

Urinary Tract Infections, Catheterization, and Nurses' Knowledge: A Scoping Review

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Article Details

ABSTRACT

Keywords: Urinary Tract Infections, Catheterization, Nurses' Knowledge

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Background: One crucial nursing intervention that improves the comfort of people with chronic urinary issues is Foleys Catheterization Objective: The aim of this scoping review was to systematically map and compile the existing body of research on UTIs, catheterization, and nurses' knowledge. Methods: An in-depth literature review was conducted thoroughly between April and September, 2024. The five-step framework established by Arksey and O'Malley was applied for this scoping review. Cochrane Library, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Academic as well as SCOPUS, the National Library of Medicine (PubMed), Premier (via the EBSCO platform), Web of Science, and the Online Knowledge Library. Results: After screening for full-text accessed 15 studies were ultimately selected for this scoping review based on inclusion exclusion criteria for this study. Conclusion: To reduce the risk of CA-UTIs and enhance the quality of life for patients with indwelling urinary catheters, more thorough trials of educational strategies are required for nurses. Recommendation: Future researches are required to be conducted on larger scale to find the gap between practice and theories, challenges and barriers, nurses encounter during the implementation of best practices.

BACKGROUND

One crucial nursing intervention that improves the comfort of people with chronic urinary issues is Foley catheterization¹. However, if done incorrectly, it could result in the development of certain consequences (pain, trauma, urinary tract infections linked to catheter use, etc.)². Despite the fact that many nursing programs teach urine catheterization in the first year, students may not have had the chance to maintain or reach the desired level of competency in urinary catheterization knowledge and abilities in recent years³. According to clinical study, nursing graduates struggle to follow the procedures involved in urinary catheterization, Undergraduate students may find it difficult to acquire clinical skills that call for rigorous adherence to aseptic standards. However, it is an essential ability to lower iatrogenic consequences. In order to prevent procedural sepsis and lower the risk of catheter-acquired urinary tract infections (CAUTI), the intimate process of female catheterization necessitates the coordination of complex psychomotor abilities. Given the high incidence of catheter-associated bacteriuria linked to procedural contamination, students' capacity to hone their clinical skills related to this operation is crucial⁴. 40% of all healthcare-related infections are thought to be caused by bacteriuria linked to indwelling urinary catheter (IDC) insertion. This has serious consequences for patients' morbidity and mortality as well as higher healthcare expenses due to prolonged hospital stay which have been shown to be double those of patients who do not get a CAUTI⁵. Urinary catheters (UCs) are frequently used acute care devices that can result in noninfectious complications or catheter-associated UTIs. Since nurses and doctors typically share responsibilities for IUC, a shared mental model between the two professional groups is necessary for an effective decrease in catheter use⁶. Renal failure and advanced age are significantly correlated, which results in older adults' reduced physical and cognitive capacities and highlights the urgent need for integrated care measures⁷. Urinary catheterization significantly increases urinary problems, according to the research therefore the vital need for medical professionals to thoroughly assess if a catheterization is necessary, try to reduce its length whenever possible, and closely follow established procedures in order to reduce problems⁸. The perfect surface for bacterial colonization and biofilm formation is provided by the catheter, which can lead to serious problems and a persistent bacterial infection. In order to prevent bacterial infections from colonizing catheters, great efforts have been undertaken to create catheters with antimicrobial and anti-fouling qualities. In this sense, it has been shown that altering catheters by surface functionalization, impregnation, mixing, or coating with antibiotics, bioactive substances, or Nano formulations can effectively reduce the formation of biofilms⁹. Antimicrobial-resistant bacteria make treatment difficult, and traditional approaches, such administering antibiotics to prevent such infections, typically have short-term impact¹⁰.

Research on health workers' knowledge, attitudes, and practices about CAUTI prevention—particularly among nurses—is essential to reducing the incidence of CAUTI. Nurses are regarded as the primary healthcare provider since they are responsible for catheter insertion and management¹¹. To reduce the risk of infection, this entails making sure that catheterization is only done when it is absolutely required, utilizing sterile procedures during insertion, and keeping the catheter site clean and well-maintained. Nurses who receive regular training and education are guaranteed to remain current on best practices and be able to implement them successfully in clinical settings. As a crucial preventative measure against CAUTIs, nurses can participate in patient education in addition to procedural protections¹². Even while system-wide nurse education is a crucial intervention for enhancing UC treatment

for complex patients, it is insufficient on its own to lower this population's risk of infection and iatrogenic consequences. Therefore, a multifaceted strategy is needed to guarantee that only skilled, committed individuals successfully implant UCs in patients with complicated circumstances¹³. A Study in Pakistan indicated that 40% of nurses practiced poorly and 60% lacked sufficient expertise. There was a lack of knowledge on the proper use of procedures including wearing gloves, washing your hands before handling a catheter, and leaving the catheter in its bag. Consequently, an educational module on the subject is necessary in order to improve the staff nurses' comprehension and application of catheter care¹⁴. The aim of this scoping review was to identify, integrate, and analyze the evidence that indicating the nurses' understanding of urinary catheterization.

