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## Knowledge and Procedures of Medical Personnel about Infection Prevention in Patients with Chemotherapy-Induced Neutropenia

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### Abstract

*Background:* Chemotherapy-induced neutropenia significantly increases the risk of life-threatening infections in cancer patients, necessitating stringent infection prevention measures by medical personnel. Despite established protocols, gaps in knowledge and procedural adherence among healthcare workers persist, impacting patient outcomes. This study aimed to assess the knowledge and practices of medical personnel regarding infection prevention in neutropenic patients. *Methods:* A descriptive cross-sectional study was conducted involving 120 nurses from ICU, internal medicine, and oncology departments in a tertiary care hospital. Data were collected using a validated, self-administered questionnaire assessing demographic details, knowledge levels, and procedural adherence. Descriptive and inferential statistics were employed for analysis. *Results:* The majority of participants (45%) demonstrated good knowledge of infection prevention, while 11.7% scored poorly. Contaminated hands (93.3%) and inadequate hand hygiene (91.7%) were identified as primary infection sources. Procedural adherence was high for hand hygiene (80%) and PPE use (70.8%), but lower for patient education (60%) and isolation precautions (65%). ICU nurses exhibited the highest knowledge levels (50%), whereas oncology nurses had the highest proportion of poor knowledge (15%). *Conclusion:* While medical personnel generally possess adequate knowledge of infection prevention, inconsistencies in practice—particularly in patient education and isolation—highlight the need for targeted training and institutional reinforcement. Strengthening these areas is critical to improving patient safety and reducing infection-related morbidity in neutropenic individuals.

**Keywords:** Chemotherapy-Induced Neutropenia, Infection Prevention, Medical Personnel, Knowledge, Procedural Adherence, Patient Safety.

### Introduction

Chemotherapy-induced neutropenia is one of the most serious and frequent complications faced

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by cancer patients undergoing treatment. This condition leads to a significant reduction in neutrophils, which are white blood cells essential for combating infections. As a result, patients with neutropenia are at a markedly increased risk of acquiring infections that may progress rapidly and become life-threatening. This vulnerability necessitates stringent infection prevention measures in healthcare settings, particularly among medical personnel responsible for patient care (Al Qadire et al., 2023).

Infection prevention in neutropenic patients is not solely reliant on medical protocols and guidelines, but also heavily depends on the knowledge and procedural compliance of healthcare workers. Nurses, physicians, and other allied healthcare professionals play a critical role in maintaining sterile environments, identifying early signs of infection, and applying preventative strategies. Their understanding of infection pathways and adherence to proper procedures significantly influence patient outcomes, especially for those with compromised immunity due to chemotherapy (Tarakcioglu Celik & Korkmaz, 2017).

Despite advancements in oncology and supportive care, infections remain a major cause of morbidity and mortality in neutropenic patients. The high susceptibility of these patients to bacterial, viral, and fungal infections underscores the importance of continuous vigilance and education among medical personnel. It is not enough to rely solely on systemic prophylactic measures; active engagement in infection prevention practices is essential in reducing adverse outcomes (Boccia et al., 2022).

The variability in knowledge and practice levels among medical staff often stems from differences in training, work experience, and institutional policies. In some healthcare facilities, standardized infection control protocols are well-implemented and monitored, whereas in others, gaps in training and compliance can leave patients vulnerable. Understanding these discrepancies is essential for developing targeted educational interventions and improving patient safety across different settings (Bawankar & Ankar, 2022).

Moreover, the dynamic and demanding nature of healthcare environments can lead to lapses in infection control, even among experienced staff. The workload, patient turnover, and urgency of care required for neutropenic patients create challenges that can compromise adherence to recommended procedures. Thus, fostering a culture of safety, where infection prevention is viewed as a collective responsibility, is vital for sustaining high standards of care (Evashwick et al., 2022).

Patient education is another dimension of infection prevention that intersects with healthcare worker practices. Medical personnel must not only implement protective measures but also educate neutropenic patients and their families about hygiene, environmental exposure, and early symptoms of infection. This dual responsibility requires a solid foundation of knowledge and excellent communication skills among healthcare professionals (Gustinetti & Mikulska, 2016).

Technological advancements and infection surveillance systems have provided new tools for monitoring infection trends in neutropenic patients. However, these systems are only effective when paired with knowledgeable and competent personnel who can interpret data and respond appropriately. Training medical staff to integrate technology with clinical judgment is essential for enhancing infection prevention efforts (MacPhail et al., 2024).

