectant. The type and concentration of the disinfectant affect the effectiveness of the killing ability (Trajtman et al., 2013).

The REACH research (Researching Effective Approaches to Cleaning in Hospitals) developed an environmental cleaning bundle in 2016–2017 that focused on staff training, improved cleaning technique, product use, communication, and auditing regular touch-point cleaning. By combining techniques to inform, give feedback to, and empower healthcare staff, an environmental cleaning campaign that incorporates numerous evidence-based interventions into a "cleaning bundle" has the potential to increase the efficacy of hospital cleaning (Hall et al., 2016) .

2.1Aim of the study:

The goal of this study was to evaluate the environmental cleaning bundle knowledge and skills of nurses working in the Kafr-Saad General Hospital's Neonatal Intensive Care Unit (NICU).

2.2Research Questions

1. What is the nurses' knowledge related to the environmental cleaning bundle in the Neonatal Intensive Care Unit?
2. What is the nurses' performance related to the environmental cleaning bundle in the Neonatal Intensive Care Unit?

3. Method

3.1 Design A descriptive cross sectional study design was utilized to conduct this study.

3.2Setting

The study was conducted at the Kafr-Saad General Hospital's Neonatal Intensive Care Unit (NICU). Ten incubators, mechanical ventilators, cardiac monitors, phototherapy, an X-ray machine, an ABG analyzer, and one crush cart are all part of the NICU's second-floor setup. The infants to nurses' ratio was one to one. Its duty was to accept newborns within 24 hours of birth due to complications during labor, premature birth, or postpartum health complications for a period of invasive oxygen supply, jaundice therapy, and constant observation**.**

3.3Participants and sampling

On-duty nurses under the following criteria: both genders, assigned to give direct care to neonates, different qualifications, and at least one year of experience. The total number of nurses with the previous eligible criteria was 22 recruited conveniently

3.4Study Tools

Based on an analysis of relevant literature, the researcher created three tools to gather the study's data, which are as follows:

Tool I: Self-administrated questionnaire on the sociodemographic and professional characteristics of nurses. This questionnaire was used by the researcher to gather information about the participants' sociodemographic and occupational characteristics, including their gender, age, level of education, and years of experience.

Tool (II):Environmental cleaning knowledge of nurses organized self-administered questionnaire. This questionnaire was created by the researcher using Mitchell et al. (2018) and

National Egyptian Guideline (2020). It was written in Arabic and contained 60 questions that tested the level knowledge that nurses had in the field of environmental cleaning bundles.

Knowledge evaluation system for nurses. Saleh (2019) claims that "one" mark was given for each accurate response and "zero" for false or lack relevant knowledge. As the following: Questions 11 through 15 about knowledge of hospital environmental cleaning (5 items = 5 marks). Questions 16–35 on knowledge of cleaning products (20 items = 20 marks) Questions 36–50 (15 items = 15 marks) test your understanding of general cleaning principles.

There were 60 total points awarded for knowledge. Knowledge levels were divided into three categories based on the cut-off criteria established by the researcher: Poor: Receives fewer than 36 out of a possible 60 points. Fair: 36 to 48 marks, or 60% to less than 80% of the total. Good: A total score of 80 percent or higher (48 points).

Tool (III): Observational checklist for nurses' performance during environmental cleaning. In order to achieve the goal of the study, the researcher created an observational checklist based on the Centers for Disease Control and Prevention (CDC, 2017). Three items were included in the English-language checklist, which had the goal of evaluating how well nurses performed in relation to the environmental cleaning bundle.

Performance evaluation system for nurses. Saleh (2019) claims that "one" mark was given for each correctly completed step and "zero" for incomplete or wrong steps. As the subsequent: Question 61: Regular environmental cleanup (13 items = 13 marks). Question 62: Scheduled environmental cleaning (2 items = 2 marks). Question 63, "Terminal Environmental Cleaning," is worth 25 points (25 items).

The performance of the nurses received a 50-point overall score. The researcher's cut-off point determined three levels for the performance level classification: Incompetent less than 60% of the total (< 30 marks). Improving 60% to less than 85% from the total (30 to < 42.5 marks). Competent 85% of the total (≥42.5 marks).

