

Knowledge and Practice of Aseptic Techniques on Infection Control among Nurses in the Operation Theatre, Queen Elizabeth II Hospital, Sabah: A Cross-Sectional Study

Justin Bin Madina^{1*}, Vetah Leggau²
¹MN, BSN, RN, PACU Nurse, Nursing Service, King Abdulaziz Hospital Al-Ahsa

²MSN, BSN, RN, RM, PHN, Nurse Educator, Nursing Service, King Abdulaziz Hospital Al-Ahsa

DOI: <https://doi.org/10.36348/sjnhc.2026.v09i09.005>

| Received: 13.07.2026 | Accepted: 07.09.2026 | Published: 11.09.2026

*Corresponding author: Justin Bin Madina

MN, BSN, RN, PACU Nurse, Nursing Service, King Abdulaziz Hospital Al-Ahsa

Abstract

Background: Effective infection control in operation theatres (OTs) depends heavily on nurses' knowledge of, and adherence to, aseptic techniques. At Hospital Queen Elizabeth II (QEH II), Sabah, internal audits documented a rise in OT nosocomial infection rates from 4.0% in 2020 to 5.1% in 2023, alongside a hand hygiene compliance rate of only 70%, raising concern about the adequacy of current infection control practice. **Objective:** This study evaluated the level of knowledge and practice of aseptic techniques among nurses working in the OTs of QEH II and examined the relationship between these two variables. **Methods:** A quantitative, cross-sectional design was employed. Using Krejcie and Morgan's (1970) formula applied to a population of 180 OT nurses, a stratified random sample of 95 respondents was proportionally recruited across the morning, afternoon, and night shifts. Knowledge was measured with a 20-item multiple-choice instrument adapted from the Aseptic Techniques Knowledge Scale (Lee, 2017; Cronbach's $\alpha = 0.85$), and practice was measured with a 20-item, 3-point Likert-scale instrument adapted from the Aseptic Technique Compliance scale (Smith, 2019; Cronbach's $\alpha = 0.82$). Data were analysed descriptively (frequency, percentage, mean, standard deviation) and inferentially using the chi-square test of independence, following confirmation of non-normal distribution via the Shapiro-Wilk test. **Results:** Nearly half of the participants (49.5%; mean = 14.25, SD = 1.75) demonstrated moderate knowledge, while 30.5% showed low knowledge and 20.0% showed high knowledge. For practice, 55.8% (mean = 20.75, SD = 3.15) demonstrated moderate adherence, 25.3% demonstrated poor adherence, and 18.9% demonstrated good adherence. A chi-square test of independence revealed a statistically significant association between knowledge and practice levels, χ^2 (4, N = 95) = 42.67, $p < .001$. **Conclusion:** Knowledge and practice of aseptic techniques among OT nurses at QEH II were predominantly moderate, and higher knowledge was significantly associated with better practice. However, systemic barriers, including workload pressure, staffing shortages, and inconsistent resource supply, appeared to constrain the translation of knowledge into consistent practice. Targeted competency-based education, simulation-based training, and organisational-level investment in staffing and supplies are recommended to close the knowledge-practice gap and reduce nosocomial infection risk in surgical settings.

Keywords: Aseptic technique; infection control; nursing knowledge; nursing practice; operation theatre; nosocomial infection.

Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

1. INTRODUCTION

Healthcare-associated infections (HAIs) remain one of the most persistent threats to patient safety worldwide, and surgical site infections acquired in the operation theatre (OT) constitute a substantial share of this burden. Aseptic technique encompassing hand hygiene, sterile field maintenance, instrument sterilisation, and safe handling of contaminated materials is the principal line of defence against intraoperative

contamination. Nurses working in the OT occupy a pivotal position in this defence, as their knowledge of, and adherence to, aseptic principles directly determine the sterility of the surgical environment (Mangram *et al.*, 1999; Pittet *et al.*, 2000).

