

Exploring the Practical Implications of Different Microbiology and Infectious Disease

Topics to the Nursing Profession

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Abstract

Microbiology and infectious disease content form a substantial part of pre-service nursing education, yet the degree to which specific topics are perceived by practicing nurses as translating into concrete bedside practice varies, with implications for how nursing curricula and continuing education should be prioritized. This study explored registered nurses' knowledge of, and perceived practical relevance of, eight microbiology and infectious disease topics using a cross-sectional descriptive survey design. A total of 150 registered nurses across medical/surgical, intensive care, maternity/pediatric, and outpatient units at a Nigerian tertiary hospital completed a structured questionnaire comprising a topic-specific knowledge test, five-point Likert ratings of perceived practical relevance, and an open-ended item on specific practical implications for each topic. Knowledge scores were highest for hand hygiene and standard precautions (82.4%) and lowest for antimicrobial resistance (54.2%), while perceived relevance was rated highest for hand hygiene ($M = 4.71$) and lowest for vaccine-preventable diseases ($M = 3.96$). Years of clinical experience correlated significantly with knowledge score ($r = .31, p < .01$), perceived relevance ($r = .46, p < .01$), and self-reported practice change ($r = .40, p < .01$). Thematic analysis of open-ended responses identified concrete, topic-specific practical implications, including cautious antibiotic monitoring linked to antimicrobial resistance

knowledge and earlier escalation of deteriorating patients linked to sepsis recognition training. These findings suggest that infection prevention topics with direct, repeated bedside application are both better retained and perceived as more practically relevant than topics with less immediate clinical visibility, such as antimicrobial resistance and vaccine-preventable disease, pointing to specific areas where nursing curricula and continuing professional development could be strengthened.

microbiology education, infectious disease, nursing practice, infection prevention, clinical relevance, continuing professional development

Exploring the Practical Implications of Different Microbiology and Infectious Disease

Topics to the Nursing Profession

Microbiology and infectious disease content occupies a foundational place in nursing curricula worldwide, underpinning core clinical competencies from hand hygiene and aseptic technique to the recognition and management of sepsis. Yet the relationship between what is taught in pre-service microbiology instruction and what nurses experience as practically applicable at the bedside is not always straightforward: some topics, such as hand hygiene, are reinforced through daily repeated practice and institutional protocol, while others, such as antimicrobial resistance mechanisms or the epidemiology of vaccine-preventable disease, may be encountered more abstractly and less frequently translated into a nurse's day-to-day clinical decision-making (Storr et al., 2017).

This gap matters because healthcare-associated infections and antimicrobial resistance remain substantial burdens in many Nigerian tertiary hospitals, and nurses, as the healthcare workers with the most sustained direct patient contact, occupy a uniquely influential position in

infection prevention and control (Iliyasu et al., 2016; Ogoina et al., 2015). Prior Nigerian studies have documented variable knowledge and practice of standard precautions among hospital workers, with knowledge gaps particularly evident for topics beyond routine hand hygiene, such as the appropriate use of personal protective equipment and the principles underlying antimicrobial stewardship (Iliyasu et al., 2016; Ogoina et al., 2015). However, comparatively few studies have systematically compared multiple microbiology and infectious disease topics side by side within the same sample of practicing nurses, examining not only knowledge but nurses' own perception of each topic's practical relevance and the specific ways they report applying it in practice.

Benner's (1984) From Novice to Expert model offers a relevant lens for this inquiry, proposing that nurses move through stages of clinical skill acquisition in which knowledge becomes progressively more intuitive and practice-embedded with accumulated clinical experience, such that an expert nurse applies foundational knowledge, including microbiology principles, in a more fluid, contextually responsive manner than a novice relying on explicit rules. This model suggests that both the knowledge and perceived relevance of microbiology topics reported by nurses may vary systematically with years of clinical experience, a possibility this study directly examines. Complementing this developmental lens, Knowles's (1984) andragogical principles emphasize that adult learners, including practicing nurses, most readily engage with content they perceive as directly relevant to problems they currently face, suggesting that topics with clear, repeated bedside application may be both better retained and more consistently translated into reported practice change than topics encountered more abstractly.

Purpose of the Study

This study explored registered nurses' knowledge of, and perceived practical relevance of, eight microbiology and infectious disease topics, and examined the relationship between years of clinical experience, knowledge, perceived relevance, and self-reported practice change, in order to identify which topics nurses experience as most and least practically actionable in their day-to-day work.

Method

Research Design and Sample

This study used a cross-sectional descriptive survey design with an embedded open-ended qualitative component. A total of 150 registered nurses were recruited from medical/surgical, intensive care, maternity/pediatric, and outpatient/community units at a Nigerian tertiary hospital, using proportionate stratified random sampling across units to ensure representation across clinical contexts. Demographic and professional characteristics of respondents are presented in Table 1.

