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# Comparison of 10% povidone iodine and sterile water as a periuretra cleansing solution before the insertion of indwelling urine catheter on the occurrence of bacteria

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## ABSTRACT

Urine Catheter placement can help the patient in recovering the disease due to the absence of urine in the body, but there is a negative impact caused by the installation of the catheter, namely the occurrence of bacteriuria. Bacteriuria is an indicator of patients experiencing Catheter-associated urinary tractus infections (CAUTIs). A prevention of bacteriuria is minimizing the contact of bacteria entering the Indwelling urinary catheter closed drainage system by cleaning the periurethral by using a sterile water solution or 10% povidone iodine before the catheter is inserted. This study aimed to compare the effectiveness of the type of periurethral cleansing solution, namely sterile water with Povidone Iodine (10%) against the incidence of bacteriuria in patients with indwelling urine catheters. This research method used experimental research design with one group design with pre-test and post-test. Sampling used consecutive sampling of 32 people for the control and intervention groups. For statistical data analysis using the fisher exact test. The results showed that the highest number of respondents who used sterile water as a solution to clean periurethral before placing an Indwelling urine catheter did not occur bacteriuria (68.75%) while the number of respondents who used Povidone Iodine 10% at most did not occur bacteriuria (87.5%). Based on the results of statistical tests showed that there was no difference in effectiveness between sterile water and 10% povidone iodine for cleaning the periurethral before installing the indwelling urine catheter against the incidence of bacteriuria ( $p = 0.685$ ). The conclusion of this study is that there was no significance difference in effectiveness between sterile water and (10%) povidone iodine for cleaning the periurethral before inserting an indwelling urine catheter from bacteriuria.

Keywords: Povidone Iodine, Cautis, Sterile Water, Infection, Urinary Catheter

## INTRODUCTION

A catheter is a tool with a long, slim and flexible shape, this pipe is made of flexible material installed in patients who have difficulty passing urine before surgery or for investigations (Mazzo et al., 2015). Catheterization is an act of inserting a tube into the bladder through the urethra to pass urine (C. V Gould et al., 2017). There are 2 types of catheters based on time of use, namely intermittent and indwelling catheters (Felix, Bellush, & Bor, 2014). In intermittent catheters, the catheter tubes that have been installed immediately after the patient drained urine from the bladder, while the indwelling catheter, a catheter tube is inserted into the patient's

bladder for days or weeks to allow continuous urine discharge (Parker et al., 2017). Indwelling catheters are indicated for patients who cannot pass urine for undergoing surgery. Healthcare Associated Infections (HCAI) are infections that occur when patients receive health care in a hospital or other health facility that first appears > 48 hours or within 30 days after receiving health care (Haque, Sartelli, McKimm, & Abu Bakar, 2018). HCAI is caused by infections that originate from the bloodstream, the installation of urine catheters and ventilators (C. V Gould et al., 2017). There are two types of urine catheters namely intermittent and indwelling, while those that can cause problems such as