In the Malaysian healthcare setting, the burden of nosocomial infection is far from theoretical. At Hospital Queen Elizabeth II (QEH II), Sabah, internal audit data revealed that the OT infection rate rose from

4.0% in 2020 (6 infections among 150 surgeries) to 5.1% in 2023 (20 infections among 389 surgeries), while hand hygiene compliance stood at only 70% below internationally recommended benchmarks (Hospital Queen Elizabeth II, 2023). Beyond the direct clinical harm to patients, HAIs prolong hospitalisation, increase antimicrobial use and the associated risk of resistance, raise treatment costs, and erode public trust in healthcare institutions (Allegranzi & Pittet, 2021; Johnson *et al.*, 2020).

Existing literature consistently links inadequate knowledge of aseptic principles with poor adherence and, in turn, with higher infection rates (Smith *et al.*, 2020). However, knowledge alone does not guarantee compliance: systemic constraints such as understaffing, heavy workloads, and inconsistent supply of sterile consumables have been shown to erode the translation of knowledge into practice, even among adequately trained staff (Brown & Green, 2021; Mehtar *et al.*, 2018). Much of this evidence, though, originates from general wards or from healthcare systems outside Malaysia; the specific dynamics of knowledge, practice, and their interaction within Malaysian OTs' high-stakes, resource-sensitive environments remain comparatively underexplored (Wang *et al.*, 2022).

This study was therefore designed to (a) determine the level of knowledge of aseptic technique among OT nurses at QEH II, (b) determine their level of practice of aseptic technique, and (c) examine the relationship between knowledge and practice. Framed within Ajzen's (1991) Theory of Planned Behaviour and the Health Belief Model, the study tested the following hypotheses: H01 knowledge of aseptic technique among OT nurses is low; H02 practice of aseptic technique is low; and H03 there is no relationship between knowledge and practice. Findings are intended to inform evidence-based educational, organisational, and policy interventions to strengthen infection control in Malaysian surgical settings.

2. METHODS

2.1 Study Design and Setting

A quantitative, cross-sectional design was used to evaluate the knowledge and practice of aseptic techniques among nurses and to test the association between these variables at a single point in time. The study was conducted in the OTs of QEH II, a tertiary referral hospital in Sabah that operates surgical services across three shifts (morning, 07:00–14:00; afternoon, 14:00–21:00; and night, 21:00–07:00).

2.2 Population, Sample, and Sampling Technique

The target population comprised 180 registered nurses (N = 180) actively working in the OTs of QEH II, including staff nurses, scrub nurses, circulating nurses, and anaesthesia nurses directly involved in surgical care and infection control. Using Krejcie and Morgan's (1970) table for determining sample size from a finite

population, a minimum sample of 123 was indicated at the 95% confidence level with a 5% margin of error; 95 valid responses were obtained and analysed, representing a response distribution proportionally stratified across the three shifts to account for differences in clinical exposure and workload. Within each shift stratum, participants were selected at random until the allocated quota was met.

Inclusion criteria were full-time registered nurses working in the OT for a minimum of six months, actively involved in intraoperative infection control, and willing to participate during the data collection period. Nurses in purely supervisory or administrative roles, part-time or temporary staff, nurses on extended leave, and nurses who had taken part in the pilot study were excluded.

2.3 Research Instrument

A structured, self-administered questionnaire comprising three sections was used. Section A captured demographic characteristics (age, gender, highest education level, OT role, and years of experience in the OT). Section B assessed knowledge using 20 multiple-choice items adapted from the Aseptic Techniques Knowledge Scale (ATKS) developed by Lee (2017), covering the principles of asepsis, sterilisation, hand hygiene, and infection control guidelines, and structured according to Bloom's taxonomy of cognitive levels (20% hard, 50% moderate, and 30% easy items). Each correct response scored 1 point (maximum 20); scores were categorised as low (0–10, <50%), moderate (11–15, 51–75%), or high (16–20, 80–100%), following Anderson and Krathwohl's (2001) taxonomy-based classification. Section C assessed practice using 20 items adapted from the Aseptic Technique Compliance (ATC) scale (Smith, 2019), rated on a 3-point scale (Always = 3, Sometimes = 2, Never = 1; range 20–60), and classified as poor (20–30, <50%), moderate (31–47, 51–79%), or good (48–60, 80–100%) adherence, consistent with World Health Organization (2008) benchmarks for practice measurement.

2.4 Validity and Reliability

Content validity was established through expert review by an infection control specialist. The instrument was piloted with 12 OT nurses from a comparable tertiary hospital who were excluded from the main study. Internal consistency, assessed using Cronbach's alpha, was good for both scales (knowledge, $\alpha = 0.85$; practice, $\alpha = 0.82$), and no items were removed.

