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Original article

Knowledge gaps and predictors of early urinary tract infections detection by nurses in the aged population

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Abstract. *Background and aim:* Urinary tract infection (UTI) is a frequent cause of morbidity and mortality in hospitalized elderly patients. Early detection of signs and symptoms by nurses is crucial for timely diagnosis and treatment. This study aimed to verify if nurses detect early signs and symptoms of UTI in the elderly in hospital units and to analyze the correlation between their knowledge and sociodemographic variables. *Methods:* An observational, cross-sectional study with a descriptive design and quantitative approach was conducted in a teaching hospital and a private hospital in northwestern São Paulo. Data were collected from August to November 2019 through individual interviews with 102 nurses using a validated questionnaire. A convenience sampling method was employed. *Results:* The majority of nurses (93.14%) judged having sufficient knowledge in urological diseases. Statistically significant correlations were found between nurses' knowledge and time since graduation ($p = 0.03$), years of experience ($p = 0.02$), work unit ($p = 0.01$), and specialization ($p = 0.04$). Nurses with ten or more years since graduation and five or more years of professional experience demonstrated above-satisfactory knowledge in early UTI identification. Intensive care unit nurses had higher rates of correct answers regarding the concept of elderly according to WHO ($p = 0.037$), diaper use increasing UTI risk ($p < 0.001$), and UTI being more common in females ($p = 0.026$). *Conclusion:* Nurses' ability to detect early signs and symptoms of UTI in the elderly varied, with more experienced nurses performing better. The findings highlight the importance of ongoing professional development and the need for targeted educational interventions, particularly for less experienced nurses. Further national research is needed to explore the impact of nurses' knowledge on patient outcomes and to develop effective strategies for improving UTI prevention and management in elderly patients. (www.actabiomedica.it)

Key words: urinary tract infections, early detection, aged, nursing care, nurses' knowledge, geriatric assessment, early diagnosis, health personnel education, clinical competence

Introduction

Population aging is a current demographic fact and has a direct influence on global public health. In Brazil, this increase is becoming more and more significant (1). The improvement in life expectancy increases the incidence of problems arising from morphophysiological changes inherent to aging, leaving the body more susceptible to the development of diseases (2). Several factors increase their risk, such as physical inactivity, decreased functional capacity, comorbidities, immune decline, and the aging process itself (3,4). In

hospitalized elderly, bacterial infections are important causes of mortality (5). The infection condition may manifest with signs and symptoms atypically, without the presence of fever or other typical symptoms of an infectious process, making early diagnosis in this age group difficult and, consequently, the therapy (4). Among infections in the elderly, there is a high incidence of those related to the urinary tract, generating longer hospital stays, potential complications, increased morbidity and mortality (6). Urinary tract infection (UTI) is responsible for approximately 40% of hospital infections, being a frequent cause of complaint in hospital emergency services. Around 150 million people are diagnosed with this disease per year worldwide (7). Nurses must act by developing systematic nursing care, with health promotion actions, infection prevention measures, with a technical and scientific basis that aim to break the circle of the infectious agent, transmission and host that generate the infection (8). A challenge for improving quality in health is to offer the minimum risk of unnecessary harm associated with care, such as healthcare-associated infections (HAIs) (9). It is up to nurses to have a differentiated, attentive look, observing the specific characteristics presented by the elderly, providing comprehensive care, recognizing their characteristics and specificities (10). The identification of nurses' knowledge and adherence to standard precautions in critical patient units demonstrated that when the topic of hospital infection is discussed, it is essential to remember that its prevention and control must be a constant among all members of the health team, continuously motivating professionals in this process (11). Infections not diagnosed early can lead to a septic condition, originated by the body's systemic inflammatory response associated with the infectious condition (8). Therefore, the knowledge and actions developed by nurses are important for the health of the elderly, with attention to risk factors and early diagnosis of infections. Given the above, the study question was: do nurses in hospital units have knowledge for early detection of UTI in elderly patients? Despite the global relevance of this issue (12), there is a lack of national research on the knowledge of nurses regarding UTI in Brazil. This gap highlights the importance of conducting studies in this context to better understand and address the specific challenges faced by Brazilian healthcare professionals. Therefore, this study aims to verify if nurses detect early the signs and symptoms of urinary tract infection in the elderly in hospital units, and to analyze the correlation between their knowledge and sociodemographic variables such as age, gender, time since graduation, years of professional experience, and area of specialization (13,14).

Materials and Methods

Study design, location, and period

For the study design, the STROBE instrument was used, following the established guidelines of the Equator Network (15), as it is an observational, cross-sectional study, with a descriptive design and quantitative approach. The research was carried out in a teaching hospital and a private hospital in the northwest of São Paulo. Data collection was carried out from August to November 2019, through individual interviews conducted by the researchers.