catheter associated urinary tract infections (CAUTIs), namely indwelling urine catheters (Felix et al., 2014; Parker et al., 2017). CAUTIs are the most common type of infection in the world (Khan, Baig, & Mehboob, 2017) and around 40% are hospital-acquired infections (Trautner et al., 2011). CAUTIs are infections in patients who are using a urine catheter (C. V Gould et al., 2017). CAUTIs are caused by *Escherichia Coli*, *Klebsiella*, *proteus*, *Pseudomonas*, *Enterobacter* and *Candida* bacteria (Casias & Fish, 2015). Indwelling urine catheters inserted into the urine vesica are at risk as bacterial inlet and imperfect urine drainage from the catheter results in increased urinary volume in the bladder and increases the number of bacteria in the urine (Khan et al., 2017). The use of indwelling urinary catheters is often associated with the presence of catheter urinary tract infections (CAUTIs) due to complications of urinary catheter placement (Cao, Gong, Shan, & Gao, 2018). Based on the results of the study of Trautner et al., (2011) the incidence rate of CAUTIs is 3-7% in the inpatient room, and 17.6% in the intensive care unit and around 40% CAUTIs is an infection obtained in a hospital (Trautner et al., 2011). CAUTIs can be a problem that must be resolved because patients will experience increased time and care and costs incurred and experiencing sepsis that will threaten the lives of patients (Felix et al., 2014). CAUTIs are the highest types of nosocomial infections or Healthcare Associated Infections (HCAI) in various hospitals (C. V Gould et al., 2017). The incidence of CAUTIs in 2011 in American hospitals was 93,300 cases (Merchant et al., 2017), around 36% of catheter-mounted patients treated at hospitals at risk of CAUTIs and the costs incurred were 2 times more than those of uninfected patients (Parker et al., 2017). The incidence of CAUTIs continues to increase. In Indonesia reached 90-100 cases per 100,000 population per year or 180,000 new cases per year (Kementerian Kesehatan Republik Indonesia, 2014). The incidence of CAUTIs in several hospitals in Indonesia such as the CAUTIs incident after 73 hours of urinary catheter in RSU Raden Mattaher Jambi in 2012 was as much as 23.91% (Sepalanita, 2012), CAUTIs disease room in RSUD dr. Zainoel Abidin Banda Aceh in 2013 was 11.42% (Samad, 2013). There are 2 conditions of urinary tract infections or CAUTIs, namely infections that cause symptoms (symptomatic) and infections that do not cause symptoms (asymptomatic), signs and symptoms of patients who have indwelling urinary catheters and have CAUTIs, ie patients who have been indwelling catheters for > 2 days, presence of heat (> 38°C), presence of tenderness in the bladder, urgency, frequency, and dysuria, urine lab results showed the presence of leukocytes, nitrites, urine specimens with  $\geq 10$  white blood cells [WBC] / mm<sup>3</sup> urine (Pyuria), urine turbid because of many bacteria, and the presence of bacteriuria. Bacteriuria is a condition in which bacteria are found in urine that are characterized by (urine culture  $\geq$  cfu / ml urine and 1 or 2 microorganism specimens found) whereas asymptomatic occurs when bacteria are found in urine culture and do not cause clinical symptoms of bacterial infection (Felix et al., 2014). The microorganisms that cause CAUTIs are *Escherichia Coli*, *Klebsiella*, *proteus*, *Pseudomonas*, *Enterobacter* and *Candida* (Casias & Fish, 2015). In patients with catheters attached, bacteria can enter the urine vesica through 4 places: the meatus-catheter junction, the catheter-drainage tubing junction, the drainage tubing-bag junction, and the drainage door in the urine bag (C. V Gould et al., 2017). In short catheterization, the most common bacteria found is *E. coli*. Other bacteria found are *P. aeruginosa*, *K. pneumonia*, *Staphylococcus epidermidis*, and *enterococcus* and in long-term catheterization, the bacteria found were *E. coli*, these bacteria attached to uroepitelium (C. V Gould et al., 2017; Merchant et al., 2017). Catheter associated urinary tract infections (CAUTIs) can develop into complications such as epididymitis and prostatitis, pyelonephritis, cystitis and meningitis and even death (Cooper & Seupaul, 2012; D. Gould, Gaze, Drey, & Cooper, 2017). CAUTIs cause harm to patients by increasing length of stay, greater cost of care, experiencing long-term disability, increasing patient morbidity and mortality (Khan et al., 2017). CAUTIs can be prevented by cleaning the periurethral area before inserting an indwelling catheter (C. V Gould et al., 2017) Gould. Periurethral cleansing used by hospitals in Indonesia is Povidone iodine (10%) (Awaluddin, 2016). Based on the results of the study of Cao et al., (2018), Povidone iodine (10%) caused