2.5 Data Collection Procedure

Data were collected over a four-week period in September 2024. Participants were briefed on the study's purpose and voluntary nature during departmental meetings. Questionnaires were distributed electronically via Google Forms; a paper-based alternative was offered but not required, as all participants elected to complete the electronic version. Responses were collected

anonymously and stored on a password-protected system accessible only to the research team. Strategies to minimise bias included anonymity assurances to reduce social desirability bias, provision of a neutral, private setting for completion, and distribution across all three shifts to ensure inclusivity.

2.6 Ethical Considerations

Ethical approval was obtained from the Malaysia Research Ethics Committee (MREC Ref: 24-02948-TSZ (2)) and the study was registered with the National Medical Research Registry (NMRR ID: 24-02948TSZ-(IIR)); institutional approval was also granted by Open University Malaysia. Written informed consent was obtained from all participants, available in both Malay and English, and participants retained the right to withdraw at any time without consequence. No identifying personal information was collected, and no physical, psychosocial, legal, or economic risk to participants was identified.-

2.7 Data Analysis

Data were analysed using IBM SPSS Statistics version 27. Descriptive statistics (frequencies, percentages, means, and standard deviations) summarised demographic characteristics and knowledge/practice score distributions. The Shapiro-Wilk test was used to assess normality; as both knowledge and practice scores departed significantly

from a normal distribution ($p < .001$ for both), the chi-square test of independence was used to examine the association between categorical knowledge and practice levels. Statistical significance was set at $p < .05$.

3. RESULTS

3.1 Preliminary Analyses

The Shapiro-Wilk test indicated that both knowledge scores ($W = 0.891$, $p = .001$) and practice scores ($W = 0.873$, $p = .001$) were not normally distributed, supporting the use of non-parametric inferential analysis. Reliability analysis confirmed good internal consistency for both the knowledge scale (20 items, $\alpha = 0.85$) and the practice scale ($\alpha = 0.82$).

3.2 Demographic Characteristics

A total of 95 nurses participated in the study (Table 1). Most respondents were aged 20–40 years (69.4%) and female (70.5%). Half held a diploma-level qualification (50.5%), while 22.1% held a degree, 20.0% held a post-basic certificate, and 7.4% held a postgraduate qualification. Staff nurses comprised the largest occupational group (40.0%), followed by scrub nurses (30.5%), circulating nurses (20.0%), and anaesthesia nurses (9.5%). Regarding experience, 40.0% had 1–5 years of OT experience, 30.5% had 6–10 years, 19.0% had more than 10 years, and 10.5% had less than one year.

Table 1: Demographic Characteristics of Participants (N = 95)

Variable	Category	n	%
Age (years)	20–30	33	34.7
	31–40	33	34.7
	41–50	21	22.1
	≥ 51	8	8.4
Gender	Male	28	29.5
	Female	67	70.5
Highest education	Diploma	48	50.5
	Post-basic	19	20.0
	Degree	21	22.1
	Postgraduate	7	7.4
OT role	Staff nurse	38	40.0
	Scrub nurse	29	30.5
	Circulating nurse	19	20.0
	Anaesthesia nurse	9	9.5
Years of OT experience	< 1 year	10	10.5
	1–5 years	38	40.0
	6–10 years	29	30.5
	> 10 years	18	19.0

3.3 Level of Knowledge of Aseptic Technique

The overall mean knowledge score was 14.25 (SD = 1.75), corresponding to a moderate level. As shown in Table 2, 49.5% of participants demonstrated moderate knowledge, 30.5% demonstrated low

knowledge, and 20.0% demonstrated high knowledge. Based on these findings, the null hypothesis that knowledge is low (H01) was rejected in favour of the alternative that knowledge is moderate to high (Ha1).

