CATHETER-ASSOCIATED URINARY TRACT INFECTION (CAUTI) IN ICU PATIENTS

Mohammed Saber Alqarni

University of Melbourne, Sabt alalya hospital, Registered Nurse-Emergency Department and ICU,
Bisha region, Ministry of Health, Saudi Arabia

Correspondence:
Mohammed Saber Alqarni, RN, MSN.
Email: meydo.s@hotmail.com

Abstract

Background: Catheter-associated urinary tract infections (CAUTIs) are a significant problem in hospitals despite considerable spending on education and prevention. A catheter-associated urinary tract infection emerges when germs enter the urinary tract via a urinary catheter, leading to infection. CAUTIs have been linked with increased mortality, morbidity, healthcare costs in intensive care units. This paper reviews and discusses the most common factors contributing to CAUTI in patients in ICUs and presents the methods and strategies used to reduce ICU-acquired UTIs.

Aim:
To determine how the intensive care unit (ICU) nurses implement infection control to reduce the cases of catheter-associated urinary tract infection (CAUTI) and to find the gaps in the implementation process.

Methods: Using Plan-Do-Study-Act (PDSA) quality improvement methodology, a multidisciplinary team was created to identify ways to reduce Catheter-associated urinary tract infections in ICU. The team reviewed current procedures, protocols, and indications related to catheter insertion. There was a comparison between pre-intervention and after-intervention adherence to catheter bundles for Foley insertion best practice competency and urinary catheter best practice algorithm.

Conclusion: UTI's prevalence within the healthcare settings requires sustained and quality interventions that can be achieved through a quality improvement project. Quality improvement is a structured framework regarding the consistent evaluation of effective health care efforts and practices. It also employs the latest evidence-based practices and requires the collaborative effort and involvement of an entire health care organization. A quality improvement project can help the overall health of the population, reduce UTI associated medical expenditures and in turn diminish the UTI prevalence by utilizing the latest successful practices and methods in scientific literature reviewed in this project. However, to see significant changes, it will take time, continuous education and effort amongst healthcare organizations.

Key words: Catheter-Associated Urinary Tract Infection (CAUTI) ; ICU patients

Introduction

Catheter-associated urinary tract infection (CAUTI) is one of the most common hospital-acquired infections (HAI) in Australia, with nearly 200,000 reported incidents every year (Mitchell, Fasugba, Beckingham, Bennett, & Gardner, 2016). According to Gardner, Mitchell, Beckingham, and Fasugba (2014), 15%–25% of patients admitted to a hospital are catheterized. A report from the World Health Organization (WHO) in 2018 showed that patients who were catheterized had a 5% greater chance of acquiring a urinary tract infection (UTI) for every day they are catheterized. In one month, the chances of acquiring the infection increase to 100%. Indwelling urinary catheters (IUCs) are regularly used in different wards or units in various hospital settings worldwide, but researchers have shown that the use of IUCs is more widespread in intensive care units (ICUs) (Liu, Xiao, & Shi, 2018; Nicolle, 2014).

Moreover, in the United States (US), CAUTIs are the fourth most common infection acquired in a hospital. Also, over 67% of hospitalized patients with urinary tract infections have indwelling catheters (Nicolle, 2014). Patients who are admitted to ICUs are the most at risk of developing UTI due to the frequency and a longer period of IUC use. The chances of a patient acquiring a CAUTI once admitted to an ICU is significantly higher compared to a patient admitted to a different hospital unit (Yukusheva, Costa, Bobay, Parada, & Weiss, 2019). The aim of this project is to determine how the intensive care unit (ICU) nurses implement infection control to reduce the cases of catheter-associated urinary tract infection (CAUTI) and to find the gaps in the implementation process. In order to meet the goal of this project, a learning contract was developed that outlined the objectives and evidence of accomplishments (see Appendix 1). This paper reviews and discusses the most common factors that contribute to CAUTI in patients in ICUs and presents the methods and strategies used to reduce ICU-acquired UTIs. The effectiveness of the strategies are evaluated and an evaluation framework is developed for ongoing monitoring to ensure measures put in place are sustainable. Also, this paper provides evidence of accomplishments using different resources and strategies.