irritation to the mucous membranes thereby increasing discomfort during catheter placement, irritating to the skin, burning sensation, anaphylaxis and quite expensive costs (Awaluddin, 2016; Cunha et al., 2014; Maunoury et al., 2018). One alternative periurethral cleaning solution is sterile water (Cao et al., 2018; C. V Gould et al., 2017; Huang, Liang, Mo, Zhou, & Ying, 2018). A 10% povidone-iodine solution is a solution consisting of a polyvinylpyrrolidone and iodine polymer that has an effective disinfectant function and used for cleansing skin areas and treating wounds (Trott, 2012). In 10% povidone iodine contains 1% iodine that can destroy gram-positive and gram-negative bacteria in 1 minute and kill spores within 15 minutes (Heiner, Hile, Demons, & Wedmore, 2010), and viruses (Trott, 2012). Povidone iodine 10% causes irritation to the mucous membrane, adding to discomfort during catheter placement, irritating to the skin, burning, allergies or toxicity and the cost is quite expensive (Awaluddin, 2016; Cunha et al., 2014; Maunoury et al., 2018). Skin irritation in the periurethral area is one of the causes of CAUTIs in the patient's body (Cunha et al., 2014). Sterile water is water that does not contain nontuberculous mycobacteria, Legionella, gram-negative bacteria such as bacillus and pseudomonas (Rutala & Weber, 2017). Sterile water is water that is carried out in the process of sterilization with the aim of removing all microorganisms, except some endospores are stored in containers that are closed and not directly contaminated with bacteria (Kementerian Kesehatan, 2011). Sterile water can also be used as a periurethral cleaning solution and cleanse wounds on the body (C. V Gould et al., 2017; Trott, 2012). Sterile water is recommended to clean the periureter before inserting the indwelling urine catheter because it can prevent CAUTIs, no side effects and lower costs (Cunha et al., 2014; C. V Gould et al., 2017; Huang et al., 2018).

## METHODS

This research was a quantitative study with experimental design with one group design with pre-test and post-test. Pre-test and post-test design research are to find out the comparison of an experimental intervention (Polit & Beck, 2017). This research compared the periurethral cleaning

solution before indwelling urine catheter installation using sterile water and 10% Povidone Iodine. The control group received therapy according to the room procedure namely 10 % Povidone Iodine and the intervention group got sterile water.

The study population consisted of patients who indicated indwelling catheter installation inpatients at the dr. Slamet Hospital, Garut, West Java. The number of samples was 32 people, namely 16 people were performed periurethral cleansing before catheter installation using 10% povidone iodine and 16 people were performed periurethral cleaning before indwelling urine catheter installation using sterile water solution.

The study was conducted in August-September 2019 by taking consecutive sampling and respondent selection according to inclusion criteria, namely patients with indwelling urinary catheter indications and no bacteriuria or no history of catheter associated urinary tract infections with CAUTIs / UTI (Urinary Tract Infection) before and exclusion criteria ie the patient went home before 3 days after the catheter was placed and the patient's urine catheter was removed before 3 days. After that, the researcher conducted an informed consent / approval to become a research respondent. Immediately after catheter placement, the patient's urine would be cultured and after 3 x 24 hours urine culture would be carried out. Laboratory tests carried out at dr. SlametGarut Hospital in accordance with applicable operational procedures.

Before the study was conducted, there were literature study, observations and preliminary studies to the field of some patients who were placed in an indwelling urine catheter who were hospitalized, the researchers conducted interviews with patients about complaints felt by patients attached to the catheter and interviews with nurses related to hospital operational standard procedures about catheter placement. The research instrument used was a standard operating procedure for catheter placement, examination of bacteriuria and sterile water used by the hospital Dr. SlametGarut Regency. Data collection methods used were observation and documentation that were carried out bacteriuria examinations twice in each group using sterile water and 10% Povidone-Iodine and immediately after catheter placement (pre

intervention) and subsequently after 3 x 24 hours after catheter placement (post intervention) and record the results of the examination and the patient's medical history.

Data analysis was unpaired categorical test using the fisher exact test to analyze differences in bacteriuria in groups using Povidone Iodine cleaning solutions and Sterile water.

**ETHICAL CONSIDERATION**

Ethical approval for data collection and research protocols were approved by the research ethics committee in accordance with the International Conference on Harmonization-Good Clinical Practice (ICH-GCP) and obtained from the Padjadjaran University Bandung Research Ethics Commission No. 1057 / UN6.KEP / EC / 2019.

Characteristics	N	%
<b>Year</b>		
16-20 year	4	12.5
20-40 year	2	6.3
41-60 year	14	43.8
61-80 year	10	31.3
>80 year	2	6.3
<b>Gender</b>		
Male	32	100
<b>per urethral-cleansing solution before urinary catheter placement</b>		
Sterile Water	16	50
Povidone Iodine	16	50

**RESULTS**

The results of the study based on table 1 showed that the most respondents (43.8%) aged 41-60 years, all respondents were male and the number of respondents who used a solution to clean the periurethral before installing the indwelling urine catheter were sterile water and povidone iodine with each of 16 respondents.