In low-resource settings, the challenges become even more pronounced. Lack of access to protective equipment, inconsistent sterilization procedures, and limited training opportunities

can hinder infection control efforts. These constraints further emphasize the need for practical, evidence-based training tailored to the realities of each clinical environment (Mak & Yin Ching, 2015).

The psychological stress experienced by patients undergoing chemotherapy may also affect their immune response and compliance with infection prevention advice. Medical personnel must be equipped with both clinical and psychosocial competencies to provide holistic care. A comprehensive understanding of how stress, neutropenia, and infections interact can guide more effective interventions and improve patient outcomes (Amaral et al., 2021).

Ultimately, strengthening the knowledge and procedures of medical personnel in infection prevention is not just a matter of professional development—it is a fundamental component of patient safety and quality of care. As the incidence of cancer continues to rise globally, ensuring that healthcare providers are well-prepared to manage neutropenic patients becomes a critical public health priority. This research aims to explore the current state of knowledge and practice among medical staff and identify areas for improvement that can enhance infection prevention strategies in this vulnerable population.

## **Methodology**

### **Study Design**

This study employed a descriptive cross-sectional design to assess the knowledge and procedural practices of medical personnel regarding infection prevention in patients with chemotherapy-induced neutropenia. The design allowed for the collection of data at a single point in time to explore the current state of knowledge and adherence to infection control procedures among healthcare professionals in relevant clinical settings.

### **Study Setting**

The research was conducted in three hospital departments within a tertiary care hospital: the intensive care unit (ICU), internal medicine, and oncology departments. These departments were selected because they represent clinical environments where healthcare personnel are most likely to care for patients undergoing chemotherapy and at risk of neutropenia.

### **Study Population**

The target population for this study included registered nurses, assistant nurses, and nurse technicians working in the selected departments. All participants were required to have a minimum of six months of clinical experience in caring for patients with cancer or related conditions, including neutropenic patients.

### **Inclusion and Exclusion Criteria**

Inclusion criteria involved nurses currently working in ICU, internal medicine, or oncology units, with at least six months of direct experience in patient care. Exclusion criteria included administrative nurses not involved in direct patient care, newly hired staff with less than six months of experience, and those on leave during the data collection period.

### **Sample Size and Sampling Technique**

A total of 120 medical personnel were selected using purposive sampling to ensure the inclusion of individuals with relevant experience. The sample was distributed as follows: 40 nurses from the ICU, 40 from internal medicine departments, and 40 from oncology departments. The sample

size was deemed sufficient to allow for statistical analysis and generalization within the study setting.

### **Data Collection Tool**

A structured, self-administered questionnaire was used for data collection. The questionnaire consisted of three sections: demographic information, knowledge assessment on infection prevention in neutropenic patients, and procedural practice evaluation. The knowledge section included multiple-choice questions, while the procedural section used a Likert-scale format to assess the frequency and consistency of infection prevention practices.

### **Tool Validation and Pilot Study**

The questionnaire was adapted from previously validated tools and reviewed by a panel of three experts in infection control and oncology nursing for face and content validity. A pilot study was conducted with 10 participants (excluded from the main sample) to test the clarity, reliability, and applicability of the tool. Minor adjustments were made based on feedback from the pilot study to improve question clarity and relevance.

### **Data Collection Procedure**

Data were collected over a period of four weeks during scheduled work shifts. The questionnaires were distributed in person by the researcher and collected upon completion. Participation was voluntary, and all participants were assured of the confidentiality of their responses. Informed consent was obtained before participation.

### **Ethical Considerations**

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of the hospital. Participants were informed of the purpose of the study, the voluntary nature of their participation, and their right to withdraw at any time without any consequences. All data were anonymized, and confidentiality was maintained throughout the study.

### **Data Analysis**

Data were coded and entered into the Statistical Package for the Social Sciences (SPSS) version 25 for analysis. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were used to summarize participant characteristics and responses. Inferential statistics, such as Chi-square tests and ANOVA, were used to examine relationships between knowledge levels, practice adherence, and demographic variables. A significance level of  $p < 0.05$  was considered statistically significant.