Table 1

Demographic and Professional Characteristics of Respondents (N = 150)

Characteristic	Category	n	%
Sex	Female	118	78.7
	Male	32	21.3
Years of clinical experience	< 5 years	46	30.7
	5–10 years	58	38.7
	> 10 years	46	30.7
Unit of practice	Medical/surgical ward	51	34.0

	Intensive care unit	24	16.0
	Maternity/pediatric ward	38	25.3
	Outpatient/community	37	24.7
Highest qualification	RN/RM diploma	72	48.0
	BNSc degree	63	42.0
	Postgraduate qualification	15	10.0

Note. Percentages may not sum to 100 due to rounding.

Instrumentation

A structured, self-administered questionnaire was developed covering eight microbiology and infectious disease topics identified from nursing curricula and infection prevention guidelines as core content areas: hand hygiene and standard precautions, healthcare-associated infections, personal protective equipment and isolation precautions, sterilization and disinfection, pathogen transmission routes, antimicrobial resistance, sepsis recognition and early management, and vaccine-preventable diseases. For each topic, the questionnaire included a short multiple-choice knowledge assessment (yielding a percentage-correct score), a five-point Likert item rating perceived practical relevance to the respondent's own clinical role (1 = not relevant to 5 = highly relevant), a single item asking whether the respondent had changed a specific practice as a result of knowledge on that topic (yes/no), and an open-ended prompt inviting a brief description of the specific practical implication of that topic for their work. The instrument was reviewed by three nursing education specialists for content validity and piloted with 15 nurses not included in the main sample; internal consistency for the relevance rating scale was acceptable ($\alpha = .81$).

Data Analysis

Descriptive statistics summarized knowledge scores and perceived relevance ratings by topic. Pearson correlation coefficients examined relationships among years of clinical experience, mean knowledge score, mean perceived relevance rating, and proportion reporting a specific practice change, at $\alpha = .05$. Open-ended responses were analyzed thematically using a coding framework developed inductively from an initial reading of responses, with two independent coders identifying the specific practical implication described for each topic; divergent codes were resolved through discussion.

Results

Knowledge and Perceived Relevance by Topic

Table 2 presents mean knowledge scores and perceived relevance ratings across the eight topics. Knowledge scores were highest for hand hygiene and standard precautions (82.4%) and personal protective equipment/isolation precautions (74.1%), and lowest for antimicrobial resistance (54.2%) and sepsis recognition (58.7%). Perceived relevance ratings followed a broadly similar but not identical pattern: hand hygiene received the highest relevance rating ($M = 4.71$), followed closely by personal protective equipment ($M = 4.60$) and sepsis recognition ($M = 4.55$), while vaccine-preventable diseases received the lowest relevance rating ($M = 3.96$) despite a mid-range knowledge score, suggesting that knowledge level and perceived practical relevance, while related, are not identical constructs.

Table 2

Knowledge Scores and Perceived Practical Relevance by Microbiology/Infectious Disease Topic

Microbiology/Infectious Disease Topic	Knowledge Score (%)	Perceived Relevance (M, 1–5)
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Hand hygiene and standard precautions	82.4	4.71
Healthcare-associated infections (HAIs)	68.6	4.52
Personal protective equipment/isolation precautions	74.1	4.60
Sterilization and disinfection of equipment	71.3	4.38
Pathogen transmission routes	65.8	4.29
Antimicrobial resistance	54.2	4.44
Sepsis recognition and early management	58.7	4.55
Vaccine-preventable diseases	61.4	3.96

Note. Knowledge score is percentage correct on topic-specific multiple-choice items.

Perceived relevance is mean rating on a 1–5 Likert scale.

Correlates of Knowledge and Relevance

Table 3 presents Pearson correlations among years of clinical experience, mean knowledge score, mean perceived relevance, and self-reported practice change (proportion of topics for which the respondent reported changing a specific practice). Years of experience correlated significantly and positively with knowledge score ($r = .31$, $p < .01$), perceived relevance ($r = .46$, $p < .01$), and reported practice change ($r = .40$, $p < .01$), consistent with Benner's (1984) model of progressive, experience-based clinical skill development. Perceived relevance showed the strongest association with reported practice change ($r = .52$, $p < .01$), stronger than the association between raw knowledge score and practice change ($r = .29$, $p < .01$), suggesting that a nurse's sense of a topic's practical relevance may matter at least as much as factual knowledge in translating microbiology content into actual bedside practice change.

