

The Effect of Catheter Associated Urinary Tract Infection (CAUTI) Bundle of Care: A Systematic Review

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Keywords: Catheter, Care, CAUTI Bundle.

Abstract: The aim of this paper was to determine the effect of CAUTI bundle of care in reducing and preventing the incidence of CAUTI. The inclusion criteria of this review were; experimental studies, adult patients as samples, and urinary catheter installation for a minimum period of 72 hours; while the exclusion criteria was patients with worsening conditions. The literature search was done through 6 bibliography databases (CINAHL, Scientdirect, Proquest, Pubmed, Google Scholar and MEDLINE) from 2014 to 2018 in English language using the keywords; CAUTI, urinary catheter, protocol, guideline, and bundle of care. A total of 171 articles had been identified but after the selection process, only 6 articles met the criteria. The selected articles then were critically appraised using Critical Appraisal Skill Program (CASP). The result showed that CAUTI bundle of care had a significant effect to reduce and prevent CAUTI. The CAUTI bundle consisted of assessment, aseptic technique, catheter care, catheter removal if there was no further indication, and catheter selection. This review recommends that the CAUTI bundle of care should be implemented in Indonesia, in which no prior published study reported, for the best evidence of care.

1 INTRODUCTION

The Center of Diseases Control and Prevention (CDC) defines Catheter Associated Urinary Tract Infection (CAUTI) as an infection in patients who have or still use an indwelling catheter. (Fletcher, Tyszka, Jeanne T. Harrod, Molly. Fowler, Karen E. Fowle. Saint, Sanjay. Krein, 2016). The biggest risk factor is the use of catheters exceeding 6 days; it can be said that CAUTI occurs because of long-term catheter placement, not in accordance with the indications and lack of aseptic procedures during catheterization, both on the device and the medical staff (Theobald, Resnick, Dittus, & Roumie, 2017). The impact of CAUTI is the duration of hospital stay, unnecessary morbidity and motility, and increased costs for hospital care. Patients taking catheters have a 3 times greater risk of being hospitalized for longer periods of time and longer antibiotic use, even reports say that the organism that causing Urinary Tract Infection (UTI) due to catheterization is an organism that has been resistant to many antibiotics. If it is not immediately treated, it will cause urosepsis and even death which reaches 9,000 cases per year. It is estimated that 17% - 69%

of UTI due to catheterization can be prevented by good infection control (Semaradana, 2014).

Lee (2017) states that the incidence of catheter-related urinary tract infections (CAUTI) was 30% of the overall incidence of infections in hospitals in Singapore (Lee, 2017). Catheter use is the most common cause of urinary tract nosocomial infections. The risk of bacteriuria is related to the length of catheterization. The risk of bacteriuria increases by 5-10% per day after catheter placement. Bacteria can occur 90-100% in long-term catheter use. Bacteria that occur are usually asymptomatic (Tarmono, Renaldo, & Ghinorawa, 2015).

Some evidence based interventions had been reported to reduce CAUTI incidences (Saint et al., 2009). These interventions then were developed by CDC becoming a bundle of care as a guidelines. This guideliness is called CAUTI bundle of care. (Josephine Anne Navoa-Nga, Regina Berbab, Victor D. Rosenthalc,*, Victoria D. Villanuevaa, María Corazon V. Tolentinoa, Glenn Angelo S. Genuinob, Rafael J. Consunjib, 2013)(Josephine Anne Navoa-Nga, Regina Berbab, Victor D. Rosenthalc, Victoria D. Villanuevaa, María Corazon V. Tolentinoa,

Glenn Angelo S. Genuinob, Rafael J. Consunjib, 2013).