3.5The Study Phases

The preliminary stage

Administrative process. The Kafer Saad General Hospital's NICU manager received a formal letter from the faculty of nursing granting permission for the researcher to carry out the current investigation.

Ethical consideration. The researcher followed ethical research principles as the following:

The Faculty of Nursing, the Research Ethics Committee, and Mansoura University all gave the researcher their permission. Oral approval was obtained from each participant before the start of the study after the explanation of the purpose of the study. The researcher emphasize that the study causes no physical or psychological harm. Privacy and confidentiality of the collected data were assured throughout the wholes study phases. Any participant has the right to withdraw from the study at any time without any responsibility.

Review of the literature. In order to become familiar with all facets of the research subject and to create appropriate techniques for data collecting, the researcher searched past, present, and related local and worldwide literature utilizing the books, papers, periodicals, and magazines that were readily available .

Face and content validity of the tools. The researcher presented the study materials to a jury panel of five community health and pediatric nursing professors at the Mansoura University Faculty of Nursing. In order to meet the criteria for trustworthiness, the professors tested and evaluated these tools for appropriateness and relevant items, and they generated replies that either agreed or disagreed with the face and content validity. The suggested tools included the items on which 85% or more of the professors had concurred.

Pilot study. Three nurses, who made up 10% of the study participants, participated in a pilot study to determine the feasibility, validity, and reliability of the study instruments based on the outcomes and the time required to complete them. The main study sample was made up of participants in the pilot study.

Operational phase. The steps were as follows*:*

Sampling. The participants who met the eligibility requirements and agreed to participate in the study were interviewed and observed by the researcher to gather the necessary data once the relevant approvals were acquired to move forward with the proposed study.

Period of data collecting. Following the formal approvals, the researcher worked the two shifts in the NICU three days a week (Saturday, Sunday, and Wednesday). The researcher gave a brief explanation of the intent and approach of the study after introducing herself to the nurses. The data collection took place between the beginning of July 2020 and the end of December 2020, lasting six months.

In order to disseminate the knowledge questionnaire, the researcher conducted individual interviews with nurses in the nurses' room in accordance with their particular work schedules. Each interview lasted between 15-20 minutes per nurse. By using tool III to evaluate the performance of three shifts (morning, afternoon, and night), the researcher was able to indirectly examine nurses' performance. In order to minimize nurses' stress, anxiety, and worry, the researcher observed one to two nurses every day; the observation of each nurse took about 15-20 minutes.

3.6Analytical Statistics

SPSS (Stands for Statistical Product and Service Solutions) for Windows version 20.0 (SPSS, Chicago, IL) was used to conduct all statistical analyses. Continuous data were expressed in terms of mean and standard deviation (SD), and they had a normal distribution. Numbers were used to express categorical data, and numbers and percentages were used to express categorical data. For the questionnaires used in the study, the reliability (internal consistency) test was computed .

4.Results

As shown in Table 1, the average age of the nurses was 33.36 (4.95), In terms of gender, marital status, and place of residence, nurses made up 100%, 95.5%, and 68.2% of the workforce, respectively. For 54.5%, a technical nursing institute was their level of schooling.

According to Table 2, the mean number of years of experience for nurses in the nursing profession was 10.8 years, whereas the average number of years of experience for nurses in NICU was 7.3 years. Finally, 81.8% of nurses participated in many environmental cleaning training sessions.

As shown in Table 3. Only 50% of nurses had fair overall knowledge of the environmental cleaning bundle.