Background

With the prevalence of CAUTIs in ICUs, infection control measures are not only significant but also essential. Rigorous preventive measures should be implemented to inhibit transmission of pathogens. Although the implementation of infection control is the responsibility of all healthcare staff, it relies heavily on the nurses, who have more patient contact and are regularly present at a patient's bedside. Nurses have a significant role in the implementation of policies and procedures that directly impact on the patients. Nurses are also responsible for the maintenance care, infection prevention, and post-removal care of urinary catheters in ICUs. A study by Yakusheva et al. (2019) showed that there is considerable variability in nursing care and practice, and preventing CAUTIs

depends on individual nursing skills. In the same study, Yakusheva et al. (2019) cited a mass survey of 1,653 ICUs that was conducted in 965 US hospitals in 2011. The study showed that although hospitals have changed their policies and protocols for infection prevention, it has not routinely translated to bedside practice. There is a similar finding in a published study by Stone et al. (2014), which shows variations in health practitioners' compliance and adherence to the hospital-implemented infection prevention control programs.

According to the Australian Commission on Safety and Quality in Healthcare (2018), although CAUTIs are one of the most prevalent hospital-acquired infections in Australia, they are also the most preventable. Prevention of CAUTIs is essential not only for improving the quality of healthcare but also for reducing the healthcare cost burden. Patients who develop a UTI while in a hospital need to extend the length of their hospital stay, which, in turn, impacts on the patient's health outcomes, their families and the health service. Cases of CAUTIs in ICUs increase the costs not only of hospital care but also of health care in general (Parida & Mishra, 2013). There are modifiable factors that the Australian Commission on Safety and Quality in Healthcare (2018) recommend to prevent or minimize CAUTIs.

Factors contributing to CAUTI in ICU

The first learning objective is to identify and be familiar with the most common factors that contribute to CAUTI in patients in ICUs. In order to meet this objective, it was decided to conduct a literature review of retrospective studies on patients who develop CAUTI in ICUs, identify common pathogens that cause CAUTIs and identify the occurrence of CAUTI in ICUs. A review of the literature provides the core for studies into high-quality medical education, and helps to optimize the significance, uniqueness, generalisability and impact on clinical practice (Maggio, Sewell, & Artino, 2016). Also, the literature review is essential for any researcher to "join the conversation" by giving an explanation, informing scientific method, classifying innovation, eliminating unnecessary research, and guaranteeing professional standards are maintained. The data from the studies that provide evidence of the development of UTIs in patients with IUCs are presented, the common factors that cause CAUTI, the incidence of CAUTI in ICU and the indications for use of a urinary catheter.

Common factors that cause CAUTI

CAUTIs harbour a wide range of bacteria, including multi-resistant organisms. Bacteria colonize the indwelling catheter by forming a biofilm on the interior and exterior surface of the catheter (Nicolle, 2014). Bacterial colonization can begin either from the periurethral region or ascend from the catheter drainage tubing (Nicolle, 2014). It is essential to understand that biofilm formation starts as soon as the catheter is inserted. A single species of bacteria is immediately present following placement of the IUC, and new organisms continue to colonize

the catheter at a rate of approximately 3%–7% per day (Duszynska et al., 2016). Patients on long-term IUCs acquire an additional three to five types of microorganisms (Nicolle, 2014). The microorganisms that are commonly isolated are *Escherichia coli*, Enterococci spp, Candida spp, *Pseudomonas aeruginosa, Klebsiella spp, Proteus mirabilis, Acinetobacter baumannii, Morganella morganii, Staphylococcus aureus,* and coagulase-negative staphylococci (Duszynska et al., 2016; Nicolle, 2012, 2014).

