



[Research Article]

Appraisal of Nephrology Nurses' Knowledge and Practices in the Prevention of Central Venous Catheter-Related Infections at Muhammadu Abdullahi Wase Teaching Hospital, Kano

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Abstract:

Background: Central venous catheter-related bloodstream infections (CLABSIs) are a significant source of morbidity, mortality, and healthcare costs, particularly in resource-limited settings. Nephrology nurses are key stakeholders in preventing these infections through adherence to evidence-based protocols. This study appraised the knowledge and practices of nephrology nurses regarding CLABSI prevention at Muhammadu Abdullahi Wase Teaching Hospital (MAWTH), Kano, Nigeria.

Methods: A descriptive cross-sectional design was employed, involving all 30 nephrology nurses in the hospital's hemodialysis unit. Data were collected using a structured, self-administered questionnaire assessing socio-demographics, knowledge, and self-reported practices related to CVC infection prevention. Descriptive and inferential statistics were used for analysis.

Results: Most nurses were early-career professionals (70% aged 21–30 years, 68% with <5 years of experience). While over 84% demonstrated strong knowledge of CLABSI prevention, 34% failed to recognize hand hygiene as a key preventive measure. Universal agreement existed on the use of gloves and aseptic techniques. However, misconceptions about antiseptics and shared equipment risks were evident. A moderate positive correlation ($r = 0.563$) was found between age and experience, but years of experience did not significantly predict performance.

Conclusion: Although nephrology nurses at MAWTH exhibit generally sound knowledge and practices regarding CLABSI prevention, critical gaps remain. Continuous professional development and structured training are essential to sustain and improve infection control outcomes.

Keywords: Central venous catheter, CLABSI, nephrology nurses, infection prevention, Kano, Nigeria, hemodialysis.

Introduction:

Central venous catheters (CVCs) are essential in managing critically ill and hemodialysis patients, enabling the administration of medications, parenteral nutrition, and hemodynamic monitoring. However, their use is significantly associated with central line-associated bloodstream infections (CLABSI), which remain a major cause of morbidity, mortality, prolonged hospitalization, and increased healthcare costs worldwide (Odada et al., 2023; Lowe et al., 2021).

Despite global efforts to curb CLABSI, their incidence remains notably higher in resource-limited settings. A recent prospective study conducted in a tertiary care hospital in Northern India reported a CLABSI rate of 9.3 per 1,000 catheter days, highlighting the persistent burden in developing countries (Odada et al., 2023). Similarly, in Sub-Saharan Africa, infection prevention is often undermined by systemic challenges, including inadequate training, shortage of resources, and non-adherence to aseptic protocols (Lowe et al., 2021).

Nurses, particularly those in nephrology and intensive care units, play a pivotal role in preventing CLABSI through strict adherence to evidence-based guidelines. Nevertheless, studies have consistently identified gaps in their knowledge and implementation of preventive measures. For example, Alqalah et al. (2024) found that while many critical care nurses demonstrated acceptable compliance with CLABSI protocols, their theoretical understanding was limited, signaling an urgent need for regular training and capacity building.

Barriers to optimal infection control include high workloads, lack of equipment, limited institutional support, and irregular refresher courses (Barker et al., 2017). These challenges are particularly pronounced in lower-middle-income countries, where health systems face constraints in implementing comprehensive infection prevention programs.

At Muhammadu Abdullahi Wase Teaching Hospital (MAWTH) in Kano, Nigeria, CLABSI represent a recurring clinical and public health issue. The absence of structured infection control protocols and inconsistent training may further exacerbate the incidence of CVC-related infections. Therefore, this study aims to appraise the knowledge and practices of nephrology nurses regarding CLABSI prevention at MAWTH. By identifying existing gaps and addressing them with targeted interventions, this research seeks to reduce infection rates, enhance nursing competence, and improve patient outcomes.

Methods:

This study employed a cross-sectional descriptive design to assess nephrology nurses' knowledge and practices regarding central venous catheter infection (CVCI) prevention at Muhammad Abdullahi Wase Teaching Hospital (MAWTH), Kano. Below are the methodological details:

3.1 Research Design

A descriptive cross-sectional survey was conducted to evaluate variables at a specific point in time among a defined population (National Data Analysis Resource Centre, 2010). This design was selected to efficiently capture the current state of nurses' knowledge and practices without longitudinal follow-up.

3.2 Research Setting

The study was conducted at MAWTH, a tertiary hospital in Nasarawa L.G.A., Kano State, with a 280-bed capacity and 201 nursing staff. The hemodialysis unit, where the study was focused, comprises 20 nephrology nurses. Established in 1929, MAWTH provides specialized services, including hemodialysis, and serves neighboring regions (e.g., Niger, Chad).

3.3 Target Population and Sample Size

The target population included all 30 nephrology nurses in MAWTH's hemodialysis unit. A census approach was adopted, enrolling all eligible nurses to ensure comprehensive representation. The sample size was justified by a 95% confidence interval and 80% power for detecting significant associations.