Futhermore, some studies showed that CAUTI bundle of care decreased CAUTI occurrence significantly.(Al-Hameed Fahad, Ahmed Gulam , Al-Saedi Asim & Al-Hameed Faisal, 2018)(Mody et al., 2017)(Sushilkumar Satish Gupta; Pavan Kumar Irukulla; Mangalore Amith Shenoy; Vimbai Nyemba; Diana Yacoub, 2017)(Josephine Anne Navoa-Nga, Regina Berbab, Victor D. Rosenthalc,*, Victoria D. Villanuevaa, María Corazon V. Tolentinoa, Glenn Angelo S. Genuinob, Rafael J. Consunjib, 2013)(Regagnin, , Debora Schettini da Silva Alves, Ana Maria Cavalleiro, Thiago Zinsly Sampaio Camargo, Alexandre R. Marra, Victor, & Edmond, 2015). However, the effect of CAUTI bundle of care on the CAUTI incidence is still limited. Therefore, this review aims to determine the effect of CAUTI bundle of care in reducing and preventing the incidence of CAUTI.

2 METHODS

The inclusion criteria of this review were; experimental studies, adult patients as samples, and urinary catheter installation for a minimum period of 72 hours; while the exclusion criteria were patients with worsening conditions. The literature search was done through 6 bibliography databases namely Cumulative Index to Nursing and Allied Health Literature (CINAHL), Scientdirect, Proquest, Pubmed, Google Scholar and Medical Literature Analysis and Retrieval System (MEDLINE) from 2014 to 2018 in English language The search used keywords; CAUTI, urinary catheter, protocol, guidelines, and bundle of care. A total of 171 articles have been identified but after the selection process, only 6 articles met the criteria. The selected articles uses PICO (population, intervention, comparisons, and outcomes) and were then critically appraised using the Critical Appraisal Skill Program (CASP).

The author evaluated the title and abstract of all references. List of references from articles was sought manually by searching for research relevant to other inclusion criteria. Data extraction was done using Microsoft Word. Information obtained from each study included the following: title, journal, year of publication, location, study population, study design, time of intervention, characteristics of the intervention and control groups, measurement tools, and pre and post intervention results was shown on table 1.

The following figure 1 shows the search strategy and pre selection process carried out in this study:

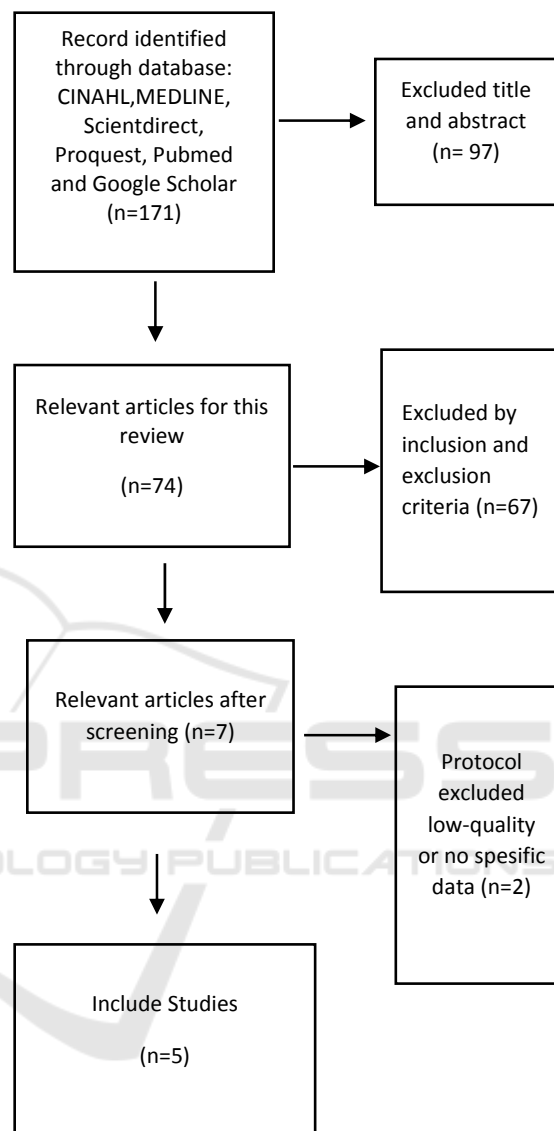


Figure 1: Searching Strategy.