Population and sample; inclusion and exclusion criteria

The population consisted of 120 nurses. The final sample consisted of 102 participants, 49 from the Intensive Care Unit (ICU), 31 from the Urgency and Emergency Service, 19 from Geriatrics and three whose unit was not identified. There were 75 participants from a teaching hospital and 27 from a private one. Exclusion criteria were those participants who were on vacation and/or any type of medical leave" (n=4). The sampling method used was convenience sampling.

Study protocol

A questionnaire with 15 multiple-choice questions was developed that served as a pilot, based on the literature and the researchers' experience on UTI in the elderly. The questionnaire was submitted to content validation by six nurses who worked in units like those where data would be collected, after individual orientation. The group that validated judged six aspects of the questionnaire and each one admitted graduation in seven levels of quality, ranging from 'unacceptable'

Table 1. Questions and domains of the questionnaire.

Domain	Question
Standard Knowledge	1. When is a person considered elderly in Brazil according to the WHO?
	2. Is fever always present in the elderly with UTI?
	3. Can UTI in the elderly be asymptomatic?
Incidence and Prevention of UTI	4. What are the clinical manifestations of UTI?
	5. What is the incidence of UTI in hospitalized elderly patients?
	6. Does UTI increase mortality in hospitalized elderly patients?
	7. Do costs increase with hospitalized elderly patients with UTI?
	8. What measures can prevent the elderly patient from developing UTI?
	9. Does UTI increase in the elderly aged 80 years or more?
Risk Factors	10. Does diaper use increase the risk of UTI in the elderly?
	11. Is UTI more common in men or women?
	12. Does bladder catheter increase the risk of UTI in the elderly?
	13. How often should the indwelling urinary catheter be changed?
Diagnosis	14. Is it important to collect urine 1 and urine culture in elderly patients admitted to the hospital?
	15. Is it important to perform abdominal ultrasound in cases of UTI in the elderly?

Source: Author.

to 'very good', being approved with 75% in the 'good' degree for each of the aspects proposed in the validation and after, served as a basis for conducting the interviews" (16). The questionnaire was included as a table, divided into different domains (standard knowledge, incidence and prevention of UTI, risk factors, etc.). Below is the Table 1 with the domains and corresponding questions.

It was considered that nurses had knowledge for very satisfactory early detection of signs and symptoms of UTI when the correct answers were above 90%, satisfactory greater than 75%, reasonable above 60% and unsatisfactory when the correct answers were below 60%.

The sociodemographic variables analyzed and related were Unit where they work, age, sex, education, educational institution, time since graduation, specialty, area of practice, experience with elderly patients and professional experience time.

Analysis of results and statistics

For all statistical tests, the significance level of $p \leq 0.050$ was adopted. Correlation analyses were performed using the Komolgorov-Smirnov normality test and the Mann-Whitney statistical test. The correlations were between the first part of the data instrument that characterizes the interviewed population, with the second part that deals with specific questions about UTI in elderly patients. The inferential part of the statistical correlations was analyzed, where the methods of analysis were based on the result of the variable's normality test. The methods chosen to approach the analyses of variation of results between the analyzed groups aimed to verify the relationship between them, where one of the variables is parameterized as dependent and the other as independent, aiming at the analysis of prediction between both. All tables were performed using the Mann-Whitney statistical test. The analysis of correlation between each item of the questionnaire and the proportion of incorrect/correct answers was described, including subgroup analysis. Subgroups were created based on sociodemographic variables such as age, sex, education, time since graduation, specialty, and professional experience. The correlation analysis aimed to identify patterns and significant relationships between the nurses' knowledge and these variables.

Results

The final study population consisted of 102 nurses, predominantly female (86%), aged between 31 and 40 years (46.08%), with a mean age of 32.87 ± 6.14 years. Most participants had specialization (84.31%), graduated from private colleges (58.82%), worked in Intensive Care Units (48.04%), and had 5-10 years since graduation (33.33%). Of the participants, 93.14% reported having sufficient knowledge of urological diseases, 46.08% had five or more years of experience with elderly patients, and 11.76% considered themselves to have some experience. Nurses with ten or more years since graduation and five or more years of professional experience demonstrated above-satisfactory knowledge in the early identification of UTI signs and symptoms in the elderly. Regarding the World Health Organization's definition of elderly in Brazil (60 years or older), a statistically significant correlation was found with the area of practice ($p = 0.037$), as shown in Table 2. Nurses in the intensive care sector had higher rates of correct answers.

Regarding clinical manifestations of UTI in the elderly, 72.55% of participants correctly identified all symptoms, while 27.45% identified only some, demonstrating reasonable knowledge. Knowledge about UTI incidence in hospitalized elderly patients was unsatisfactory, with only 40.20% correctly stating the 15-30% range. Participants demonstrated very satisfactory knowledge in several areas: 98.00% correctly answered that mortality and costs increase for hospitalized elderly patients with UTI, 72.55% recognized that diaper use increases UTI risk in the elderly, and 97.33% knew that UTI is more common in women. A statistically significant correlation ($p < 0.001$) was found between understanding that diaper use increases UTI risk and the work unit, as shown in Table 3. Professionals in the intensive care sector had higher rates of correct answers.