According to Table 4, 72.7% of nurses performed inadequately overall when cleaning the surroundings

Table 1*Nurses' Socio-demographic characteristics (N=22)*

Items	**N**	**%**
Age/ years $\bar{X}$(SD)		
33.36(4.95)		
Gender		
Female	22	100
Residency area		
Urban	7	31.8
Rural	15	68.2
Qualification		
Nursing school	6	27.3
Technical institute of nursing	12	54.5
Bachelor degree of nursing	4	18.2

Table 2*Nurses' occupational characteristics (N=22)*

Experience years in nursing carrier $\bar{X}$(SD)		
10.8(5.2)		
Experience years in NICU $\bar{X}$(SD)		
7.3(3.4)		
Number of attended training programs on environmental cleaning bundle		
Did not attain any training at all	4	18.2
One or more	18	81.8

Table 3*Nurses' total knowledge score levels about environmental cleaning bundle (N=22)*

Total knowledge score levels	N	%	Mean ±SD
Poor	11	50	37.77(3.544)
Fair	11	50	
Good	0	0.0	

Table 4*Nurses' total performance score levels about environmental cleaning bundle (N =22)*

Total performance score levels	N	%	Mean ±SD
Competent	2	9.1	31.53(5.689)
Improving	4	18.2	
Incompetent	16	72.7	

5.Discussion

It has been established that the hospital setting contributes to the spread of HCAIs and MDROs. In addition, bacteria remain on uncleaned surfaces for days or even months, increasing the chance of transmission. As a result, there is a larger chance that a patient will pick up a disease from the prior residence of the room. Efficiency and cost-effectiveness of improved cleaning depends on healthcare staff using cleaning procedures appropriately and consistently. In healthcare environments, nurses interact with patients the most. As a result, they are essential to the prevention and management of infections (Mitchell, 2021).

Time constraints, employee expertise, work processes, organizational structures, and the day-to-day complexity of healthcare systems can all play a role in how well environmental cleanliness is maintained and HCAIs are avoided in the workplace. For the best possible treatment to be delivered, patient safety, and a patient recovery without complications, it was essential to have employees who are aware about environmental cleanliness and who are dedicated to preventing infection. In order to ensure that staff members were on the same page and working towards the same goals, ensure compliance with workplace regulations, and ensure a smooth flow of information, team effectiveness was crucial (Curryer, 2021).

According to the study's findings, only half of the nurses had adequate overall knowledge of NICU environmental cleaning bundles. This finding is consistent with Mitchell, et al. (2021), an Australian study that revealed there were training and knowledge gaps as well as ambiguous roles for cleaning certain objects. More than half of the nurses who participated in the study received their nursing education at the technical institute, according to the researcher.

Additionally, Farotimi, et al (2018) study at Teaching Hospitals in Nigeria included various modules for the experimental group and control group. The participants' understanding of patient care tools, hand hygiene, and how to prepare different strengths of JIK (3.5%) hypochlorite solution was lacking.

This result conflicts with a study conducted in Australia by Curryer, et al. (2021), which found that nurses generally understood the value of environmental cleanliness and relied heavily on infection prevention and control (IPC) professionals for policy updates and advice as well as for online training.

The current study's findings show that in the NICU, approximately three-fourths of the nurses scored poorly on environmental cleaning activities. These findings support a study by Belal et al. (2020) conducted at a small hospital in rural Egypt that revealed inadequate practices in relation to environmental cleanliness and infection control. According to Ahmed, Mohammed, and Elwasefy (2020) study in Egypt, 66% of NICU nurses had performance scores that were below average in incubator care and regular daily care.

These findings, according to the researcher attributes, are due to the impact of insufficient on-job training programs, as well as a lack of cleaning supplies, PPE supplies, medical equipment, and time restrictions. This emphasizes how crucial it is to provide nurses with all necessary information and enables visualization tools of the environmental cleaning package process to serve as reminders and, ultimately, to empower pre- and on-the-job training programs.

6.Conclusion

According to the study's findings, half of nurses have a fair overall knowledge score, and nearly three-quarters have incompetent overall performance score concerns NICU environmental cleaning.

7.Recommendations

- Conduct environmental cleaning bundle scheduled on-job training programs for NICU nurses to improve their performance and knowledge .
- Equip and provide the NICU with everything needed to implement and follow the environmental cleaning bundle.
- Adopting, as well as making available to nurses comprehensive, concise protocols and instructions for environmental cleaning supplies in NICU.

8.Acknowledgement

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