The results of the study based on table 2 showed that the number of respondents using sterile water as a solution to clean periurethral before placing the indwelling urine catheter most often did not occur bacteriuria (68.75%) while the number of respondents who used Povidone Iodine 10% as a solution to clean periurethral before installation with most indwelling urine catheters did not occur bacteriuria (87.5%). Based on the results of statistical tests using the fisher exact test showed that there was no difference in effectiveness between sterile water and 10% povidone iodine for cleaning the periurethral before installing the indwelling urine catheter against the incidence of bacteriuria (p = 0.685).

**Table 1: Respondent Distribution (n=32)**

**Table 2: Ratio of sterile water and 10% povidone iodine to clean the periurethral before installation of an indwelling urine catheter (n = 32)**

Solution	Urinal Bacteria						P-Value
	Exist		Not Exist		Total		
	f	%	f	%	f	%	
Sterile Water	5	31.25	11	68.75	16	100	0.685
Povidone Iodine 10%	2	12.5	14	87.5	16	100	

Note: \*) significant when α = 0,05

**DISCUSSION**

The results of the study stated that there was no difference in effectiveness between sterile water and 10% povidone iodine for cleaning the periurethral before placing the Indwelling urine catheter against the incidence of bacteriuria (p = 0.685). The results of this study indicated that sterile water can be used as a solution to clean

periurethral that is effective and cheaper than disinfectant liquid.

The results of this study were in line with research conducted on 97 respondents who installed a urine catheter, the results of the study stated that there was no significant advantage of using antiseptic fluid as a disinfectant cleaning periurethral before and after catheter placement

to reduce the incidence of bacteriuria in patients (Kara & Ozyurek, 2017). Research Düzkeya, Uysal, Bozkurt, Yakut, & Çitak, 2017, showed that as many as 122 respondents who installed a urine catheter and performed periurethral area cleansing in children before urinary catheterization with sterile water did not differ significantly by using 0.05% Chlorhexidine Gluconate to reduce incidence of bacteriuria (Düzkeya, Uysal, Bozkurt, Yakut, & Çitak, 2017). The results of this study were in line with a systematic review conducted by Cunha *et al.*, 2013 stating that sterile water can be used to clean the periurethral before installing a urinary catheter to clean bacterial colonies and it can make the cost cheaper (Cunha *et al.*, 2014). Other research results in a Meta analysis showed that there was no significant difference between periurethral cleansing before the placement of a urine catheter with a sterile water solution and a disinfectant solution with a rate of catheter-associated urinary tractus infection (CAUTIs) (Cao *et al.*, 2018). Research Results of Meta analysis and systematic review conducted simultaneously by Huang *et al.*, 2018 showed that sterile water used to clean the periurethral before indwelling urine catheter placement was safe to use as other topical antiseptics were used for these activities (Huang *et al.*, 2018). *Catheter-associated urinary tractus infection* (CAUTIs) occur through the entry of bacteria into the urinary tract when urinary catheters are installed, these bacteria are self-originating microbes found in the meatal or peri-urethral region (Clayton, 2017). Bacteria around the peri-urethral region ascend to the bladder either through the inner surface of the catheter or along the space between the urethral mucosa and the outer surface of the catheter so that as a strategy to prevent the development of CAUTIs namely sterile water that is cheaper and effectively prevents CAUTIs (Fasugba, Koerner, Mitchell, & Gardner, 2017; Flores-Mireles, Walker, Caparon, & Hultgren, 2015; C. V Gould *et al.*, 2017). Sterile water can clean the dirt and bacteria in the periurethra, because sterile water is a hypotonic, non-pyrogenic and nonbacteriostatic liquid that has a pH of 5.0-7.0, so it is safe to use to clean body parts and sterile water also functions as a mechanical cleaning of the periurethral region to ensure that that is clean socially and not contaminated and not

aseptic to prevent CAUTIs (Clayton, 2017; García-Monasterio *et al.*, 2019; Kulthanan, Nuchkull, & Varothai, 2013).

## CONCLUSION

CAUTIs can be prevented by cleaning the periurethral area before indwelling the catheter by using 10 povidone Iodine (10%) and sterile water. Statistically sterile water solution was not significantly different from povidone Iodine (10%) that was used as a solution to clean periurethral before indwelling urinary catheter placement on the incidence of bacteriuria.

