

Prevention of Catheter-Associated Urinary Tract Infections: Literature Review

Cindy Ho

Lakeview College of Nursing

Dr. Ariel Wright

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Urinary catheterization is one of the most common procedures performed in hospitals and is associated with a high risk for catheter-associated urinary tract infections (Teshager et al., 2022). The prevention of CAUTIs has high success rates, and this literature review aims to analyze quantitative data to understand best practices for preventing CAUTIs. Literature reviews enhance the known characteristics of a study by adding credence to the importance of a topic. Literature reviews can identify a gap in knowledge and guide the development of a research plan (Houser, 2023). The three studies reviewed in this paper analyze the multifactorial measures in CAUTI prevention, educational programs, and daily checklists for maintenance of indwelling urinary catheters and assess nurses' knowledge, practice, and associated factors towards preventing CAUTIs. The methods utilized were quantitative research and subsequent data analysis using mathematical statistics, a quasi-experimental design, and a cross-sectional study.

Aspects of Prevention of Urinary Tract Infections Associated with Urinary Bladder Catheterisation and Their Implementation in Nursing Practice

Catheter-associated urinary tract infections (CAUTIs) are among the most common healthcare-acquired infections (HAIs). With the high success rate in preventing CAUTIs, Krocová and Prokešová (2022) highlight the importance of high-quality and safe nursing care in their review of nursing protocols in 34 hospitals in the Czech Republic. The Czech hospitals which granted the author's research access between March 2020 and December 2020 consisted of university hospitals (26.9%), regional hospitals (33.9%), municipal (15.1%), private hospitals (18/8%), and others (5.4%). Krocová & Prokešová (2022) performed quantitative research

looking into indications for catheterization, nursing education, increasing the quality of care and care quality monitoring, risk management, support of IT technologies in the process, documentation of the procedure, consumables and aids, and the team of experts. These factors showed statistical significance in their effects on preventing CAUTIs (Krocová & Prokešová, 2022). Krocová and Prokešová (2022) analyzed relationships using the chi-square test of goodness of fit- χ^2 (Pearson chi-Square), with the strengths of the relationships measured on three levels of significance: $\alpha = 0.05$, 0.01, and 0.001 (Krocová & Prokešová, 2022).

Key Points

Krocová and Prokešová (2022) conducted their study using questionnaires to collect data. The questionnaires were modified to enable data to be collected online and add questions concerned with identifying characteristics related to the nurses' position, type of workplace, and hospital. Results for competence to assess indications for catheterization showed statistical significance ($p \leq 0.001$) for nurses who believe they can voice their opinion or are competent to evaluate the indication for urinary bladder catheterization and have their opinion respected by the physician (Krocová & Prokešová, 2022). Statistical significance exists between the support of education by executive workers and the possibility of taking part in CAU education during working hours ($p < 0.001$). Twenty percent of non-surgical nurses reported that the workplace provides education as entry training, compared to 23.1% of nurses in surgical workplaces (Krocová & Prokešová, 2022). Approximately 38.5% of nurses from surgical and non-surgical workplaces received periodic education activities performed regularly (Krocová & Prokešová, 2022).

Krocová and Prokešová (2022) found that in terms of increasing the quality of care and care quality monitoring, there was statistical significance between regular audits of the

prevention of CAUTIs and the implementation of a standard of prevention ($p < 0.001$). IT interventions were statistically significant ($p < 0.001$); the interventions consisted of a system of reminders of the indication of catheterization as part of electronic documentation (Krocová & Prokešová, 2022). There was also statistical significance observed between the documentation of the procedure regarding record keeping of hygienic care, date of catheterization, and size of the catheter used at internal-medicine-type wards compared to other workplaces ($p < 0.05$). The research also showed statistical significance between workplace type and the possibility of selecting from recommended catheter sizes ($p = <0.05$). Internal medicine wards again demonstrated a greater selection choice (Krocová & Prokešová, 2022). Lastly, the research by Krocová and Prokešová (2022) determined that workplaces with a team of experts for infection prevention experts were more likely to conduct regular audits for the prevention of CAUTIs ($p \leq 0.001$).

Assumptions

Krocová and Prokešová (2022) assumed several relationships between clinical practice and the prevention of catheter-associated urinary tract infections. Due to the high success rates in prevention of CAUTIs, the authors research was to determine whether hospitals providing acute inpatient care in the Czech Republic have implemented CAUTI prevention measures. The authors assume the prevention of CAUTIs involve multifactorial measures. The prevention measures researched by Krocová and Prokešová (2022) include the relevancy of indication of catheterization, education on prevention of CAUTIs in the workplace, increasing the quality of care and care quality monitoring, risk management, support of IT technologies, procedure documentation, consumables and aids, and a team of experts.