3 RESULTS

3.1 Effect of CAUTI Bundle of Care

A total 171 studies were initially identified as results. After filtered by abstract and title total studies, excluded by criteria inclusion and exclusion and Protocol excluded low-quality or no specific data total studies were reviewed 5 studies.

The results showed that 3 out of 5 of studies had level II of evidence with good quality and two

studies had level III with good quality and low quality data or major flaws. No study had high level of evidence (level I).

Table 2 described the effect of CAUTI bundle of care. The CAUTI rate decreased significantly with the average of rates CAUTI mean pre implementation 7,90%, mean post 1,18% and mean difference 5, 59%. All studies had p value significant effect CAUTI rates after interventions.

Population and sample performed of studies that 4 out 5 had at ICU and one studies medical surgical.

3.2 CAUTI Bundle of Care

The CAUTI of care Bundle consists of several interventions that are interrelated with each other, from several studies reviewed the interventions carried out include, There bundles were: The use of a catheter is only for the right indication, The use of appropriate techniques for catheter placement, Proper catheter care (antimicrobial urine catheter can prevent bacteriuria in hospitalized patients during short-term catheterization, depending on the antimicrobial layer and several other variables compared to standard catheters), Noting the use of catheter material (choosing the right catheter aims to delay the onset of bacteriuria and to prevent bacterial attachment and growth), Obstruction management (there is no consensus regarding the time at which routine catheter changes must be made. Shorter periods may be needed if there is damage or catheter leakage. In general, long-term catheters must be replaced before blockages occur or may occur. Time of indwelling catheter use different for each patient, some patients form deposits on the lumen of the catheter very quickly), Specimen Collection (get aseptic urine samples), Small amounts of fresh urine can be taken from the distal part of the catheter, or if it is better than the place where the material is available, and before urine is aspirated with sterile needles and syringes, the place of extraction must be disinfected (if a large volume of urine is needed for special analysis, then the urine must be taken aseptically from the drainage bag and routine urine culture in patients with asymptomatic catheters is not recommended).

4 DISCUSSION

4.1 Effect of CAUTI Bundle of Care

The effect CAUTI of care bundle that has shown that developing nurse driven protocol interventions

show that interventions has made the decline in urinary catheter use from 37.6% to 26.3%, and provide education about the diagnosis and definition of CAUTI. increasing the right identification ability so that the given antibiotic therapy is right, and the last one using the CAUTI prevention bundles, one of the studies conducted in America states that there has been a decrease in the average CAUTI incidence of 50% per month and a decrease from 5.41 to 2.49 per 1000 catheter days (Peter, Devi, & Nayak, 2018). While a study conducted by Al-Hameed showed the results of the rate of UTI and the use of urinary catheters during the study decreased the rate of UTI significantly per 1000 days catheter from 2.3 to 0.3 (Al-hameed et al., 2018). Then another study conducted by Navoa et al in 2013 showed the effect of CAUTI of care bundle intervention on the incidence of CAUTI from 11.0 to 2.66 per 1000 catheter days (Josephine Anne Navoa-Nga, Regina Berbab, Victor D. Rosenthalc, Victoria D. Villanuevaa, María Corazon V. Tolentinoa, Glenn Angelo S. Genuinob, Rafael J. Consunjib, 2013)

Bundle CAUTI of care is some of the interventions conducted to prevent the incidence of CAUTI, which is a combination of several interventions based on evidence practice nursing.(Lona Mody,M Todd Greene, Jennifer Meddings, Sarah L Krein, Sara E McNamara, Barbara W Trautner, David Ratz, Nimalie D Stone, LillianMin, Steven J Schweon, Andrew J Rolle, RussellN Olmsted, Dale R Burwen, James Battles, Barbara Edson, 2017)

Other studies show significant results between bundles CAUTI of care for UTI rates, such as the research conducted by Lona Mody in 2017, a decline in UTI rate from 6.78 to 2.63 per 1000 catheter-days (Mody et al., 2017). The study conducted by Sushilkumar et al also showed significant results between interventions carried out on the UTI rate of 5.47 before intervention to 1.08 per 1000 catheter-days. (Sushilkumar Satish Gupta, Pavan Kumar Irukulla, Mangalore Amith Shenoy, Vimbai Nyemba, Diana Yacoub, 2017)

4.2 CAUTI Bundle of Care

An integrative review conducted by Michelle Henry (2018) to evaluate Evidence Based Practice preventive measures for infections that occur due to catheter placement (CAUTI) in critical care settings. The recommended intervention to prevent the occurrence of CAUTI is the use of urine samples to identify CAUTI in patients who have fever, some studies recommend patient hand hygiene protocols

Table 1: Extract Data.