3.4 Data Collection Instrument

A structured, self-administered questionnaire was used, divided into three sections:

- **Section A:** Socio-demographics (age, sex, qualifications).
- **Section B:** Knowledge of CVCI prevention (e.g., aseptic techniques, catheter care).
- **Section C:** Self-reported practices (e.g., adherence to protocols).

3.5 Validity and Reliability

The questionnaire was developed through a literature review and validated by experts in medical-surgical nursing for **face and content validity**. A pilot test confirmed **reliability (Cronbach's $\alpha = 0.80$)**.

3.6 Data Collection Procedure

1. **Initial visit:** Researchers introduced the study to unit managers and obtained ethical approval.
2. **Second visit:** Questionnaires were distributed to nurses, with a research assistant assisting in retrieval to minimize bias.
3. Participation was voluntary, and confidentiality was maintained.

3.7 Data Analysis

Descriptive statistics (frequencies, percentages, means, standard deviations) were used to summarize data. Inferential statistics (e.g., Pearson's correlation) assessed relationships between knowledge and practice.

3.8 Ethical Considerations

Ethical approval was obtained from MAWTH's institutional review board. Participants provided **written informed consent**, with assurances of anonymity and voluntary participation.

Result

Table 1: Socio-demographic Characteristics of Respondents (N=70)

Variable	Category	Frequency (n-70)	Percentage (%)
Age	21-30 years	48	70%
	31-40 years	14	20%
	>40 years	7	10%
Gender	Male	31	45%

Variable	Category	Frequency (n-70)	Percentage (%)
Marital Status	Female	39	55%
	Married	42	61%
	Single	26	38%
	Widow/Widower	2	1%
Tribe	Hausa	46	67%
	Other Tribes	19	28%
	Yoruba	5	5%
Religion	Islam	61	87%
	Christianity	9	13%
Qualification	RN	35	50%
	RN/RM	12	17%
	BNSc	22	31%
	MSc	1	1%
Years in Service	<5 years	47	68%
	5-10 years	13	[%]
	>10 years	10	[%]

The study revealed that 70% of nephrology nurses at MAWTH were early-career professionals (aged 21–30, 68% with <5 years of experience), which aligns with global evidence linking limited clinical experience to gaps in infection prevention practices (O’Grady et al., 2011). The high response rate (99%) underscores the reliability of these findings, though the cohort’s homogeneity may limit generalizability. Notably, 50% of nurses held only RN qualifications, with just 1% possessing an MSc, suggesting a need for advanced training to bridge knowledge-practice gaps in CRBSI prevention—a concern echoed in low-resource settings (Han et al., 2010). The demographic predominance of Hausa (67%) and Muslim (87%) respondents reflects Kano’s sociocultural context, while the gender distribution (55% female) mirrors nursing workforce trends (WHO, 2022). These results emphasize the urgency of tailored interventions, such as simulation-based training for early-career staff and policy reforms to standardize certification requirements, to reduce CRBSI rates in hemodialysis units.

4.2 Knowledge and Practices on CVCII Prevention

Table 1: Nurses’ Knowledge of CVCII Causes, Signs, and Transmission (N=70)

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
Central venous catheter infection is caused by bacteria or fungi?				
Chills/fever/purulence are signs of CVCII	51% (36)	40% (28)	9% (6)	0% (0)
<i>Staphylococcus</i> is the most common causative agent	56% (39)	43% (30)	1% (1)	0% (0)
Oral secretions, skin contamination of patients and nurses transmit CVCII	49% (34)	39% (27)	11% (8)	1% (1)
Hand hygiene could be mode of transmitting CVCII	24% (17)	13% (10)	34% (24)	27% (19)
Aseptic techniques reduce CVCII colonization	81% (57)	19% (13)	0% (0)	0% (0)
Topical antibiotics reduce CVCII risk	53% (37)	37% (26)	6% (4)	4% (3)

Key Findings:

- Over 90% of nurses correctly identified clinical signs (e.g., fever) and *Staphylococcus* as primary causes of CVCII, aligning with NHSN (2013) guidelines.
- 88% recognized skin/oral secretions as transmission routes, though 34% erroneously disagreed that poor hand hygiene contributes to CVCII, highlighting a critical knowledge gap.
- Universal consensus (100%) on aseptic techniques and hand hygiene as effective preventive measures, consistent with Zhou et al. (2014).
- Divergent views on topical antibiotics: 90% endorsed their use despite mixed evidence on efficacy (O’Grady et al., 2011), suggesting overreliance on pharmacological interventions.