Table 2. Correlation between when a person is considered elderly in Brazil according to WHO and the area of practice. (n=102) São José do Rio Preto, São Paulo, Brazil.

	Wrong		Right		TOTAL	
Information	**n**	**%**	**n**	**%**	**n**	**%**
Intensive Care (p = 0,037)	*23*	*60.53*	*26*	*40.63*	*49*	*48.04*
Ward/Geriatrics	*7*	*18.42*	*12*	*18.75*	*19*	*18.63*
Emergency	*7*	*18.42*	*24*	*37.50*	*31*	*30.39*
Alternative 1 and 2	*0*	*0.00*	*2*	*3.13*	*2*	*1.96*
Alternative 2 and 3	*1*	*2.63*	*0*	*0.00*	*1*	*0.98*
TOTAL	**38**	**100.00**	**64**	**100.00**	**102**	**100.00**

*Mann-Whitney Statistical Test

Table 3. Correlation between diaper use increases the risk of UTI with the work unit (n=102) São José do Rio Preto, São Paulo, Brazil.

	Wrong		Right		Missing		TOTAL	
Information	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Intensive Care (p = 0,001)	*18*	*58.06*	*29*	*41.43*	*1*	*100.00*	*48*	*47.06*
Ward/Geriatrics	*4*	*12.90*	*15*	*21.43*	*0*	*0.00*	*19*	*18.63*
Emergency	*7*	*22.58*	*25*	*35.71*	*0*	*0.00*	*32*	*31.37*
Alternative 1 and 2	*1*	*3.23*	*1*	*1.43*	*0*	*0.00*	*2*	*1.96*
Alternative 2 and 3	*1*	*3.23*	*0*	*0.00*	*0*	*0.00*	*1*	*0.98*
TOTAL	**31**	**100.00**	**70**	**100.00**	**1**	**100.00**	**102**	**100.00**

*Mann-Whitney Statistical Test

Table 4. Correlation of UTI being more common in work unit (n=102) São José do Rio Preto, São Paulo, Brazil.

	Wrong		Right		TOTAL	
Information	**n**	**%**	**n**	**%**	**n**	**%**
Intensive Care (p = 0,026)	*44*	*46.32*	*5*	*71.43*	*49*	*48.04*
Ward/Geriatrics	*18*	*18.95*	*1*	*14.29*	*19*	*18.63*
Emergency	*31*	*32.63*	*0*	*0.00*	*31*	*30.39*
Alternative 1 and 2	*1*	*1.05*	*1*	*14.29*	*2*	*1.96*
Alternative 2 and 3	*1*	*1.05*	*0*	*0.00*	*1*	*0.98*
TOTAL	**95**	**100.00**	**7**	**100.00**	**102**	**100.00**

*Mann-Whitney Statistical Test

Table 5. Correlation if fever is always present in the elderly with UTI with the area of practice (n=102) São José do Rio Preto, São Paulo, Brazil.

	Wrong		Right		TOTAL	
Information	**n**	**%**	**n**	**%**	**n**	**%**
Intensive Care (p = 0,030)	*39*	*47.56*	*10*	*50.00*	*49*	*48.04*
Intensive Care	*16*	*19.51*	*3*	*15.00*	*19*	*18.63*
Emergency	*24*	*29.27*	*7*	*35.00*	*31*	*30.39*
Alternative 1 and 2	*2*	*2.44*	*0*	*0.00*	*2*	*1.96*
Alternative 2 and 3	*1*	*1.22*	*0*	*0.00*	*1*	*0.98*
TOTAL	**82**	**100.00**	**20**	**100.00**	**102**	**100.00**

*Mann-Whitney Statistical Test

The majority of participants (84.31%) correctly recognized that fever is not always present in elderly UTI cases. A significant correlation (p = 0.026) was found between understanding that UTI is more common in females and the work unit, with intensive care nurses showing higher rates of correct answers (Table 4).

When relating the knowledge that fever is not always present in elderly UTI cases to the area of practice, a statistically significant correlation was found (p = 0.030), with most professionals answering correctly (Table 5).

"Other significant findings included: 97.06% of participants correctly identified that urinary catheters increase UTI risk in the elderly; 89.22% recognized increased UTI risk in elderly over 80 years old; and 91.18% understood that UTI in the elderly can be asymptomatic. A statistically significant correlation (p = 0.004) was found between the importance of performing abdominal ultrasound in UTI cases and the age of the professionals, with most nurses answering correctly.