Deficit/Conclusion

The article implies that the prevention of CAUTI involves multifactorial measures, with nurses playing an essential role in care quality management and introducing preventative measures and their checks (Krocová & Prokešová, 2022). The research conducted by Krocová and Prokešová (2022) found that unified documentation as part of the clinical information system at the healthcare facility, along with the function of reminders to re-evaluate the indication of catheterization, is a benefit in the prevention of CAUTIs. The research also showed that regular audits in the prevention of CAUTI are performed for urinary bladder catheterization if the workplace implements a standard procedure. Standards are further regarded as an instrument to improve the quality of care; related to that, it is the function of audits to provide feedback to quality managers about the efficacy of their nursing care management (Krocová & Prokešová, 2022). An area of potential improvement based on the research was maintaining electronic documentation as part of the clinical information system (Krocová & Prokešová, 2022).

Long-term prevention of catheter-associated urinary tract infections among critically ill patients through the implementation of an educational program and a daily checklist for maintenance of indwelling urinary catheters

In a twelve-year study between January 1, 2005, to December 31, 2016, Meneguetti et al., 2019 conducted a quasi-experimental study on the rates of urinary catheter use and incidence density of catheter-associated urinary tract infections. The study was performed in a general intensive care unit of a tertiary-care hospital in Southeastern Brazil. The study used Centers for Disease Control and Prevention (CDC) criteria for CAUTI; at least one of the following signs or

symptoms are present: fever greater than 38°C; suprapubic tenderness; costovertebral tenderness, and a positive urine culture of greater than 10⁵ colony-forming units (CFU)/mL and with no greater than two species of microorganisms (Meneguetti et al., 2019). There were four distinct phases in the intervention protocol. Interventions included biannual training, a denominated checklist plus biannual training, initial training for newly-hired personnel and checklist, and a baseline phase corresponding to the status quo before protocol implementation (Meneguetti et al., 2019). The purpose of the study was to evaluate the effects of different protocols for indwelling urinary catheter indications among critical patients and the incidence of CAUTI (Meneguetti et al., 2019).

Key Points

Two outcome measures are presented for each implementation due to a period of adaptation to each protocol implementation, followed by the stabilization of the effect of the protocol (Meneguetti et al., 2019). The values presented are for the entire period and for the last 6 months, when it would be expected that the full effect of the protocol in the phase has been achieved.

The baseline phase was conducted between 2005-2006 and corresponded to the clinical team CAUTI prevention measures prior to protocol implementation. The second phase protocol utilized biannual training between 2007-2010 with training every 6 months based on CDC guidelines. The second phase training topics addressed criteria for the indication of the use of indwelling urinary catheters consisting of patients with medical necessities such as urinary retention, bladder obstruction or coagulation problems that contraindicate intermittent catheterization, or have undergone a urologic procedure (Meneguetti et al., 2019). The second phase training included aseptic techniques as well as measures for CAUTI prevention.

The third phase protocol utilized a checklist in addition to the biannual training and was conducted between 2011-2014. In the third phase, a daily checklist was utilized to evaluate the indications and/or maintenance of any indwelling catheter that was added. The third phase protocol required clinical staff to review criteria for necessity of the catheter daily as well as a physician and a nurse on the Infection Control Service review the clinical staff decision three times per week. The fourth phase protocol utilized the daily checklist and substituted the biannual training with mandatory initial training to newly-hired personnel. The substitution of the biannual training allowed the researchers to see if the removal was a detrimental change to the rates of CAUTI.

Assumptions

Meneguetti et al. (2019) assume that healthcare workers (HCWs) training and implementing a daily checklist for reviewing the indication of indwelling urinary catheters reduce the rates of CAUTI in the general intensive care unit. The mean acute physiology and chronic health evaluation II (APACHE II) tool measure the disease severity of the types of patients on the unit. The mean APACHE II score was similar in all 4 phases of the study and did not change significantly over the study period; therefore, the authors assume the reductions in CAUTIs are unlikely due to the types of patients and characteristics of the unit but rather, the implementation of the protocols (Meneguetti et al., 2019).