In addition, the Centers for Disease Control and Prevention (CDC) and National Health Care Safety Network (NHSN) criteria for a CAUTI are that the patient has had an indwelling urinary catheter (ICU) for more than two consecutive days, has developed a fever of >38°C and has a positive urine culture of at least one bacterium of >10^5 CFU/ml (Al Nasser et al., 2016). Several other studies illustrated that an increased duration of catheterization has been identified as a significant factor associated with the acquisition of CAUTI (Dublynn, & Episcopia, 2019; Medina et al., 1997; Plat et al., 1996). The occurrence of bacteriuria while the urinary catheter is in place is inevitable (Davies et., 2018). Also, a study done by Lee (2017) identified that diabetes is a factor in CAUTI development, and numerous other studies have confirmed diabetes as a factor in the development of UTIs. Rousseau et al. (2016) noted that impaired granulocyte function in patients with diabetes, increased adhesion of uropathogens to bladder epithelial cells, and the impacts of glucosuria on the development of uropathogens in diabetic patients make a significant contribution to a higher incidence of UTI.

Incidence of CAUTI in ICU

IUCs are commonly used on patients in ICUs to measure the fluid intake and urinary output of patients who are critically ill. A study by Allen et al. (2014) claimed that inserting a urinary catheter is an essential step in the patients' admission process in ICUs. Allen et al. (2014) asserted that a catheter's insertion is almost an automatic intervention for everyone admitted to an ICU. Allen et al. (2014) further argued that nurses prefer to leave a urinary catheter intact until the patient is discharged from the ICU.

Furthermore, several studies have consistently proven that the placement of an IUC increases the likelihood of developing CAUTIs and can result in further complications such as sepsis (Duszyńska et al., 2016; Liu, Xiao, & Shi, 2018; Nicolle, 2014). In 2015, in Australia and New Zealand, 30.2% of patients with urinary tract infections developed sepsis; in Canada and the US, it was 14.7%; in Saudi Arabia, it was 18.3%; and in France, this percentage was 8.4% (Duszyńska et al., 2016). Similarly, a comparable study by Rosenthal et al. (2011) reported that in 10 developing countries, the risk of dying for patients who contracted CAUTIs could increase to 15%.

Indication for a urinary catheter

IUCs are inserted to collect a urine specimen from a patient (WHO, 2018). In Gazarin et al.'s (2020) study, a rural hospital in Canada, Winchester District Memorial Hospital, performed an audit to measure the appropriate use of a urinary catheter in their hospital. The audit found that 31%–41% of patients catheterized did not meet the guidelines of the US Center for Disease Control and Prevention (CDC). Also, a study of seven ICUs from different regions in Japan found that in 76% of patients who were catheterised, only 54% were indicated for appropriate use (Kuriyama et al., 2017). In this study by Kuriyama et al. (2017), measuring the patient's fluid input and urinary output was identified as the most common inappropriate reason for IUC insertion. In Japan, however, the nurse can determine which patient will be catheterised because the placement of a urinary catheter does not require a physician's approval.

Consequently, indwelling urinary catheters are frequently used in ICUs to measure the fluid input and urinary output of critically ill patients. Other indications are for perioperative use and sustained immobility (Kuriyama et al., 2017). The WHO (2018) has set guidelines and criteria that advise on indwelling urinary catheters' appropriate use. IUCs are recommended for patients with bladder obstruction, urinary retention, or difficulty passing urine due to a neurological disorder, for precise urinary output measurement, as a particular perioperative procedure, when there is prolonged immobilisation due to multiple trauma, and to assist with end of life support.

Strategies for Reducing CAUTI

The second learning objective is to understand the methods and strategies that hospitals utilise to reduce CAUTIs in patients and to evaluate the effectiveness of these methods. In order to meet this objective, online journals and databases were used as tools to further collect information from studies in different hospitals, both local and international. Many clinical situations are suitable for catheter placement, but they are used too frequently without proper guidelines and continue longer than is necessary. This method was chosen in order to provide evidence that CAUTI is a largescale issue in many hospital settings. The other learning objective is to identify and recognise the role of nurses in the implementation of hospital policies and procedure for the process of inserting a urinary catheter in patients. In order to meet this objective, the project included a review of studies that show the current role of nurses in hospitals in relation to IUCs and the associated infections. What follows below is a review of the literature that describes various methods and protocols that hospitals have implemented to prevent and reduce the occurrence of CAUTIs and the role of nurses in the prevention of CAUTI.