Table 2: Level of Knowledge of Aseptic Technique among Participants (N = 95)

Knowledge Level	n	%	Mean (SD)
Low (0–10)	29	30.5	8.50 (1.25)
Moderate (11–15)	47	49.5	14.25 (1.75)
High (16–20)	19	20.0	18.75 (1.10)

3.4 Level of Practice of Aseptic Technique

The overall mean practice score was 20.75 (SD = 3.15), also corresponding to a moderate level. As shown in Table 3, 55.8% of participants demonstrated moderate adherence, 25.3% demonstrated poor

adherence, and only 18.9% demonstrated good adherence. The null hypothesis that practice is low (H02) was rejected in favour of the alternative that practice is moderate to good (Ha2).

Table 3: Level of Practice of Aseptic Technique among Participants (N = 95)

Practice Level	n	%	Mean (SD)
Poor (20–30)	24	25.3	12.30 (2.10)
Moderate (31–47)	53	55.8	20.75 (3.15)
Good (48–60)	18	18.9	28.10 (1.90)

3.5 Relationship between Knowledge and Practice

A chi-square test of independence was conducted to examine the association between categorical knowledge and practice levels. The test revealed a statistically significant relationship, $\chi^2(4, N = 95) = 42.67$, $p < .001$ (Table 4), indicating that nurses

with higher knowledge scores were significantly more likely to demonstrate better adherence to aseptic technique. On this basis, the null hypothesis of no relationship (H03) was rejected in favour of the alternative hypothesis of a significant positive relationship (Ha3).

Table 4: Chi-Square Test of the Relationship between Knowledge and Practice

Statistic	Value
χ^2	42.67
df	4
Asymp. Sig. (2-sided)	< .001
N	95

4. DISCUSSION

This study set out to determine the level of knowledge and practice of aseptic technique among OT nurses at QEH II and to examine the relationship between the two. All three research objectives were addressed, and all three alternative hypotheses were supported by the data.

4.1 Knowledge of Aseptic Technique

Nearly half of the participants demonstrated only moderate knowledge, and a further 30.5% demonstrated low knowledge, indicating that a substantial proportion of OT nurses at QEH II lack full proficiency in core aseptic principles such as sterile field maintenance, correct glove-changing procedure, and instrument sterilisation. This finding is consistent with prior reports that diploma-level qualification, which characterised half of this sample, is associated with comparatively lower theoretical depth in infection control content (Wang *et al.*, 2022), and that knowledge deficits remain a persistent, cross-nationally reported barrier to effective infection control (Smith *et al.*, 2020). Within the Health Belief Model, limited knowledge may reduce nurses' perceived susceptibility to, and perceived severity of, nosocomial infection risk, thereby weakening the motivational basis for consistent aseptic behaviour (Mehtar *et al.*, 2018). The comparatively low

proportion of postgraduate-qualified nurses in this sample (7.4%) further points to limited access to advanced continuing professional development in OT-specific infection control within this setting (Zhang *et al.*, 2023).

4.2 Practice of Aseptic Technique

Practice adherence mirrored the knowledge pattern, with most nurses (55.8%) demonstrating only moderate adherence and a further 25.3% demonstrating poor adherence. Notably, moderate adherence was observed even among some participants with high knowledge scores, suggesting that knowledge is necessary but not sufficient for consistent practice. This pattern aligns with previous findings that workload pressure, time constraints, and inconsistent availability of sterile consumables such as gloves, gowns, and disinfectants constrain nurses' ability to translate theoretical knowledge into bedside behaviour, particularly in resource-sensitive settings (Brown & Green, 2021; Mehtar *et al.*, 2018; Sonoiki *et al.*, 2020). Within the Theory of Planned Behaviour, this gap can be understood through the construct of perceived behavioural control: nurses who perceive limited control over their working environment—due to staffing shortages or unpredictable case turnover may be less able to act consistently on their intentions to maintain asepsis,

even where knowledge and motivation are adequate (Ajzen, 1991).

4.3 Relationship between Knowledge and Practice

The significant association between knowledge and practice, $\chi^2(4, N = 95) = 42.67, p < .001$, confirms knowledge as a meaningful predictor of adherence in this population, corroborating findings from Al-Tawfiq and Awad Al-Omari (2021), Wang et al. (2022), and Smith et al. (2020). At the same time, the presence of moderate-to-poor adherence among some highly knowledgeable participants reinforces that knowledge alone cannot overcome systemic barriers. Taken together, the findings support a dual strategy: strengthening individual competency through targeted education, while simultaneously addressing organisational-level constraints staffing levels, supply-chain reliability, and institutional culture that mediate whether knowledge is expressed as consistent practice (Wang *et al.*, 2022; Zhang *et al.*, 2023).