No	Author/Year	Title	Sample Population	Research Design	Methods	Outcome	Level Of Evidence
1	Fahad M. Al-Hameed, Gulam R. Ahmed, Asim A. AlSaedi, Muhammad J. Bhutta, Faisal Al-Hameed, Majid M. Al Shamrani, 2018	Applying preventive measures leading to significant reduction of catheter-associated urinary tract infections in adult intensive care unit	ICU	quasy experimental-retropective study	The proper use of silicon catheter, aseptic insertion technique, emptying bag three-fourth via close circuit, the use of appropriate size catheter, securing the draining tube on the thigh to keep catheter bag below patient's bladder level and removal of the catheter as early as possible were ensured in all patients.	The Rate of CAUTI significant reduction from 2.3 to 0.3 per 1000 catheter days.	II-B
2	Josephine Anne Navoa-Nga, Regina Berbab, Victor D. Rosenthal, Victoria D. Villanueva, Maria Corazon V. Tolentino,	Impact of an International nosocomial Infection Control Consortium multidimensional approach on catheter-associated urinary tract infections in	Patients characteristics such as UC duration mean, surgical stay, pulmonary disease, abdominal surgery, cancer, endocrine metabolic diseases, renal	quasy experiment-Prospektive	Perform hand hygiene (HH) before insertion and manipulation of a UC, Maintain unobstructed urine flow; i.e., UC on thigh without strangulating, Keep the collecting bag below the level of the bladder at all times; i.e., UC with collecting bag hanging and not allowing urine reflux, Empty the collecting bag regularly and to avoid allowing the draining spigot to touch the collecting container and to monitor CAUTIs using standardized criteria to identify patients with CAUTIs and to collect UC-days as denominators.	Urinary Catheter use mean 0,67. The rate of CAUTI was 11,0 days per 1000 UC-days at baseline and decreased 2,66 per UC-days after interventions.	II-B
No	Author/Year	Title	Sample/ Population	Research Design	Methods	Outcome	Level Of Evidence
3	Glenn Angelo S. Genuinob, Rafael J. Consunjib, Jacinto Blas V 2013	adult intensive care units in the Philippines: International Nosocomial Infection Control Consortium (INICC) findings	impairment, and immune-compromised condition, were similar during both periods. However, he mean age of patients, proportion of women, and presence of previous infections were higher during the interventions periods				
4	Lona Mody,; M.Todd Greene, Jennifer Meddings 2017	A National Implementation Project to Prevent Catheter Associated Urinary Tract Infectionin Nursing Home Residents	Older adults nursing home. ICUs and SDUs (Step Down Units)	experimental study-prospective	Catheter removal, aseptic insertion, using regular assessments, training for catheter care, and incontinence care planning, as well as a socio adaptive bundle emphasizing leadership, resident and family engagement, and effective communication.	The rate of CAUTI decreased from 6.78 to 2.63 infections per 1000 catheter-days.	II-B

Table 1: Extract Data. (cont.)