Table 3

Pearson Correlations Among Experience, Knowledge, Perceived Relevance, and Practice Change

Variable	1	2	3	4
1. Years of experience	1.000			
2. Knowledge score	.312**	1.000		
3. Perceived relevance	.458**	.396**	1.000	
4. Reported practice change	.401**	.287**	.522**	1.000

Note. ** $p < .01$. Practice change is the proportion of the eight topics for which the respondent reported changing a specific practice as a result of their knowledge.

Practical Implications Identified

Thematic analysis of open-ended responses identified specific, concrete practical implications nurses associated with several topics, summarized with illustrative responses in Table 4. For hand hygiene, nurses consistently described it as an automatic, repeated behavior performed between every patient contact regardless of workload. For antimicrobial resistance, responses described a shift toward questioning repeat antibiotic orders and monitoring for treatment failure rather than deferring automatically to prescribed regimens. For sterilization and disinfection, nurses described concrete equipment reprocessing checklists applied to shared devices, and for sepsis recognition, several nurses described trusting early clinical deterioration signs to prompt escalation before laboratory confirmation was available.

Table 4

Selected Practical Implications of Microbiology/Infectious Disease Topics Identified by Nurses

Topic	Practical Implication Identified	Illustrative Response
Hand hygiene and standard precautions	Directly reduces bedside transmission of pathogens between patients during routine	"It's the one thing I do between every single patient, no matter how busy the ward is."

	care	
Antimicrobial resistance	Informs cautious antibiotic administration timing and monitoring for treatment failure	"We now question a repeat antibiotic order more than we used to, and flag it to the doctor."
Sterilization and disinfection	Shapes daily equipment reprocessing decisions, especially for shared devices	"Every reusable device that touches more than one patient goes through the same checklist."
Sepsis recognition	Supports earlier escalation of deteriorating patients before results confirm infection	"You learn to trust the early warning signs before the culture even comes back."

Note. Themes derived from open-ended responses via inductive thematic coding by two independent coders.

Discussion

This study found that nurses' knowledge and perceived practical relevance of microbiology and infectious disease topics were highest for hand hygiene and personal protective equipment, topics embedded in daily, repeated bedside routine, and lowest for antimicrobial resistance and vaccine-preventable disease, topics more often encountered through less frequent, more abstract clinical or public health framing. This pattern is consistent with Knowles's (1984) andragogical principle that adult learners engage most readily with content they experience as directly and repeatedly relevant to immediate practice problems, and echoes prior Nigerian findings of comparatively weaker standard precaution and antimicrobial-related knowledge relative to more routinized infection control behaviors (Iliyasu et al., 2016; Ogoina et al., 2015).

The positive association between years of clinical experience and both knowledge and perceived relevance supports Benner's (1984) proposition that clinical expertise, including the practical application of microbiology knowledge, develops progressively with accumulated experience rather than being fully instilled at the point of pre-service education. Notably,

perceived relevance showed a stronger association with self-reported practice change than raw knowledge score did, suggesting that nursing education and continuing professional development efforts aimed at changing bedside practice may benefit from deliberately cultivating a sense of practical relevance, for example through case-based or simulation scenarios grounded in the nurse's own clinical unit, rather than relying on knowledge transmission alone.

The qualitative findings suggest specific, actionable directions for curriculum and in-service training: the comparatively low relevance rating for vaccine-preventable disease content, despite moderate knowledge, may indicate this topic is taught in a manner disconnected from nurses' direct clinical role, an issue that could be addressed by reframing content around the nurse's specific responsibilities in vaccination programs and outbreak response rather than general epidemiological description. Similarly, the gap between antimicrobial resistance's high perceived relevance but comparatively low knowledge score suggests nurses recognize the topic's importance but may benefit from more concrete, practice-embedded antimicrobial stewardship training rather than general microbiological mechanism content.

This study is limited by its cross-sectional design, which cannot establish causal direction between experience, knowledge, and relevance, and by its reliance on self-reported practice change rather than observed behavior, which may be subject to social desirability bias. The study was also conducted at a single tertiary hospital, which may limit generalizability to primary or secondary care settings with different infection control resources and patient populations. Future research should incorporate observed practice measures, extend sampling across multiple facility types, and evaluate whether curriculum interventions designed around the practical-relevance gaps identified here measurably improve bedside infection prevention practice.

Conclusion

Nurses' knowledge and perceived practical relevance of microbiology and infectious disease topics were highest for routinized infection prevention practices such as hand hygiene and lowest for topics with less frequent direct clinical application, such as antimicrobial resistance and vaccine-preventable disease, with perceived relevance more strongly associated with self-reported practice change than knowledge alone. These findings support reframing nursing microbiology education and continuing professional development around topics' concrete bedside application, particularly for antimicrobial resistance and vaccine-related content, to better translate foundational knowledge into consistent nursing practice.

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