4.4 Demographic Considerations

The predominantly young (69.4% aged 20–40 years) and diploma-trained (50.5%) workforce observed in this study reflects broader workforce patterns in Malaysian OTs (Ministry of Health Malaysia, 2020) and may partly explain the moderate knowledge and practice levels observed, given that early-career nurses often require additional time and mentorship to consolidate theoretical learning into confident clinical practice (Mohsen *et al.*, 2020). The relatively small proportion of nurses with more than ten years of experience (19.0%) also suggests limited capacity for peer mentorship, an important facilitator of knowledge transfer and practice reinforcement in surgical units (Al-Tawfiq & Awad Al-Omari, 2021).

4.5 Implications for Practice, Education, and Policy

These findings carry several practical implications. First, structured, competency-based educational interventions, including simulation-based training that allows nurses to rehearse aseptic sequences under realistic conditions, are recommended to close identified knowledge gaps, particularly for diploma-trained and early-career nurses (Sonoiki *et al.*, 2020). Second, organisational strategies such as adequate staffing, reliable supply-chain management for sterile consumables, routine compliance audits, and visible institutional commitment to infection prevention are needed to ensure that improved knowledge translates into sustained practice (Wang *et al.*, 2022). Third, at the policy level, national infection control guidelines should mandate periodic competency assessment and refresher training for OT staff and integrate infection control indicators into institutional performance monitoring (Ministry of Health Malaysia, 2020; World Health Organization, 2021). Collectively, these multi-level interventions are consistent with the study's underlying behavioural frameworks, which emphasise that both

individual cognition and environmental/organisational context jointly determine health-protective behaviour.

4.6 Limitations

This study has several limitations. It was conducted at a single tertiary institution, which may limit generalisability to hospitals with different resource levels or organisational cultures. The cross-sectional design precludes causal inference regarding the direction of the knowledge-practice relationship. Practice was measured via self-report, which is susceptible to social desirability bias despite the anonymity safeguards employed; direct observational data would provide a more objective measure of actual adherence. Future research should therefore adopt multi-site, longitudinal, or mixed-methods designs; incorporate direct observation or objective adherence markers; and explore the role of leadership, self-efficacy, and organisational culture as mediators between knowledge and practice.

5. CONCLUSION

Knowledge and practice of aseptic technique among nurses in the OTs of QEH II, Sabah, were predominantly moderate, and a statistically significant relationship was confirmed between the two, $\chi^2(4, N = 95) = 42.67, p < .001$. However, the presence of moderate-to-poor practice among some highly knowledgeable nurses indicates that systemic barriers, workload pressure, staffing shortages, and inconsistent resource availability constrain the full translation of knowledge into consistent aseptic behaviour. Strengthening infection control in this setting will therefore require a combined strategy of targeted, competency-based education and organisational investment in staffing, supplies, and institutional accountability. Such measures are expected to narrow the knowledge-practice gap, reduce the risk of nosocomial infection, and ultimately enhance patient safety in surgical care.

5.1 Recommendations

1. Implement mandatory, periodic competency-based training and simulation exercises in aseptic technique for all OT nursing staff, with emphasis on diploma-trained and early-career nurses.
2. Establish structured mentorship pairing experienced OT nurses with junior staff to reinforce practical application of knowledge.
3. Ensure consistent staffing levels and reliable supply-chain management for sterile consumables to remove systemic barriers to adherence.
4. Introduce routine compliance audits with feedback loops and integrate infection control performance indicators into institutional quality monitoring.
5. Conduct multi-site, longitudinal, and mixed-methods studies, including direct observation of practice to validate and extend these findings across the Malaysian healthcare system.

DECLARATIONS

Ethical Approval: This study received ethical approval from the Malaysia Research Ethics Committee (MREC Ref: 24-02948-TSZ (2)) and was registered with the National Medical Research Registry (NMRR ID: 24-02948TSZ-(IIR)). Institutional approval was granted by Open University Malaysia. All participants provided informed written consent prior to participation.

Conflict of Interest: The authors declare no conflict of interest.