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## REFERENCES

1. Awaluddin, A., 2016. comparison of effectiveness of normal saline and 10% povidone iodine in periurethral cleaning. *Jurnal Endurance: Kajian Ilmiah Problema Kesehatan*, 1(1), pp.1-10.
2. Cao, Y., Gong, Z., Shan, J. and Gao, Y., 2018. Comparison of the preventive effect of urethral cleaning versus disinfection for catheter-associated urinary tract infections in adults: A network meta-analysis. *International Journal of Infectious Diseases*, 76, pp.102-108.
3. Casias, M. and Fish, D.N., 2015, December. Evaluation of the Etiology and Management of Catheter-Associated Urinary Tract infections (CAUTI) in Hospitalized Patients at the University of Colorado Hospital (UCH). In *Open Forum Infectious Diseases* (Vol.2, No. suppl\_1, p. 289). Infectious Diseases Society of America.
4. Clayton, J.L., 2017. Indwelling urinary catheters: A pathway to health care-associated infections. *AORN journal*, 105(5), pp.446-452.
5. Bhausheb b. Jankar, devesh d. Gosavi (2017) adverse drug reaction of lithium carbonate-a review. *Journal of Critical Reviews*, 4 (1), 1-6. doi:10.22159/jcr.2017v4i1.14555
6. Cunha, M., Santos, E., Andrade, A., Jesus, R., Aguiar, C., Marques, F., Enes, F., Santos, M., Fernandes, R. and Soares, S., 2013. Eficácia da limpeza e desinfecção do meatourinário antes da cateterizaçãourinária: revisão sistemática. *Revista da Escola de Enfermagem da USP*, 47(6), pp.1410-1416.
7. Eric Wei Chiang Chan, Siu Kuin Wong, Joseph Tangah, Hung Tuck Chan. "Chemistry and Pharmacology of Artocarpin: An Isoprenyl Flavone from Artocarpus Species." *Systematic Reviews in Pharmacy* 9.1 (2018), 58-63. Print. doi:10.5530/srp.2018.1.12
8. Fasugba, O., Koerner, J., Mitchell, B.G. and Gardner, A., 2017. Meatal cleaning with antiseptics for the