Hospital Policy and Guidelines

Hospitals and ICUs have methods and strategies for reducing the incidence of CAUTIs. One way to reduce the incidence of CAUTI is to implement hospital policy and guidelines, such as by applying the CAUTI care bundles. The project guidelines included a catheter discontinuation policy, bladder management, introduction of a CAUTI investigation tool, standardisation of perianal care before catheter insertion, staff education, an educational toolbox specifically for CAUTI presenting the rates of CAUTI to stakeholders monthly. However, Allen et al. (2014) argue that implementation practices and changes in hospital protocols and policies do not ensure that there will be a decrease in the incidence of CAUTIs, as often there are challenges in the organisation, and its culture can hinder clinical outcomes and improvement.

The Ann Arbor Criteria for Appropriate Urinary Catheter Use provides a guide for the appropriate use of urinary catheters (Meddings, Fowler, Saint, & Fowler, 2015). The criteria include specifics on the guidelines to measure the fluid input and urine output of patients. Monitoring urine volume is clinically indicated for patients who are severely ill, and includes (1) haemodynamically unstable patients who require hourly medication adjustment; (2) acute respiratory patients who require aggressive ventilation with hourly adjustment of diuretics; and (3) patients who require hourly monitoring of urine studies to manage life-threatening laboratory abnormalities (Meddings et al., 2015).

Education and Technology Utilisation

Another approach that hospitals implement is the education of ICU staff. Technology, such as electronic prompts, is used to enhance staff awareness and provide education (Bell, Alaestante, & Finch, 2016). Electric prompts are also utilised to monitor IUC use and current patients who have a urinary catheter – the project was reported to be an effective intervention (Bell et al., 2016). The mechanism of the electronic prompts works by asking healthcare practitioners before the procedure about the indication for IUC placement (Bell et al., 2016). It also tracks patients with a urinary catheter, as tracking patients who have an IUC daily alerts nurses and doctors to which patients have a urinary catheter and its placement duration (Bell et al., 2016; Sauter, 2012). This strategy has helped decrease the days that a patient needs to have a urinary catheter and reduces the risk of developing a urinary tract infection (Sauter, 2012). Also, Electronic Medical Records (EMRs) can track patients who have an IUC and provide a reminder to healthcare providers (Sauter, 2012). The EMR prompts nurses to assess the patient and justify IUC placement. The EMR also requires nurses to document the presence of a catheter at every shift.

Utilisation of CAUTI Care Bundles

The USA Institute of Healthcare Improvement and the United Kingdom Health Department have suggested several 'care bundle' strategies for preventing CAUTIs (WHO, 2018).

Insertion Care Bundle

Avoid unnecessary catheterisation

Choose catheters of appropriate size

Use sterile items/equipment

Insert catheter using a strict aseptic non-touch technique

Use a closed drainage system

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*Adapted from WHO (2018) guidelines on prevention of catheter-associated urinary tract infection

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Maintenance Care Bundle

Review the need for the catheter on a daily basis and remove the catheter promptly when no longer necessary

Use an aseptic technique for daily catheter care (e.g., hand hygiene, sterile items/equipment)

Do not break the closed drainage system. If a urine specimen is required, take the specimen aseptically via the sampling port

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An eight-year study at King Abdul-Aziz Medical City, Saudi Arabia by Al-Hameed et al. (2018) reported success in reducing CAUTIs using the 'care bundle' approach. The bundle guidelines were reported to be effective in infection control and reducing the rate of CAUTIs in an adult ICU. The researchers' primary strategy was creating a multidisciplinary team that educated the staff and monitored and identified the appropriate indications for the use of an IUC. The hospital also used a standardised maintenance form for documentation of the removal or renewal of a patient's IUC. The nurse unit manager in the ICU monitored the number of urinary catheters in use in the ICU, and there was also a team who conducted surveillance regularly. The combined strategies and team collaboration lowered the number of incidences of CAUTI in the adult ICU.