No	Author/Year	Title	Sample/Population	Research Design	Methods	Outcome	Level Of Evidence
5.	Dejanira A. Regagnin, Debora Schettini da Silva Alves, Ana Maria Cavalheiro, Thiago Zinsly Sampaio Camargo, Alexandre.	Sustainability of a program for continuous reduction of catheter-associated urinary tract infection	Medical-surgical intensive care unit and step down unit.	quasy experimental study	ICU nurses and physicians inserted urinary catheter, remove made solely by the patients's physician, catheter insertion audited, process measures audited, urinary catheter insertion cart implemented, Nurse appointed exclusively for CAUTI prevention,	The rate of CAUTI in the ICUs was 0,9 per 1,000 catheter days, and the SDUs the rate was 1,0 UTI per 1,000 catheter days.	III-B
No	Author/Year	Title	Population/Sample	Research Design	Methods	Outcome	Mean
6.	Marra, Elivane da Silva Victor, Michael B. Edmond. 2015				intensification of audits, and catheter insertion team developed.		
7.	Sushilkumar Satish Gupta, Pavan Kumar Irukulla, Mangalore Amith Shenoy, Vimbai Nyemba, Diana Yacoub, Yizhak Kupfer 2016	Successful strategy to decrease indwelling catheter utilization rates in an academic medical intensive care unit	ICU	quasy experimental - retrospective observational study	to permit IUC use only in the following predetermined indications, futher narrow down the criteria for urinary catheter utilization to urinary retention and genitourinary procedures only, and use sonographic bladder scanning to identify high-risk patients who may need indwelling catheters in the near future.	IUC utilization rasio had a statistically significant decrease from 0,92 (baseline) to 0,28 (after 3 interventions) (P <,0001). The CAUTI rates had a statistically significant decrease from 5,47 (baseline) to 1,08 (after 3 interventions) (P=,0134).	III-C

No.	Title	Author	Mean Pre	Mean Post	Mean Difference	P
1.	Applying preventive measures leading to significant reduction of catheter-associated urinary tract infections in adult intensive care unit	Fahad M. Al-Hameed, Gulam R. Ahmed, Asim A. AlSaedi, Muhammad J. Bhutta, Faisal Al-Hameed, Majid M. Al Shamrani,	2,3 %	0,3%	2%	0,001
2.	Impact of an International Nosocomial Infection Control Consortium multidimensional approach on catheter-associated urinary tract infections in adult intensive care units in the Philippines: International Nosocomial Infection Control Consortium (INICC) findings	Josephine Anne Navoa-Nga, Regina Berbab, Victor D. Rosenthalc, Victoria D. Villanuevaa, Maria Corazon V. Tolentinoa, Glenn Angelo S. Genuinob, Rafael J. Consunjib, Jacinto Blas V	11 %	2,66%	8,34%	0,0001
No.	Title	Author	Mean Pre	Mean Post	Mean Difference	P
3.	A National Implementation Project to Prevent Catheter Associated Urinary Tract Infectionin Nursing Home Residents	Lona Mody, M.Todd Greene, Jennifer Meddings	6,78%	2,63%	4,15%	< ,0001
4.	Sustainability of a program for continuous reduction of catheter-associated urinary tract infection	Dejanira A. Regagnin, Debora Schettini da Silva Alves, Ana Maria Cavalheiro, Thiago Zinsly Sampaio Camargo, Alexandre R. Marra, Elivane da Silva Victor, Michael B. Edmond.	ICU :7 % SDU:14,9%	0,9% 1%	ICU: 6,1 % SDU: 13,9%	All test of statistical significance were 2-sided, with the significance level set at P<,05.
5.	Successful strategy to decrease indwelling catheter utilization rates in an academic medical intensive care unit	Sushilkumar Satish Gupta, Pavan Kumar Irukulla, Mangalore Amith Shenoy, Vimbai Nyemba, Diana Yacoub, Yizhak Kupfer	5,47%	0,78%	4,69%	< .0001
Average of Mean			7.90 %	1,18%	5,59%	

(PHHP) as one of the interventions that must be done to prevent CAUTI, some studies also recommend strategies for preventing CAUTI focusing on limiting the use and duration of catheter installation, the use of aseptic techniques for catheter insertion and catheter care, then a study (Henry, 2018) only for people in need, ensure that only competent and experienced people do catheter installation, use sterile equipment, keep the drainage system closed, maintain urine flow, maintain hand hygiene before and after put on a catheter. (Sushilkumar Satish Gupta; Pavan Kumar Irukulla; Mangalore Amith Shenoy; Vimbai Nyemba; Diana Yacoub, 2017). Meanwhile the research conducted by Vicki Parker etc states that CAUTI bundle care is divided into several components which are abbreviated to NOCAUTI namely need for catheter assessed, Obtain the patient consent, Competency, Asepsis, Unobstructed flow, Timely catheter, Infection risk daily periurethral hygiene. (Lona Mody, M Todd Greene, Jennifer Meddings, Sarah L Krein, Sara E McNamara, Barbara W Trautner, David Ratz, Nimalie D Stone, Lillian Min, Steven J Schweon, Andrew J Rolle, Russell N Olmsted, Dale R Burwen, James Battles, Barbara Edson, 2017)