Deficit/Conclusion

The number of catheter days per month decreased along with the phases, from a mean of 169 catheter days in the baseline to 102 days in the last phase (Meneguetti et al., 2019). Based on data collection, the second, third, and fourth phase interventions positively impacted the CAUTI

mean incidence rates. There is a reduction in CAUTI mean incidence rate when comparing the entire phase with the last six months of intervention, in which the authors expected the full effect of the protocols. The baseline measurements reduced from 14.9 episodes per 1000 catheter days to 11.1 episodes per 1000 catheter days, the second phase interventions reduced from 7.3 to 6.1, the third phase intervention reduced from 3.8 to 2.5, and the fourth phase intervention reduced from 1.1 to 0.0 (Meneguetti et al., 2019). Failure to accept this line of reasoning may increase CAUTIs in the general intensive care unit.

Knowledge, practice and associated factors of nurses towards prevention of catheter-associated urinary tract infection in intensive care unit of public hospitals administered by federal government in Addis Ababa, Ethiopia: A cross-sectional institutional-based study

In a cross-sectional study conducted from March 1 to April 15, 2021, the authors collected data from nurses in the Intensive Care Unit (ICU) of public hospitals in Addis Ababa, Ethiopia, to analyze nursing practices. The data was collected using pretested self-administered semi-structured questionnaires that were reviewed and checked for completeness, accuracy, and consistency by data collectors daily (Teshager et al., 2022). As the primary healthcare providers responsible for inserting and maintaining urinary catheters, as well as the production of desired outcomes, this study aimed to assess knowledge, practice, and associated factors towards the prevention of CAUTIs among the nurses working in intensive care units at public hospitals in Addis Ababa, Ethiopia. The evidence from this study indicates that factors such as the availability of resources and the presence of guidelines in the health facility positively impact the knowledge and practice of nurses toward the prevention of CAUTI (Teshager et al., 2022).

Key Points

A total of 184 nurses from four public hospitals in Addis Ababa, Ethiopia, participated in the study. The data was analyzed using Statistical Package for Social Science (SPSS) with the Pearson chi-square (X^2) and Fischer exact tests to test for the significance of association between the independent and outcome variables. This study's significance level was considered at a p-value < 0.05 (Teshager et al., 2022). The findings of this study show that nearly two-thirds (63.04%) of the study participants had poor knowledge, and only 36.96% of nurses had good knowledge about preventing CAUTIs. The majority (71.7%) correctly answered that urinary catheter insertion requires an aseptic technique with sterile equipment. Two-thirds knew the appropriate indications for indwelling catheterizations and another two-thirds knew CDC guidelines for preventing CAUTIs, which advise catheterization removal within 24 hours in postoperative patients (Teshager et al., 2022).

Pearson chi-square (X^2) and Fischer exact tests found a statistically significant association between the nurses' knowledge of CAUTI prevention ($p = 0.031$). There was no statistical association between professional work experiences and the nurses' practice in CAUTI prevention, with a p-value of 0.700, as well as no association between nurses' knowledge and practice towards CAUTI prevention, with a p-value of 0.450 (Teshager et al., 2022).

Assumptions

The assumption made by Teshager et al. (2022) was that factors such as age, amount of time as a practicing nurse, level of education, and current working department impacted the CAUTI rates. Other factors were whether facilities provided guidelines or protocols for proper insertion of Foley catheters, if the nurses received job training on catheterization, if the facilities

provided enough supplies for catheterization, or if the facilities provided hand washing stations in the work areas. None of the variables demonstrated statistical significance in preventing CAUTIs in the ICU.

Deficit/Conclusion

The study's results demonstrate a statistically significant association between professional work experience and the nurses' level of knowledge, with a p-value of 0.031. Therefore, the author's reasoning is accepted (Teshager et al., 2022). The authors recommend increasing the knowledge of nursing staff through appropriate educational programs and training regarding the prevention of CAUTI and the indications for catheterization. If nursing fails to accept this line of reasoning, there will be no improvement in the incident rates of CAUTIs in the ICUs of hospitals in Addis Ababa, Ethiopia.

Conclusion

Catheter-associated urinary tract infections are the most common infection related to the provision of healthcare associated infections (Krocová & Prokešová, 2022). The literature reviews highlight the importance of education as a cornerstone in the prevention of CAUTIs. Krocová & Prokešová (2022) found statistical significance where regular audits on the urinary catheterization procedure were performed, those workplaces were more likely to have implemented a standard procedure. Standards are regarded to be an instrument to improve quality of care of the patients (Krocová & Prokešová, 2022). As part of nursing practice, nurses should look into indications for catheterization, always complete documentation of the procedure, follow standards for the procedure of urinary bladder catheterization (Krocová & Prokešová (2022). These factors showed statistical significance in their effects on preventing

CAUTIs The study by Meneguetti et al. (2019) demonstrates the effectiveness of implementing educational programs and daily checklists for maintenance of indwelling urinary catheters in the prevention of CAUTIs.

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