Nurse's role in CAUTI prevention

The following sections present information on the potential role of nurses, nurse leaders and nurse educators in reducing CAUTIs and identifies strategies used by researchers to address the issue of CAUTIs.

Nursing responsibilities in CAUTI prevention

The role of nurses in reducing CAUTIs is essential and can significantly impact the overall process of IUC placement. The nurses directly care for patients and overall have the general impression and understanding of a patient. Sauter (2012) stated that nurses could recognise when

the patient no longer requires a catheter and is able to communicate this observation to the doctor, who can order the catheter removal. Early removal of a catheter has been proven to reduce the risk of CAUTIs (Sauter, 2012). Despite protocols in place to guide staff in removing the catheters, researchers have found that many nursing staff are still hesitant to timely remove a patient's catheter (Gazarin et al., 2020; Sauter, 2012).

Nursing leader responsibilities

A nurse-driven system to decrease the number of CAUTIs acquired from the hospital is effective and efficient for a community hospital (Quinn, 2015). Clinical leadership is vital in nursing as it equates to high-quality patient care. Every healthcare setting aims to empower staff to take initiatives, be proactive, and be willing to learn and improve their skills and knowledge. According to Daly, Jackson, Mannix, Davidson, and Hutchinson (2014), clinical leadership is not exclusive to any particular group, but instead, every member of the healthcare team has the potential to become a leader. Developing clinical leadership skills then means that it is not only the healthcare professional's effort alone that develops these skills, but it is also the result of the influences from the people they work with (Xu, 2017). Also, nursing leaders are assigning a nurse champion to monitor catheter use in the ICU, accurately identify patients at risk, review interventions, and educate staff on preventing CAUTIs, all of which are among nurses' various roles (Russell, & Watters, 2019).

The nursing leaders implementing daily rounds is an excellent way to educate other nurses about protocols, review medical records, and check if patients with urinary catheters have an order to keep the catheter in place (Gazarin et al., 2020). A nurse-to-nurse discussion on whether the catheter is still indicated for the patient can also be beneficial (Sauter, 2012).

Nursing educators' responsibilities

Effective CAUTI prevention must identify all catheter care components through continued training, utilising multi-faceted techniques, and everyone taking part in catheter care. Nursing educators have a significant role in preventing CAUTIs due to their responsibility of educating nurses about the issues surrounding catheterisation, as this can increase their awareness and improve their perception of the issue and promote autonomy and confidence as advocates for patients (Sauter, 2012). Nevertheless, there is a gap in knowledge about catheter use among nurses that potentially impacts the nurse's role in preventing CAUTIs. Yoon et al. (2013) proposed a solution to educate nurses, provide an opportunity for nurses to lead, and recognise their work and effort through a simple reward system. It has been shown that empowered ICU nurses help to decrease the number of days a urinary catheter is in place. Nurses provide education to patients and family about the need for the IUC and discuss alternative options for patients such as using condom catheters (Gazarin et al., 2020; Sauter, 2012). Furthermore, Yoon et al. (2013)

added that the creation of a catheter curriculum that aims to increase awareness among nurses and includes information about essential microbiology, infection control, and hand hygiene practices is an excellent starting point in enabling the clinical team to be proactive in catheter care and surveillance. The education team should be comprised of clinical nurse leaders, educators, and doctors.

Evaluation

The third learning objective is to develop an evaluation framework for ongoing monitoring to ensure that measures put in place are sustainable. An evaluation framework of clinical practice and practice change can significantly improve patient safety (Parker et al., 2017). Part of developing an evaluation framework is evaluating the process measures. According to Sharma et al. (2017), evaluations of the process intend to understand and evaluate how an intervention is carried out. Process evaluations can also facilitate answering what the primary active intervention is and what emerging adaptations are needed.