4.2 Knowledge, Practices and Perceptions on CVCI Prevention

Table 1: Infection Prevention Practices (N=70)

Prevention Method	Strongly Agree	Agree	Disagree	Strongly Disagree
Hand hygiene before and after CVCI reduces risk	74% (52)	29% (18)	0% (0)	0% (0)
Hand glove use	71% (50)	29% (20)	0% (0)	0% (0)
Aseptic technique	79% (55)	21% (15)	0% (0)	0% (0)
Sterilization of dressings/equipment	70% (49)	27% (19)	1% (1)	1% (1)

Nurses exhibited strong knowledge of CVCI signs (91% agreement) and causes (99%), with universal consensus on hand gloves and aseptic techniques (100%). This aligns with global standards (NHSN, 2013) but contrasts with 34% underestimating hand hygiene's role (Table 2), revealing a critical training gap.

Table 2: Antiseptics & Equipment Risks (N=70)

Variable	Support* (%)	Oppose* (%)	Key Conflict
Chlorhexidine risks	23	77	Misconception of efficacy
Povidone-iodine effectiveness	92	8	Preferred antiseptic
Normal saline adequacy	37	63	Undervalued limitations
Shared equipment risk	63	37	Resource-driven risk
Recycled consumables risk	71	28	High perceived threat

Support = *Strongly Agree/Agree*; *Oppose* = *Disagree/Strongly Disagree*. While povidone-iodine was widely trusted (92%), 23% erroneously linked **chlorhexidine** to infection risks—a myth requiring correction. Normal saline splits opinions (37% support), suggesting inconsistent wound care protocols. Shared equipment (63%) and recycled supplies (71%) were flagged as risks, highlighting resource limitations.

Table 3: Environmental & Systemic Factors (N=70)

Factor	Support* (%)	Oppose* (%)	Implication
Crowd control efficacy	78	22	Space management critical
Antimicrobial spray need	81	19	Underutilization concern
Sterilization necessity	97	2	Strong adherence

Environmental controls like crowd reduction (78% support) and sterilization (97%) were prioritized, but 19% undervalued antimicrobial sprays, indicating uneven protocol adoption. This mirrors resource-constrained settings where systemic measures compete with practical constraints.

Discussion:

This section synthesizes the major findings, integrating both literature-derived theoretical insights and data-driven empirical observations.

The first objective of the study was to assess the level of knowledge nephrology nurses possess concerning the prevention of CVC-related infections in the hemodialysis unit. The findings reveal an encouraging level of awareness. A significant majority of participants (over 84%) demonstrated a good understanding of infection prevention practices, suggesting strong foundational knowledge. However, 15% fell within the average range (51%–70%), and a smaller group (4%) scored below 50%, indicating gaps that could benefit from targeted educational interventions.

The second objective aimed to evaluate the practical application of infection prevention measures among the nurses. While the overall practices were commendable, the findings underscore the importance of continuous professional development. Notably, 97% of respondents affirmed that they were adequately informed about prevention protocols in their unit. Nevertheless, translating knowledge into consistent, high-quality practice requires regular updates to guidelines and refresher trainings to maintain standards in infection control.

The third objective explored the relationship between nurses' knowledge and their practice in preventing CVC infections. A moderate positive correlation ($r = 0.563$) was observed between age and experience, suggesting that as nurses age, they accumulate valuable clinical experience. Interestingly, the relationship between years of experience and performance was weak and statistically insignificant. This points to a critical insight: experience alone does not guarantee optimal performance—ongoing education and support are essential to maintaining high standards of care.

Conclusion:

The study concludes that while nephrology nurses at MAWTH Kano generally demonstrate a solid grasp of CVC-related infection prevention and sound practical habits, there remains a need for structured, continuous professional development to address knowledge gaps and reinforce evidence-based practices. Encouraging lifelong learning, mentorship, and institutional support for training will ensure sustained quality improvement in patient care delivery.

5.3 Recommendations

In light of the study findings, the following recommendations are proposed:

1. **Broaden the Scope:** Replicate the study with a larger and more diverse sample, extending to other hospitals across Nigeria and potentially other African regions. This will improve the generalizability of findings and support the development of national guidelines.
2. **Continuous Professional Development:** There should be regular updates on best practices, guidelines, and innovations related to CVC infection prevention. Workshops, seminars, and online modules can keep nurses informed and skilled.
3. **Promote Research Among Students:** Nursing students should be encouraged to conduct empirical research and participate in journal clubs, conferences, and academic discussions to foster a culture of inquiry and evidence-based practice.
4. **Integrate CVC Infection Prevention in Training:** Nephrology training curricula should include updated modules on vascular access care, evidence-based infection prevention, and antimicrobial stewardship.

Nursing Implications

Nursing Practice: This study affirms that nursing professionals play a pivotal role at critical points in patients' lives. Strengthening nurse-patient interactions through evidence-based infection prevention practices will enhance the quality of care.

Nursing Research: The findings highlight the need for continuous inquiry. Nurses are encouraged to engage in research to inform and improve clinical practice.

Nursing Education: The knowledge generated from this study contributes to the growing body of nursing literature and serves as a resource for both educators and students in nursing and related fields.

Conflict of interest:

The authors declare that there is no conflict of interest.

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