Then another study stated that bundle care to prevent CAUTI consisted of Hand hygiene before catheter placement, maintaining urinary unobstructed flow, keeping the catheter sac under the bladder, emptying the bladder, and monitoring CAUTI using standard criteria to identify patients with CAUTI. (Josephine Anne Navoa-Nga, Regina Berbab, Victor D. Rosenthal, Victoria D. Villanueva, Maria Corazon V. Tolentino, Glenn Angelo S. Genuinob, Rafael J. Consunjib, 2013)

Other studies say that the bundle technique to prevent CAUTI is abbreviated with CAUTI which is a component of Catheter Removal, Aseptic Insertion, Regular Use Assessment, and Training for Catheter Care, Incontinence Care Plan, and Appropriate Indications for Indwelling Urinary Catheters (Lona Mody, M Todd Greene, Jennifer Meddings, Sarah L Krein, Sara E McNamara, Barbara W Trautner, David Ratz, Nimalie D Stone, Lillian Min, Steven J Schweon, Andrew J Rolle, Russell N Olmsted, Dale R Burwen, James Battles, Barbara Edson, 2017) The basic principle of using a catheter is the use of appropriate indications at the time of installation and removal of the actuator, when it is an indication such as the following: Haematuria; Retention; Urology surgery; Decubitus ulcer; Measurement of inputs and outputs; End of life care; and Immobility. Other studies suggest that hematuria does not require a catheter except patients

in retention. (Dawson, Gallo, & Prevc, 2017)

Research conducted by Al Hameed shows that a multidisciplinary approach, stepwise intervention strategies and CAUTI bundles, can significantly reduce the IUC utilization ratio (Indwelling Urinary Catheter) and CAUTI level. IAD (Intocetenensia Associated Dermatitis) which is a potential complication after catheter insertion can be minimized by a variety of multidisciplinary strategies, which involve nursing staff, nutritionists, and care specialist wounds. (Sushilkumar Satish Gupta; Pavan Kumar Irukulla; Mangalore Amith Shenoy; Vimbai Nyemba; Diana Yacoub, 2017) There is no definite definition of CAUTI Bundle recommended so far, the researchers collected the best evidence based that could be applied as a CAUTI intervention. There are eight components adopted including; screening all admission patients, using Foley's silicone catheters, aseptic techniques, insertions, emptying catheter bags, selecting the right catheter size, cleaning the catheter ducts in the patient's thighs, placing a catheter sac lower than the patient's bladder and not touching the floor, and releasing the catheter as soon as possible after the patient's condition improves and no further catheter assistance is needed (Al-Hameed Fahad, Ahmed Gulam, Al-Saedi Asim & Al-Hameed Faisal, 2018)

While the research conducted by Mariam divided the two phases of the intervention process to prevent CAUTI, namely the Assessment phase and the Protocol phase of care. In the assessment phase the researcher made an assessment of the nurse regarding nurse's knowledge and educated the nurse to carry out the protocol of care. Then in the protocol of care phase is divided into several parts, namely first to prepare the object settings (catheter-mounted patients), then prepare the protocol of care content that is knowing the anatomy and pathophysiology of the urinary system, knowing indications of catheter installation and infection control in patients who are catheterized know contraindications to catheter installation, prepare catheter installation, perform catheter care, and find out complications related to catheter placement. After completion, proceed with the planning of action protocol of care by paying attention to the patient's condition. Then at the end of the phase an evaluation was conducted on nurses related to the protocol of care that had been done. (Shehab, 2017)