Moreover, part of the evaluation framework is a quality improvement tool, Plan, Do, Study and Act (PDSA). The intent of the PDSA method is to understand as quickly as possible whether a procedure works in a specified environment and to make adjustments to increase the likelihood of providing and sustaining the desired improvement accordingly.

Process Measures

The primary measure of the process will be a re-examination of the catheter necessity at the time of insertion and for each day of use with the goal that ≥95 per cent of indwelling catheters would meet the bundle's ≥1 indication(s). For use at unit-specific quality improvement meetings, the improvement advisor generated monthly, and annual compliance reports in ICU. During the evaluation, PDSA cycles will be developed to facilitate and measure daily assessment of catheter necessity. As part of our plan, catheter necessity monitoring will be conducted daily in ICU. Unit champions will be identified, trained and granted the responsibility of discussing the necessity of an indwelling catheter in daily rounds with the patient care team. When no indication is identified, the patient care team will explore the possibility of removing the catheter. To identify compliance with the critical bundle measure, unit charge nurses will assess the presence and indication for a urinary catheter for all patients on their unit daily. Moreover, these data that will be gathered will measure the impact of the PDSA cycles.

PDSA

The Plan-Do-Study-Act (PDSA) cycle is a component of the Institute for Healthcare Improvement improvement model and is a simple yet powerful tool for accelerating quality improvement (IHI, 2017). PDSA has become the most frequently used process improvement model and

involves completing the sequences, then repeating the process until the desired results are achieved (Tichnor-Wagner et al., 2017). CAUTIs comprise one of the most common HAIs in hospitals worldwide. Also, there are changes in the prevalence of cases. PDSA is the most suitable model for long-term management of CAUTIs in hospitals because it provides for any changes that may arise with new circumstances of infection.

Plan

The planning phase involves establishing the targets, processes and action plan to deliver the desired results. The creation and implementation of a multidisciplinary CAUTI prevention plan will reduce CAUTI infections. The plan would be a blueprint on how to implement the process improvement for CAUTI prevention. A performance measurement plan would also be in place in the ICU. A plan should be developed for integrating CAUTI risk prevention strategies into the processes of the ICU.

DO

The multidisciplinary team would include personnel from all the departments concerned. Successful CAUTI prevention teams include the team leader, the champions of nurses and physicians, executive partners, frontline nurses, planners or case managers for infection prevention and discharge, and risk managers in the ICU. In addition to being in charge of CAUTI management, the team of planners would give annual, weekly, and monthly reports on the progress of their undertakings. They would also be responsible for educating the staff and patients and their families about the prevention of CAUTI infections.

Finally, in ICU, they will be responsible for case risk assessments and risk scoring. Secondly, a weekly CAUTI risk meeting will be held by the CAUTI prevention team, all the staff, and the patients, especially in the acute care unit. All case and risk reports will be sent on a weekly, monthly, and yearly basis to the persons concerned, such as department managers, patients, and hospital management. A committed risk management head of CAUTI in ICU shall be appointed to manage all cases, including treatment and prevention. The preventive measures would be based on evidence-based measures, including urinary catheter care during placement, timely removal of urinary catheters based on nurse-driven processes, and inappropriate prevention of short-term catheter use.

STUDY

The phase would involve assessing and analysing the incident monitoring reports and other scoring tools to determine whether any positive results have been achieved by all of the prevention strategies for CAUTI in the ICU. Patients and their families, facility staff, prevention committee, hourly-round feedbacks, and other necessary information will be collected.