### **Results**

This study aimed to evaluate the knowledge and procedures followed by medical personnel in preventing infections among chemotherapy-induced neutropenic patients. Data were collected from a total of **120 participants**, consisting of nurses from **ICU (n=40)**, **internal medicine (n=40)**, and **oncology departments (n=40)**. The analysis focused on demographic characteristics, knowledge levels regarding neutropenic precautions, and adherence to infection prevention practices.

Department	Frequency	Percentage (%)
ICU	40	33.3%
Internal Medicine	40	33.3%
Oncology	40	33.3%
<b>Total</b>	<b>120</b>	<b>100%</b>

Table 1: Distribution of Participants by Department

As shown in Table 1, the sample was evenly distributed across the three departments, with **33.3%** of participants from each: ICU, internal medicine, and oncology. This equal representation ensured that perspectives from all key departments dealing with neutropenic patients were adequately captured.

Variable	Category	Frequency	Percentage (%)
Gender	Male	42	35.0%
	Female	78	65.0%
Years of Experience	6 months – 2 years	30	25.0%
	3–5 years	50	41.7%
	>5 years	40	33.3%
Educational Qualification	Diploma	28	23.3%
	Bachelor's Degree	74	61.7%
	Master's Degree	18	15.0%

Table 2: Demographic Characteristics of Participants

The majority of participants were **female (65%)**, reflecting the gender distribution common in nursing. Regarding experience, **41.7%** had between 3–5 years of clinical practice, and **33.3%** had over five years. Most participants (**61.7%**) held a **bachelor's degree**, with a smaller portion having a **diploma (23.3%)** or **master's degree (15%)**, indicating a generally well-educated sample.

Knowledge Score	Frequency	Percentage (%)
Poor (0–4 correct)	14	11.7%
Moderate (5–7 correct)	52	43.3%
Good (8–10 correct)	54	45.0%
<b>Total</b>	<b>120</b>	<b>100%</b>

Table 3: Knowledge Level About Infection Prevention in Neutropenic Patients

Nearly half of the participants (**45.0%**) demonstrated a **good level of knowledge** regarding infection prevention in neutropenic patients, correctly answering 8–10 items. **43.3%** had a **moderate level**, while only **11.7%** scored poorly. These results indicate a generally acceptable knowledge base, though a portion of the workforce still requires targeted training.

Source of Infection	Frequency	Percentage (%)
Contaminated hands	112	93.3%
Non-sterile equipment	98	81.7%
Visitors or family	85	70.8%

Inadequate hand hygiene	110	91.7%
Airborne pathogens	78	65.0%

Table 4: Common Sources of Infection Identified

Most respondents identified **contaminated hands (93.3%)** and **inadequate hand hygiene (91.7%)** as leading sources of infection. A high percentage also recognized the risk from **non-sterile equipment (81.7%)** and **visitors (70.8%)**. This demonstrates strong awareness of major infection risks, particularly those related to direct contact and equipment use.

Procedure	Always	Sometimes	Rarely	Never
Hand hygiene before patient contact	96	18	6	0
Use of personal protective equipment	85	25	10	0
Isolation precautions for neutropenic pts	78	30	12	0
Disinfection of reusable equipment	88	22	10	0
Patient/family education on hygiene	72	30	18	0

Table 5: Frequency of Procedural Adherence in Practice

Procedural adherence was generally high, with **80% (n=96)** always practicing hand hygiene before patient contact, and **85 (70.8%)** consistently using PPE. However, practices such as **educating patients and families** were always performed by only **60% (n=72)**, indicating a need to reinforce educational responsibilities. Adherence to isolation and equipment disinfection procedures remained relatively high, though some inconsistencies were noted.

Department	Good (%)	Moderate (%)	Poor (%)
ICU	20 (50%)	16 (40%)	4 (10%)
Internal Medicine	18 (45%)	18 (45%)	4 (10%)
Oncology	16 (40%)	18 (45%)	6 (15%)

Table 6: Differences in Knowledge Level by Department

The **ICU nurses had the highest proportion of good knowledge (50%)**, followed by internal medicine (45%) and oncology (40%). Oncology nurses also had the highest percentage of poor knowledge (15%). This suggests that ICU environments may provide more rigorous infection control exposure or reinforcement, while oncology nurses may benefit from additional training or support in infection-specific knowledge.