OBJECTIVE OF THE REVIEW

The primary aim of this scoping review was to systematically map and compile the existing body of research on UTIs, catheterization, and nurses' knowledge concerning both Negative and Positive outcomes. This review specifically searched to:

1. Identify and classify the different types of UTIs resulting from catheterization.
2. Explore the broad range of studies related to UTIs associated with catheterization and nurses' understanding of the procedure.
3. Evaluate the limitations and methodological quality of previous research.
4. Assess how effectively nurses' knowledge of catheterization can mitigate the occurrence of UTIs.
5. Identify the areas and gaps for future research in this field.

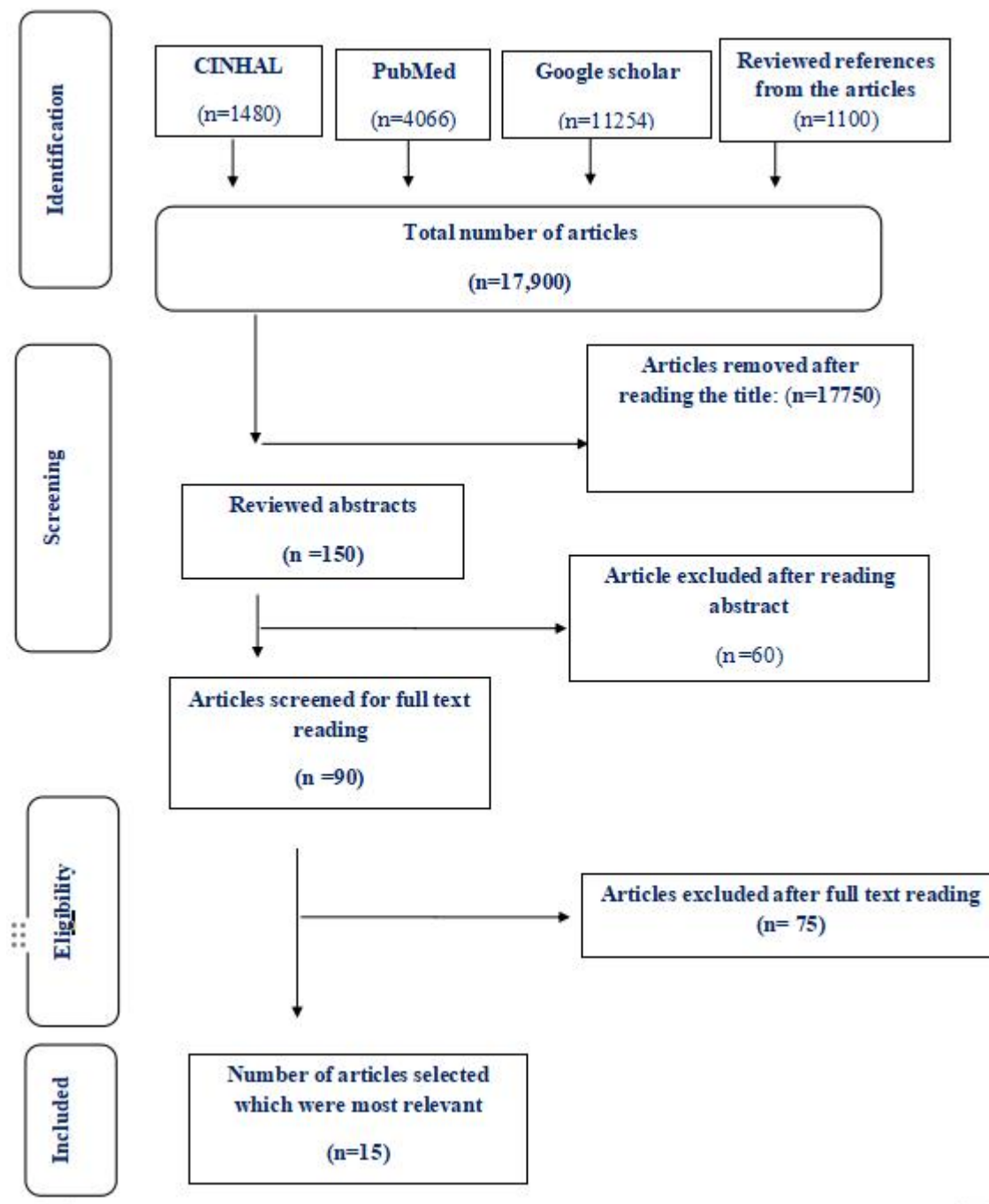
METHODS

This research utilized a scoping review methodology. An in-depth literature review was conducted thoroughly between April and September 2024. The five-step framework established by Arksey and O'Malley was applied for this scoping review. (i) Identifying the research question (ii) Finding relevant research (iii) Choosing the study (iv) Charting the data (v) Compiling, analyzing, and publishing the findings. To guarantee comprehensive coverage of the literature, each phase of the sequential process was carried out multiple times. The study topic was developed using the PICO framework, which stands for patient or issue, intervention or exposure, comparison, and control. This review asks about the current state of UTIs, nurses' knowledge and catheterization, and how appropriate procedure lowers UTI cases.