- prevention of catheter-associated urinary tract infections: a discussion paper. *Infection, Disease & Health*, 22(3), pp.136-143.
9. Felix, K., Bellush, M., & Bor, B. (2014). Guide to Preventing Urinary Tract Infections. Washington, DC, USA: APIC. Retrieved from [http://apic.org/Resource\\_/EliminationGuideForm/0ff6ae59-0a3a-4640-97b5eee38b8bed5b/File/CAUTI\\_06.df](http://apic.org/Resource_/EliminationGuideForm/0ff6ae59-0a3a-4640-97b5eee38b8bed5b/File/CAUTI_06.df)
  10. Flores-Mireles, A.L., Walker, J.N., Caparon, M. and Hultgren, S.J., 2015. Urinary tract infections: epidemiology, mechanisms of infection and treatment options. *Nature reviews microbiology*, 13(5), pp.269-284.
  11. García-Monasterio, E.I., Álvarez-Vázquez, J.C., Morado-Quiñoa, P., Pena-Pena, A., Mazón, M.F., Bouso, A.M., López, A.L. and Cendán-Celeiro, E., 2019. Post-operative pain management among surgical trauma patients in an acute ward: a best practice implementation project. *JBI database of systematic reviews and implementation reports*, 17(9), pp.1941-1953.
  12. Gould, D., Gaze, S., Drey, N. and Cooper, T., 2017. Implementing clinical guidelines to prevent catheter-associated urinary tract infections and improve catheter care in nursing homes: Systematic review. *American journal of infection control*, 45(5), pp.471-476.
  13. Gould, C.V., Umscheid, C.A., Agarwal, R.K., Kuntz, G., Pegues, D.A. and Healthcare Infection Control Practices Advisory Committee, 2010. Guideline for prevention of catheter-associated urinary tract infections 2009. *Infection Control & Hospital Epidemiology*, 31(4), pp.319-326.
  14. Caselli, E., D'Accolti, M., Soffritti, I., Lanzoni, L., Bisi, M., Volta, A., Berloco, F. and Mazzacane, S., 2019. An Innovative Strategy for the Effective Reduction of MDR Pathogens from the Nosocomial Environment.
  15. Heiner, J.D., Hile, D.C., Demons, S.T. and Wedmore, I.S., 2010. 10% Povidone-iodine may be a practical field water disinfectant. *Wilderness & environmental medicine*, 21(4), pp.332-336.
  16. Huang, K., Liang, J., Mo, T., Zhou, Y. and Ying, Y., 2018. Does periurethral cleaning with water prior to indwelling urinary catheterization increase the risk of urinary tract infections? A systematic review and meta-analysis. *American journal of infection control*, 46(12), pp.1400-1405.
  17. Kara, A. and Özyürek, P., 2017. The effect of periurethral care and follow-up on bacteriuria in patients with urinary catheter: A comparison of three solutions. *Journal of Clinical and Experimental Investigations*, 8(2), pp.62-69.
  18. Indonesia, D.K.R., 2008. Pedoman manajerial pencegahan dan pengendalian infeksi di rumah sakit dan fasilitas pelayanan kesehatan lainnya. Jakarta: Departemen Kesehatan RI.
  19. Kementrian Kesehatan, R.I., 2014. Pusat data dan informasi. Jakarta Selatan: Kementrian Kesehatan RI.
  20. Khan, H.A., Baig, F.K. and Mehboob, R., 2017. Nosocomial infections: Epidemiology, prevention, control and surveillance. *Asian Pacific Journal of Tropical Biomedicine*, 7(5), pp.478-482.
  21. Kulthanan, K., Nuchkull, P. and Varothai, S., 2013. The pH of water from various sources: an overview for recommendation for patients with atopic dermatitis. *Asia Pacific Allergy*, 3(3), pp.155-160.
  22. Maunoury, F., Farinetto, C., Ruckly, S., Guenezan, J., Lucet, J.C., Lepape, A., Pascal, J., Souweine, B., Mimoz, O. and Timsit, J.F., 2018. Cost-effectiveness analysis of chlorhexidine-alcohol versus povidone iodine-alcohol solution in the prevention of intravascular-catheter-related bloodstream infections in France. *PloS one*, 13(5), p.e0197747.
  23. Mazzo, A., Bardivia, C.B., Jorge, B.M., Júnior, V.D.S., Fumincelli, L. and Mendes, I.A.C., 2015. Cateterismo urinário permanente: prática clínica. *Enfermería Global*, 14(2), pp.50-77.
  24. Bhayani, P., Rawekar, R., Bawankule, S., Kumar, S., Acharya, S., Gaidhane, A. and Khatib, M.N., 2019. Profile of urinary tract infection in a rural tertiary care hospital: Two-year cross-sectional study. *Journal of DattaMeghe Institute of Medical Sciences University*, 14(1), p.22.
  25. Parker, V., Giles, M., Graham, L., Suthers, B., Watts, W., O'Brien, T. and Searles, A., 2017. Avoiding inappropriate urinary catheter use and catheter-associated urinary tract infection (CAUTI): a pre-post control intervention study. *BMC health services research*, 17(1), p.314.
  26. Polit, D.F. and Beck, C.T., 2008. Nursing research: Generating and assessing evidence for nursing practice. Lippincott Williams & Wilkins.
  27. Rutala, W.A. and Weber, D.J., 2008. Guideline for disinfection and sterilization in healthcare facilities, 2008.
  28. Samad, R. A. (2013). Hubungan pemasangan kateter dengan kejadian infeksi saluran kemih pada pasien di ruang rawat inap penyakit dalam RSUDZA Banda Aceh year 2012. *Jurnal Keperawatan Medikal Bedah*, 1(1).
  29. Suharta, E.W. and Ruhyana, R., 2015. Pengaruh Indwelling Model American Association of Critical Care Nurses (AACN) terhadap Tingkat Bakteriuria Pasien di RSUP Dr. Soeradji Tirtonegoro Klaten (Doctoral dissertation, STIKES'Aisyiyah Yogyakarta).
  30. Trautner, B.W., Kelly, P.A., Petersen, N., Hysong, S., Kell, H., Liao, K.S., Patterson, J.E. and Naik, A.D., 2011. A hospital-site controlled intervention using audit and feedback to

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implement guidelines concerning inappropriate bacteriuria. *Implementation Science*, 6(1), p.41.  
treatment of catheter-associated asymptomatic