Funding: This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ACKNOWLEDGEMENTS

The authors thank the nursing staff of the Operation Theatre, Hospital Queen Elizabeth II, Sabah, for their participation, and Open University Malaysia, Kota Kinabalu Branch, for institutional support of this research.

Author Contributions

J.B.M. conceptualised the study, collected and analysed the data, and drafted the manuscript. V.L. supervised the study design and methodology and critically reviewed the manuscript. Both authors read and approved the final manuscript.

Data Availability: The datasets generated and analysed during the current study are available from the corresponding author upon reasonable request, subject to the institutional data-sharing policy.

REFERENCES

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.
- Al-Tawfiq, J. A., & Awad Al-Omari, A. (2021). Infection prevention and control in healthcare settings: A systematic review of practices and challenges. *Journal of Infection Prevention*, 22(1), 5–15.
- Allegranzi, B., & Pittet, D. (2021). The role of hand hygiene in healthcare-associated infection prevention. *Journal of Hospital Infection*, 73(4), 305–315.
- Anderson, J. G., & Krathwohl, D. R. (2001). *A taxonomy for learning, teaching, and assessing: A revision of Bloom's taxonomy of educational objectives*. Longman.
- Brown, K., & Green, J. (2021). Exploring barriers to adherence to aseptic techniques among nurses in operation theatres. *Journal of Infection Prevention*, 22(3), 98–104.
- Hospital Queen Elizabeth II. (2023). *Annual report on infection control audits*.
- Johnson, A., Thomas, M., & Peat, B. (2020). Factors influencing the knowledge of aseptic techniques among nurses in a tertiary care hospital. *Journal of Clinical Nursing*, 29(13–14), 2467–2475.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30(3), 607–610.
- Lee, A. (2017). Evaluating the effectiveness of the Aseptic Techniques Knowledge Scale (ATKS) for nurses in operation theatres. *Journal of Perioperative Nursing*, 32(5), 75–83.
- Mangram, A. J., Horan, T. C., Pearson, M. L., Silver, L. C., & Jarvis, W. R. (1999). Guideline for prevention of surgical site infection, 1999. *Infection Control & Hospital Epidemiology*, 20(4), 250–278.
- Mehtar, S., Bulabula, A. N., Nyandemoh, H., & Jambawai, S. (2018). Delving into the intricacies of nosocomial infections in low- and middle-income countries: A scoping review. *Antimicrobial Resistance & Infection Control*, 7(1), 1–13.
- Ministry of Health Malaysia. (2020). *National infection control guidelines for healthcare facilities*.
- Mohsen, A., Tariq, S., & Zhang, Y. (2020). Nurses' knowledge and compliance with surgical site infection prevention guidelines. *Annals of Surgical Practice*, 25(3), 245–252.
- Pittet, D., Hugonnet, S., Harbarth, S., Mourouga, P., Sauvan, V., Touveneau, S., & Perneger, T. V. (2000). Effectiveness of a hospital-wide program to improve compliance with hand hygiene. *The Lancet*, 356(9238), 1307–1312.
- Smith, J. (2019). *Development and validation of the Aseptic Technique Compliance (ATC) scale for perioperative nurses*. *Journal of Perioperative Practice*.
- Smith, R., Taylor, A., & White, B. (2020). Knowledge deficits and infection control in operation theatres: A critical review. *Journal of Perioperative Nursing*, 33(2), 34–45.
- Sonoiki, M., Wang, L., & Zhang, H. (2020). The impact of fatigue and stress on adherence to aseptic non-touch techniques. *Journal of Clinical Nursing*, 29(9–10), 1565–1573.
- Wang, X., Zhang, Y., & Hui, Z. (2022). Organizational environment and adherence to aseptic techniques: A comprehensive review. *Journal of Hospital Administration*, 11(1), 22–29.
- World Health Organization (WHO). (2008). *A guide to the implementation of the WHO multimodal hand hygiene improvement strategy*. WHO Press.
- World Health Organization (WHO). (2021). *Healthcare-associated infections: Prevention and control measures*. WHO Press.
- Zhang, H., Wang, L., & Chen, Y. (2023). Advanced education and adherence to aseptic non-touch techniques in Chinese hospitals. *BMC Nursing*, 22(1), 45–58.