SEARCH STRATEGY

The databases used for the search method, Cochrane Library, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and Academic. Look up SCOPUS, the National Library of Medicine (PubMed), Premier (via the EBSCO platform), Web of Science, Google scholar and the Online Knowledge Library (b-on). The following keywords were identified UTIs, urinary catheterization, patient, and nurse's knowledge of procedure. Boolean operator were used along with description for search, UTIs, CATHETRIZATION, NURSES KNOWLEDGE, AND, OR for composing the search principle in the search database.

FIGURE I: PRISMA MODEL SHOWING THE SELECTION OF ARTICLES FOR REVIEW PROCESS, RESEARCH THAT DID NOT MEET THE INCLUSION CRITERIA WERE ELIMINATED



INCLUSION EXCLUSION CRITERIA

Article published in English language, related to UTIs, catheterization and nurses knowledge

published between 2014 and 2024 and available in full-text were included in the scoping review. Article older the 2014, thesis, dissertation, editorials opinion or news articles, studies that were not relevant to the outcomes and research question. Case and piloting studies, articles published outside the specified time frame were excluded from the scoping review.

DATA EXTRACTION AND ANALYSIS

In order to find various catheterization types and associated UTIs, as well as nursing practice and details regarding their types, application, and outcomes, the literature was explored. Article published in English language, related to UTIs, catheterization and nurses knowledge published between 2014 and 2024 and available in full-text were included in the scoping review. Article older the 2014, thesis, dissertation, editorials opinion or news articles, studies that were not relevant to the outcomes and research question. Case and piloting studies, articles published outside the specified time frame were excluded from the scoping review.

To achieved the study objective special attention were given to the studies that have been explored the catheter related UTIs and nurses knowledge and procedure skills that have negatively or positively affect the patients' health and occurrence of UTIs. Most study done on catheter associated UTIs ,many research evaluated nurses knowledge of catheterization, few study evaluated the importance of nurses skills knowledge related to catheterization , some studies talked about the effects of poor procedural skills and its outcomes on patients health e.g. increased hospital stay and ill general health. However only those articles were included focused on urinary catheterization associated UTIs and importance of nurses' procedural knowledge while articles focused on scholarly activities were excluded.

The first author searched database for the data extraction and screened independently title abstract of all publications for the inclusion of studies. Which were checked by the second author and confirmed the extracted results. To remove any discrepancy the authors cross checked the selected studies and articles available full-text but excluded the reasons for exclusion were recorded.

For data charting, an excel sheet was designed to chart the data taken from every study including author, year of publication and place of publication and its findings. The excel sheet smoothed the data synthesis. The first author reviewed all the selected articles for study for final review. For data synthesis content analysis were done to recognize all the content relevant to the UTIs, catheter associated UTIs and nurses knowledge.

RESULTS

The initial searched were done total 17,900 studies were retrieved, out of which 150 studies meet the inclusion criteria of the review, 17750 studies were excluded during the title and abstract screening because this research were not relevant to this review and out of the inclusion criteria.90, duplicate studies were removed. After screening for full-text accessed 15 studies were ultimately selected for this scoping review based on inclusion exclusion criteria for this study. (See Figure 1 PRISMA diagram and Table 1, list of studies included in this review).

URINARY TRACT INFECTIONS (UTIS) ASSOCIATED WITH CATHETERIZATION

One of the most frequent diseases that patients in healthcare institutions get is a urinary tract infection linked to the use of an indwelling urine catheter¹⁵. New substitutes for conventional antibiotics are being researched. To stop catheter and bladder adherence, they contain inhibitors that target bacterial pathogenic pathways such sticky pilus assembly¹⁶. Up to 40% of all hospital infections in the United States are urinary tract infections, making them one of the most prevalent infections linked to healthcare¹⁷. There was a slight correlation between

catheter blockage and urinary tract infections. The following issues were mentioned at least once by each individual during the course of the year: urinary tract infection linked to catheter use 57%¹⁸. All catheter brands and types are susceptible to encrustation, biofilm formation, and CAUTIs; existing preventative measures may just slow down the process rather than address the underlying issue¹⁹.