ACT

The phase would involve acting on the results or outcomes obtained from the previous phase and making any reasonable and appropriate changes. For example, if the current procedures have not been successful, the unit would have to fine-tune the preventive actions to significantly improve the positive outcomes or find other CAUTI prevention strategies

Key Learning

In the literature, most quality improvement projects resulted in a significant reduction in the incidence of CAUTIs. Other studies, however, did not show significant changes, mainly because of the challenges of adopting new culture and practices. Although these projects had a potential role in decreasing CAUTI, compliance from the staff was not sustainable, and the expected changes were short-lived or not long enough to gain potential benefits. The support of the organisation and provision of resources were also reported to have an impact on staff motivation. All the studies identified challenges with the introduction of new protocols, in particular, the extra time required for the clinical staff to adopt a new hospital culture. The clinical champions mentioned in one of the studies were useful in motivating other staff and serving as a leader for their peers. Ultimately, every nurse has the potential to become a nurse leader in their field of expertise. Education and team collaboration are critical factors in developing leadership. A nurse has direct contact with a patient and can influence their health outcomes. Adding leadership to the nursing skills and intervention can ensure the provision of high quality, efficient care of the patient.

Conclusion

Catheter placement is a multidisciplinary decision and not the sole responsibility of nurses. Although the placement of an IUC is inevitable in many cases in ICU patients, it is entirely feasible to decrease CAUTIs through collaborative interventions. The best guideline that the healthcare professional can use to prevent CAUTIs is to limit the use of a urinary catheter and only use when there is a clear indication for usage. Also, getting the catheter removed as soon as it is not required is just as necessary. Following the hospital guidelines and practising a proactive attitude and evidenced-based care promise a positive health outcome for any patient. Finally, utilising a quality improvement tool like PDSA will impact on the sustainability of the improvement plan. Nonetheless, this project's limitation is the inability to evaluate potential confounding risk factors for CAUTI, including antibiotic exposure, because our data were primarily collected for surveillance purposes. Also, small sample size affects the reliability, and a pre-and-after design had been utilized, which is susceptible to unmeasured confounding variables.

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Appendix

Learning Contract Project

Contract aim:

The aim of this project is to determine how the intensive care unit (ICU) nurses implement infection control to reduce the cases of catheter-associated urinary tract infection (CAUTI) and to find the gaps in the implementation process.

Background:

Urinary tract infection (UTI) is widespread among intensive care unit patients and 60% to 80% of the cases are due to indwelling urinary catheters (Liu, Xiao, & Shi, 2018).To determine how infection control is implemented, this project will review literature that describes the incidence of UTIs in the ICU setting, the risk factors, and the effectiveness of prevention measures. Cases of CAUTIs in ICUs increase the costs not only of hospital care but also of health care in general (Parida & Mishra, 2013). Identifying the gap in infection control implementation will help to determine which evidenced-based strategy implemented by ICU nurses has the most impact in reducing CAUTIs.

Learning Objectives	Learning Resources and Strategies	Evidence of Accomplishment
Identify the duration before ICU patients acquire a UTI from the time the indwelling catheter (IDC) is inserted Determine the indications of IDC use on the ICU patient.	Review journals and studies and identify cases of UTIs in the ICU setting Identify the common pathogens. Identify how frequently infection occurs and determine how long it takes to acquire a UTI after IDC insertion. Show evidence or report on the use of IDCs on patients although not indicated.	Evidence that shows the cases of patients that have acquired UTIs while in ICU. Identify the factors that contribute to developing UTIs through literature review. The evidence will also show the possible strategies that can be used to minimise the incidence of UTIs in patients who are in the ICU. 1000 words
Identify the methods and strategies used to reduce ICU-acquired UTIs and evaluate the effectiveness of the strategies. Determine the role of nurses in reducing CAUTIs	Journals Books Databases: PubMed, Medline, Cochrane library Semi-structured interviews with ICU nurses.	Review of literature that describes the strategies used by nurses to decrease UTIs in ICU. Identify hospital policies and protocols. Identify the role of nurses in reducing CAUTI 1250 words
Develop an evaluation framework for ongoing monitoring to ensure measures put in place are sustainable	Databases: PubMed, Medline, Cochrane library Data gathering	Assess the success of the implementation programs by identifying the number of ICU patients on IDC who did not develop a UTI using the PDSA framework. Assess the cases that developed a UTI despite the strategies implemented. Evaluate the strategy and propose a recommendation. Determine if the methods are applicable to other clinical settings besides ICU. 1250 words.