Some important things in CAUTI Bundle that must be considered by nurses are among others: first the catheter must remain closed and minimize the duration of catheter use. Second, pay attention to the risk of cross infection between patients who are

catheterized also must receive attention. Third, nurses must also pay attention to the fact that patients should receive treatment from nurses when the installation of the catheter includes hand washing procedures and the use of sterile gloves in the catheter installation must also be considered by the nurse. Furthermore, patients should receive enough fluids orally to maintain urine flow of 50-100 ml / hour. Then, systemic prophylactic antibiotics are not recommended for catheter placement or intermittent catheterization. There is no benefit from antibiotic irrigation through a catheter and bladder. When changing catheters regularly depending on the catheter material used. Take into account alternatives for sedentary catheterization which often causes symptomatic infections. In certain cases, suprapubic catheters, catheter condoms and intermittent catheterization are more recommended than permanent catheters. (Tarmono et al., 2015)

Meanwhile other studies make programs to prevent infection due to catheter placement. The program was divided into 3 phases, namely phase 1 including ICU Nurse installing a catheter, determining the discussion to remove the catheter, and auditing catheter insertion consisting of determining the type of catheter, Hand hygiene before catheter placement, perineal hygiene using antimicrobial soap, hand washing, prior connection between catheters and catheter sacs, using aqueous chlorhexidine antiseptic, introducing opportunities for catheter placement as a unique opportunity and hand washing after catheter placement. Then phase 2 consists of the audit process, and the implementation of catheter installation is then followed by the third phase, namely the appointment of nurses who are in charge of preventing CAUTI, then looking at the feedback to what has been done. (Josephine Anne Navoa-Nga, Regina Berbab, Victor D. Rosenthalc, Victoria D. Villanuevaa, María Corazon V. Tolentinoa, Glenn Angelo S. Genuinob, Rafael J. Consunjib, 2013) While other studies state that interventions to reduce CAUTI by installing catheters

Then Systematic Review conducted by Dinah Gould et al entitled Implementing clinical guidelines to prevent catheter-associated urinary tract infections and improve catheter care in nursing homes using the Systematic search method and critical appraisal. The total studies reviewed and analyzed were 8 studies which included the study conducted by Gokula and Gaspar which used guidelines for prevention of CAUTI and carried out in a population of 14 patients with long-term catheter use and used a comparison for control groups using the SOP in

hospital and carried out for 3 months with the results of the study saying there was no difference between the application of the CAUTI guidelines and the standard SOP carried out. Whereas 2 studies were conducted by Galeon and Romero and the research of Abraham and Debakey using the Uncontrolled Before and After Study research methods. The study was carried out by implementing a complete guideline for CAUTI Prevention, stating that there were significant differences after the CAUTI prevention guidelines were implemented. While 5 other studies evaluated one part of the CAUTI Prevention guidelines showing significant results. What should be a concern in the application of the CAUTI prevention guideline is the challenge that comes from nurses to be able to properly implement the guideline that has been made by the consensus for the prevention of CAUTI (Gould, Gaze, Ba, Cooper, & Cadwaladr, 2017)

Meanwhile another study conducted by Parker et al. (2017) conducted a study using the intervention study pre-post control method. The study was conducted at 2 Health Districts with the population being adult patients in several acute spaces in 4 hospitals (acute setting) and in NSW, Australia. The study began by educating nurses on NOCAUTI Interventions bundles consisting of guidelines for IDC insertion, indications for collection of urine specimens, guidelines for IDC removal and education for nurses to implement CAUTI prevention interventions. Saint Have made the concept of NOCAUTI bundles through pilot projects in Australia. The concept of NOCAUTI consists of Need for catheter assessed (Assessment is done for patients with appropriate indications for catheter placement), Obtain patient consent and Offer Patient Education (Giving informed consent and education to patient / patient families), Competency (Ensuring only nurses have competence and experienced who put on a catheter), Asepsis (Using asepsis technique), Unobstructed (Keeping urine flow in the hose not having obstruction), Timely Catheter removal (Determining the time of catheter up based on indications and medical needs needed), and Infection (Performing care catheter and taking urine specimen with asepsis technique). The results of the research carried out can improve patient safety through strong implementation and evaluation of clinical practice and changes in practice that will contribute to improving patient experience and the results obtained by the hospital. Research conducted adds evidence based practice through increasing understanding of interventions to reduce CAUTI. (Lona Mody, M Todd Greene,