## Discussion

The findings of this study provide valuable insight into the current state of knowledge and procedural adherence among medical personnel involved in the care of chemotherapy-induced neutropenic patients. With nearly half of the sample (45.0%) demonstrating good knowledge and 43.3% showing moderate understanding, the results reveal a promising foundation for effective infection prevention practices. However, the presence of 11.7% of staff with poor knowledge suggests that there remain gaps that must be urgently addressed through structured educational interventions.

The variation in knowledge levels across departments also highlights disparities in staff preparedness. ICU nurses had the highest percentage of good knowledge (50%), followed

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closely by internal medicine (45%) and oncology nurses (40%). This distribution could be attributed to the high acuity nature of ICU care, where infection control practices are more frequently reinforced. These results are consistent with Al Qadire et al. (2023), who found significant differences in knowledge among nurses depending on departmental exposure and prior training in neutropenic care.

Infection sources such as contaminated hands (93.3%) and inadequate hand hygiene (91.7%) were accurately identified by most participants, indicating a strong conceptual understanding of primary infection routes. This aligns with the findings of Tarakcioglu Celik and Korkmaz (2017), who emphasized hand hygiene as the cornerstone of infection prevention among neutropenic patients. However, the transition from knowledge to consistent action requires system-wide procedural adherence and regular monitoring.

Although a high percentage of staff reported always practicing hand hygiene (80%) and using personal protective equipment (70.8%), there was a noticeable drop in consistent performance when it came to patient/family education (60%) and isolation precautions (65%). These inconsistencies mirror the challenges reported by Evashwick et al. (2022), who observed lapses in standardized infection prevention bundle adherence unless supported by audit tools and reinforcement.

The findings further underscore the importance of comprehensive education and protocol training. Participants with bachelor's or higher degrees formed 76.7% of the sample and had a relatively higher proportion of good knowledge scores, supporting Bawankar and Ankar's (2022) conclusion that structured education significantly improves protocol compliance and patient safety outcomes. These findings point to the critical need for continuous professional development tailored to infection prevention in immunocompromised populations.

Nurses play a central role in early detection of infection and implementation of preventive procedures. In our study, 78 participants (65%) correctly identified airborne pathogens as potential infection sources. This is crucial in settings where neutropenic patients are exposed to open environments or poorly ventilated spaces. Gustinetti and Mikulska (2016) emphasized the significance of environmental controls in reducing bloodstream infection rates in such vulnerable patients.

However, gaps in procedural consistency remain. Although 88 participants (73.3%) reported always disinfecting reusable equipment, 26.7% did so only sometimes or rarely. This is concerning considering MacPhail et al. (2024) highlighted contaminated equipment as a frequent cause of hospital-acquired bloodstream infections in neutropenic cancer patients. The procedural gap underscores the necessity of regular competency checks and institutional accountability.

The moderate level of knowledge in 43.3% of staff, though not alarming, indicates that many healthcare workers may only be partially aware of protocols or may not be up to date with evolving guidelines. Boccia et al. (2022) noted that febrile neutropenia remains a significant burden in oncology, largely due to the inconsistent application of prevention measures, especially in non-oncology-focused departments.

Isolation precautions, which were always implemented by only 65% of respondents, also present an area of concern. Neutropenic patients are highly susceptible to opportunistic infections, and consistent isolation can significantly reduce exposure. Amaral et al. (2021) emphasized that effective bundling of isolation with other preventive strategies can substantially reduce neutropenic complications.

Interestingly, despite the high knowledge of infection sources, patient/family education had the lowest full adherence rate (60%). This is particularly concerning given the findings of Mak and Yin Ching (2015), who showed that patient and caregiver education significantly reduces infection rates when patients understand hygiene protocols and warning signs of febrile neutropenia.

Another notable point is the correlation between years of experience and knowledge level. In our study, participants with more than five years of experience had a higher frequency of good knowledge scores, suggesting that experiential learning plays a role in infection control understanding. This supports findings by Al Qadire et al. (2023), who noted that clinical exposure enhances the ability of staff to translate theoretical knowledge into practical application.

While equipment sterilization and PPE use were reported to be well-followed, this self-reported data must be cautiously interpreted. As highlighted by Evashwick et al. (2022), without direct observation or audit tools, reported adherence may not reflect actual behavior, particularly under stress or time constraints commonly seen in ICU or oncology wards.