Discussion

The study revealed that nurses' knowledge about diagnosis, prevention, and clinical signs of urinary tract infection (UTI) in the elderly was predominantly unsatisfactory, particularly among those working in intensive care units, emergency departments, and geriatric inpatient units. This finding contrasts with some previous studies (16) but aligns with others that have identified knowledge gaps among nurses regarding UTI in elderly patients (13,17). The demographic profile of participants was consistent with recent studies (16,18,19), showing a prevalence of female professionals aged 31-40 years, who graduated from private institutions within the last ten years, had five or more years of professional experience, worked in intensive care units, and held a lato sensu postgraduate degree.

While most nurses reported having sufficient knowledge to care for elderly patients with urological diseases, the results did not fully support this

self-assessment. This discrepancy between perceived and actual knowledge has been noted in other studies (20–22) and highlights the need for ongoing professional development in this area (23). Regarding the WHO's definition of elderly, most participants demonstrated only reasonable knowledge, consistent with other studies (16,18,24). This finding is concerning given that Brazil has been debating this concept since the late 1990s, with clear administrative and political instruments defining the elderly as individuals aged 60 or over (11,25).

Nurses showed satisfactory knowledge of clinical manifestations of UTI in the elderly. However, their understanding of UTI incidence in hospitalized elderly patients was unsatisfactory. This knowledge gap is significant, considering that UTI is one of the most common hospital-acquired infections, affecting 15% to 30% of hospitalized elderly in Brazil (26,27). Participants demonstrated above-satisfactory knowledge in several areas, including the relationship between UTI and increased mortality and costs, the higher prevalence in women, and the increased risk associated with diaper use and urinary catheters. These findings align with current literatura (28–33) and suggest that nurses are well-informed about certain aspects of UTI in the elderly. However, knowledge about indwelling urinary catheter (IUC) change frequency was unsatisfactory. Given that IUC use is associated with 80% of hospital-acquired UTIs (30–33), this knowledge gap could have significant clinical implications. Nurses play a crucial role in assessing the need for continued catheter use and implementing safe care practices (33), highlighting the importance of addressing this knowledge deficit. The study found statistically significant correlations between nurses' knowledge and various factors. Specifically, nurses' knowledge about UTI correlated significantly with time since graduation ($p = 0.03$), years of experience ($p = 0.02$), work unit ($p = 0.01$), and specialization ($p = 0.04$). These findings suggest that nurses with more experience and specialized training tend to have a deeper understanding of UTI in the elderly population. Nurses working in Intensive Care Units consistently demonstrated higher rates of correct answers, indicating a potential area for knowledge sharing across different hospital units. These results have important practical implications. They suggest a need for targeted educational interventions, particularly for less experienced nurses and those working outside of intensive care settings. Furthermore, the identified knowledge gaps, such as those related to IUC management, should inform the development of continuing education programs and hospital protocols. While this study provides valuable insights into nurses' knowledge about UTI in the elderly, it also highlights the need for more comprehensive national research in this area. Future studies could explore the impact of nurses' knowledge on patient outcomes and investigate effective strategies for improving knowledge and practice in UTI prevention and management among elderly patients.

Conclusion

This study revealed that nurses' knowledge about urinary tract infection (UTI) in the elderly varied across different aspects of the condition. Notably, nurses with more than ten years since graduation and those with five or more years of professional experience demonstrated better ability to detect early signs and symptoms of UTI in elderly patients in hospital units. Significant correlations were found between nurses' knowledge and several sociodemographic variables, including time since graduation, years of experience, work unit, and specialization.

While some areas of knowledge were satisfactory, such as understanding the increased risk associated with urinary catheters and the higher prevalence in women, other areas showed concerning gaps. These included knowledge about UTI incidence in hospitalized elderly patients and the frequency of indwelling urinary catheter changes. The importance of periodic assessment of professionals' knowledge is emphasized, and the nurse, as the team leader, is a potential educator, generator and multiplier of knowledge and, thus, must be updated and trained to conduct training with their team.

Based on these findings, we recommend the implementation of targeted educational interventions, particularly for less experienced nurses and those

working outside of intensive care settings. Future research should focus on evaluating the effectiveness of such interventions and exploring the impact of nurses' knowledge on patient outcomes. Additionally, studies investigating strategies to bridge the gap between perceived and actual knowledge among nurses caring for elderly patients with UTI are warranted. We aim to provide excellent and quality care, with greater efficiency, autonomy and scientificity to the professional, an evidence-based Nursing care. The effective and essential work of Nursing will only become recognized when practiced based on the continuous development of the professional, with the help of continuing education based on study and research. To this end, healthcare institutions should prioritize ongoing professional development programs focused on geriatric care and UTI management, ensuring that nurses are equipped with the most up-to-date knowledge and skills to provide optimal care for elderly patients at risk of UTI.

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