Jennifer Meddings, Sarah L Krein, Sara E McNamara, Barbara W Trautner, David Ratz, Nimalie D Stone, LillianMin, Steven J Schweon, Andrew J Rolle, RussellN Olmsted, Dale R Burwen, James Battles, Barbara Edson, 2017)

Interventions are targeted at nurses who have the task of installing a urine catheter in the hospital and are designed to reduce the use of inappropriate urine catheters and improve the necessary catheter care. The interventions consisted of education with lecture methods from videos, installing reminders in the room, and weekly infection prevention lectures by the head of the room. (L. Gayani Tillekeratne, Darren R. Linkin, Mariah Obino, Wanjiku, Holtzman, & Cohn, 2014) Nurses must understand indications of catheter placement namely acute urinary obstruction or retention, the need for measurement accurate from input and output in critically ill patients, the presence of open sacrum or perineal ulcers in patients with urinary incontinence, prolonged immobilization, the need for continuous urinary discharge during perioperative care and increased comfort in patients who are near death (L. Gayani Tillekeratne, Darren R. Linkin, Mariah Obino et al., 2014)

Another intervention the researchers obtained was that the interventions used in nursing home implementation projects, which depend on technical and social adaptive interventions, reduce the level of ISTI associated with catheter installation in settings where utilization is low but catheter use lasts longer. Although this project focuses on reducing catheter-related UTIs, an approach similar to evidence based can be used to address the security issues of other residents in community-based nursing homes. (Lona Mody, M Todd Greene, Jennifer Meddings, Sarah L Krein, Sara E McNamara, Barbara W Trautner, David Ratz, Nimalie D Stone, LillianMin, Steven J Schweon, Andrew J Rolle, RussellN Olmsted, Dale R Burwen, James Battles, Barbara Edson, 2017)

Another study conducted on resident students produced two important points, the first was the simulation of providing optimal facilities for evaluating clinical decision making and the second the participants had experience and training in a catheterization scenario that would be their responsibility in the future. This information allows opportunities for change in surgical education that will emphasize important clinical topics, ongoing assessment, and the method of feedback. Thus will improve the performance of trainees and ensure competency for independent practice (Nathwani, Law, Witt, Ray, & Dimarco, 2017)

5 CONCLUSION

Interventions that have been designed to reduce initially high levels of CAUTI indicate that there is a decrease in unnecessary use of urinary catheters and a decrease in CAUTI levels. And the costs for interventions are more affordable. (Tillekeratne et al., 2014) CAUTI incidence has decreased significantly after the implementation of strategies and interventions to prevent CAUTI levels being carried out in adult ICU patients. (Al-hameed et al., 2018) Interventions apply a variety of approaches including the following are: bundles of infection control interventions, education, supervision of CAUTI levels, feedback on CAUTI, supervision of the nurse's performance feedback process (Josephine Anne Navoa-Nga, Regina Berbab, Victor D. Rosenthalc, Victoria D. Villanuevaa, María Corazon V. Tolentinoa, Glenn Angelo S. Genuinob, Rafael J. Consunjib, 2013)

CAUTI incidence declined significantly after the adoption of strategies and interventions to prevent CAUTI levels being carried out in adult ICUs by implementing eight components adopted in patient care (Al-Hameed Fahad, Ahmed Gulam , Al-Saedi Asim & Al-Hameed Faisal, 2018)

The results of the research discussed above show that the CAUTI of care bundle can prevent and reduce CAUTI so that it can help nurses to improve effective and efficient health services for patients. This Systematic review recommends that the CAUTI bundle can significantly reduce CAUTI incidence and become the basis for the study of the effect of the CAUTI bundle in Indonesia.

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