Departmental differences in knowledge also reflect the varying degrees of exposure to infection control training and institutional support. The oncology department, despite being central to chemotherapy delivery, had the highest percentage of staff with poor knowledge (15%). This gap reinforces the call by Bawankar and Ankar (2022) for mandatory training sessions and nursing protocols in chemotherapy settings.

The findings suggest that while the foundation of infection prevention knowledge is present, consistent execution of protocols remains the primary challenge. Institutional factors such as staffing levels, availability of resources, and leadership engagement directly influence adherence. As MacPhail et al. (2024) argued, infection prevention cannot be divorced from hospital culture and organizational priorities.

The overall results of this study align with global literature, reinforcing the need for targeted, department-specific interventions that combine education, supervision, and systems-based reinforcement. Such a multipronged approach was successfully demonstrated by Amaral et al. (2021) in their infection prevention bundle for neutropenic patients.

## Conclusion

This study revealed that while medical personnel caring for chemotherapy-induced neutropenic patients generally possess moderate to good knowledge of infection prevention, significant inconsistencies exist in the application of procedures—particularly in areas like patient education and isolation. These findings highlight the need for continuous, structured training, monitoring tools, and department-specific infection control protocols. Strengthening these areas can play a critical role in improving patient safety and reducing morbidity associated with infections in neutropenic individuals.

## References

- Al Qadire, M., Ballad, C. A. C., Aljezawi, M., Al Omari, O., Alaloul, F., Musa, A., Al Sabei, S., & Khalaf, A. (2023). Nurses' knowledge of chemotherapy-induced neutropenia and its management: a cross-sectional survey. *Journal of cancer research and clinical oncology*, 149(7), 2893–2901. <https://doi.org/10.1007/s00432-022-04140-9>
- Tarakioglu Celik, G. H., & Korkmaz, F. (2017). Nurses' knowledge and care practices for infection

- 1344 *Knowledge and Procedures of Medical Personnel about Infection prevention in neutropenic patients. Contemporary nurse*, 53(2), 143–155. <https://doi.org/10.1080/10376178.2016.1254566>
- Boccia, R., Glaspy, J., Crawford, J., & Aapro, M. (2022). Chemotherapy-Induced Neutropenia and Febrile Neutropenia in the US: A Beast of Burden That Needs to Be Tamed?. *The oncologist*, 27(8), 625–636. <https://doi.org/10.1093/oncolo/oyac074>
- Bawankar, P. R., & Ankar, R. (2022). Evidence Generation of Standard Nursing Protocol on Chemotherapy-Induced Neutropenia Among Oncology Nurses. *Cureus*, 14(11), e31217. <https://doi.org/10.7759/cureus.31217>
- Evashwick, E., Ben-Aderet, M. A., Almario, M. J., Madhusudhan, M. S., Raypon, R., Rome, S., Desvignes, K., Jessup, J., Fawcett, S., & Grein, J. D. (2022). A novel intervention: Implementation of a neutropenic infection-prevention bundle and audit tool in an oncology unit. *American journal of infection control*, 50(4), 454–458. <https://doi.org/10.1016/j.ajic.2021.11.008>
- Gustinetti, G., & Mikulska, M. (2016). Bloodstream infections in neutropenic cancer patients: A practical update. *Virulence*, 7(3), 280–297. <https://doi.org/10.1080/21505594.2016.1156821>
- Mak, W. C., & Yin Ching, S. S. (2015). Effect of an education program on knowledge, self-care behavior and handwashing competence on prevention of febrile neutropenia among breast cancer patients receiving Doxorubicin and Cyclophosphamide in Chemotherapy Day Centre. *Asia-Pacific journal of oncology nursing*, 2(4), 276–288. <https://doi.org/10.4103/2347-5625.167232>
- MacPhail, A., Dendle, C., Slavin, M., & McQuilten, Z. (2024). Hospital-acquired bloodstream infections in patients with cancer: current knowledge and future directions. *The Journal of hospital infection*, 148, 39–50. <https://doi.org/10.1016/j.jhin.2024.03.002>
- Amaral, R. A. C., Oliveira, P. P., Fonseca, D. F. D., Schlosser, T. C. M., Moraes, J. T., Silveira, E. A. A. D., & Santos, K. B. D. (2021). Bundle for the prevention and management of complications of neutropenia in cancer patients. *Revista brasileira de enfermagem*, 74(2), e20200195. <https://doi.org/10.1590/0034-7167-2020-0195>