NURSES' KNOWLEDGE AND PRACTICE

To enhance outcomes for patients with long-term indwelling urinary catheters, it is crucial to up skills nurses and boost their confidence in their ability to provide patient-centered catheter care practices. But in order to organize and carry out focused educational activities that are tailored to the learning needs, nurses who directly care for patients must be actively involved²⁰. Knowledge deficit related to urinary catheterization practice can cause UTIs. There is a great need for increasing the use of evidence based practice and organizing the post registration educational training²¹. The care of indwelling urinary catheters is a shared obligation and a strong inter professional domain⁶. Many staff members have learnt catheter procedures in their early careers, there is no requirement for a formal review of skills. This may have played a role in the continued performance of some antiquated and historical tasks²².

BEST PRACTICES FOR CATHETER CARE

Urinary catheter securement is proven to be improved and complemented by the use of a specially made securement device. When it came to applying and maintaining urinary catheter securement, nurses demonstrated a higher level of expertise and knowledge²³. Many catheter coatings and physical modifications have been created in an effort to stop the formation of biofilms, CA-bacteriuria, and CA-UTIs²⁴. CA-UTIs can be avoided by using indicators of diagnostic precision and contamination, such as the percentages of specimens with periurethral, perianal, epidermal, or vaginal flora²⁵. In today's clinical practice, a thorough review of the patient's urologic history and comorbidities is essential, as is a risk assessment for multidrug-resistant organisms (MDROs) ²⁶.

CHALLENGES AND FUTURE DIRECTIONS

Given the substantial and competitive global urinary catheter market, especially for indwelling devices, indicates that the task is challenging. Innovation should keep catheter users at the forefront, and any developments that could alter clinical practice should take into account not only physics and engineering but also biology, psychology, and economics²⁷. Although design modifications are valid alternatives for advancement, they only indirectly prevent UTIs. Although changes could be beneficial, they could also cause other issues. Health care professional educational level can reduce UTIs and therefore to be given top priority²⁸. Numerous modalities offer benefits over traditional approaches and are clinically useful in the field of urology, particularly in the treatment of urinary tract infections (UTIs) ²⁹. Health care workers especially nurses mostly involved in direct patient care, their vigilance and knowledge are significant in preventing catheter associated UTI. However, the frequency of workplace violence against female nurses makes it extremely difficult to maintain regular and consistent infection control³⁰.

TABLE NO 1: DETAILS OF RESEARCH STUDIES INCLUDED IN SCOPING REVIEW

S. No.	Author (Year) and Place	Findings
01.	Lindsay E Nicolle (2014), Canada	CA-UTI is an important device-associated health care acquired infection.
02.	Werneburg (2022), USA	Antibiotic resistance rates are shockingly high, and CAUTI continues to be a major healthcare burden.
03.	Menegueti (2019), USA	Up to 40% of all hospital infections in the United States are urinary tract infections
04	Wilde (2017), USA	Urinary tract infection linked to catheter use 57%.
05	Declan Devine (2018), Ireland	Urine components, ions, and minerals are deposited onto the catheter's surface to create an organic conditioning coating that prepares it for bacterial attachment.
06	Joby Alex (2022), Australia	In order to organize and carry out focused educational activities that are tailored to learning needs, nurses who directly care for patients must be actively involved.
07	J Blanco (2021), Brazil	Knowledge deficit related to urinary catheterization practice can cause UTIs.
08	Niederhauser (2020), Switzerland	The care of indwelling urinary catheters is a shared obligation and a strong inter professional domain.
09	Holroyd (2019), UK	Revision of nurses skills in important to prevent UTIs.
10	Shum et al., (2017), Singapore	Urinary catheter securement is proven to be improved and complemented by the use of a specially made securement device
11	Campeau et al., (2020), Canada	Numerous catheter coatings and physical alterations have been developed to prevent the development of CA-UTIs, CA-bacteriuria, and biofilms.
12	Larocco Mark et al., (2015), USA.	CA-UTIs can be avoided by using indicators of diagnostic precision and contamination, such as the percentages of specimens with periurethral, perianal, epidermal, or vaginal flora.
13	Murphy (2019), UK	Innovation required not only biological, physical but engineering like short length catheter to prevent UTIs.
14	Mittal et al., (2018), USA.	Many modalities find clinical practicality in the field of urology, specifically in the treatment of urinary tract infections (UTIs) and offer advantages over conventional methods.
15	Rando et al., (2022), Australia	A careful assessment of the patient's comorbidity and urologic history, along with a risk evaluation for MDROs is crucial in the current clinical practice.

CONCLUSION

Nurses are not receiving enough advance information or continuing education on urinary catheters. Fluid intake, bowel control, hygiene and self-monitoring/management, and sterilization should all be central to educational programs. To reduce the risk of CA-UTIs and enhance the quality of life for patients with indwelling urinary catheters, more thorough trials

of educational strategies are required for nurses.

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