CADTH

CADTH RAPID RESPONSE REPORT:
SUMMARY WITH CRITICAL APPRAISAL

Antisepsis for Urinary Catheter Insertion: A Review of Clinical Effectiveness and Guidelines

Service Line:	Rapid Response Service
Version:	1.0
Publication Date:	January 09, 2019
Report Length:	18 Pages

CADTH

Authors: Michelle Clark, Mary-Doug Wright

Cite As: Antisepsis for urinary catheter insertion: a review of clinical effectiveness and guidelines. Ottawa: CADTH; 2019 Jan. (CADTH rapid response report: summary with critical appraisal).

ISSN: 1922-8147 (online)

About CADTH: CADTH is an independent, not-for-profit organization responsible for providing Canada's health care decision-makers with objective evidence to help make informed decisions about the optimal use of drugs, medical devices, diagnostics, and procedures in our health care system.

Funding: CADTH receives funding from Canada's federal, provincial, and territorial governments, with the exception of Quebec.

Abbreviations

CAUTI	catheter-associated urinary tract infection
RCT	randomized controlled trial
SR	systematic review
UTI	urinary tract infection

Context and Policy Issues

A urinary tract infection (UTI) may involve the kidneys (upper tract infection), or the bladder, urethra, or prostate (lower tract infection).[1] Bacteria are most often the cause of a UTI.[1] Healthcare-associated UTIs are the fourth most common type of healthcare-associated infection and approximately 80% of healthcare-associated UTIs are related to the use of indwelling urinary catheters.[1] A catheter-associated UTI (CAUTI) is diagnosed when infection symptoms are observed within 48 hours of catheterization and a urine specimen tests positive for infection-causing bacteria.[1] CAUTIs have been associated with harms such as increased morbidity and mortality and costs such as increased length of stay and hospital costs.[1]

A urinary catheter provides a way for bacteria to enter the urinary tract more easily. These infections most often result from bacteria already present on the patient in the meatal, rectal or vaginal areas, and less often from contamination of the catheterization equipment or the hands of the healthcare personnel;[1] therefore, several antiseptic agents or procedures are available to clean these areas prior to the insertion of urinary catheters with the aim of reducing the incidence of CAUTIs.

The objective of this report is to summarize the evidence regarding the clinical effectiveness and the evidence-based guidelines regarding antisepsis procedures or agents to reduce infection in patients undergoing urinary catheter insertion.

Research Questions

1. What is the comparative clinical effectiveness of antisepsis procedures or agents to reduce infection in patients undergoing urinary catheter insertion?
2. What are the evidence-based guidelines informing the use of antisepsis procedures or agents to reduce infection in patients undergoing urinary catheter insertion?

Key Findings

Good quality evidence from one network meta-analysis and one systematic review suggested that there was no statistically significant difference between various topical cleansing agents, ranging from soap and water to chlorhexidine, used prior to urinary catheter insertion in the rate of catheter-associated urinary tract infections.

No evidence-based guidelines were identified informing the use of antisepsis procedures or agents to reduce infection in patients undergoing urinary catheter insertion.

Methods

Literature Search Methods

A limited literature search was conducted on key resources including PubMed, The Cochrane Library, University of York Centre for Reviews and Dissemination (CRD) databases, Canadian and major international health technology agencies, as well as a focused Internet search. Methodological filters were applied to limit retrieval to health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, and guidelines. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2013 and November 30, 2018.

Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Q1, Q2: Adult patients (inpatient or in outpatient/community settings) undergoing urinary catheter (i.e., either indwelling and/or intermittent catheters) insertion
Intervention	Q1, Q2: Antisepsis procedures and/or cleansing agents
Comparator	Q1: Standard care (currently used antisepsis procedures and/or cleansers/cleansing agents) Q2: No comparator
Outcomes	Q1: Clinical effectiveness (e.g., reduced infection rates, hospital length of stay) and harms Q2: Evidence-based guidelines
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies, evidence-based guidelines

Exclusion Criteria

Articles were excluded if they did not meet the selection criteria outlined in Table 1, they were duplicate publications, or were published prior to 2013. Guidelines with unclear methodology were also excluded.

Critical Appraisal of Individual Studies

The included network meta-analysis was appraised using the ISPOR Indirect Treatment Comparison/Network Meta-Analysis Study Questionnaire[2] and the systematic review (SR) was critically appraised using AMSTAR II.[3] Summary scores were not calculated for the included studies; rather, a review of the strengths and limitations of each included study were described narratively.

Summary of Evidence

Quantity of Research Available

A total of 556 citations were identified in the literature search. Following screening of titles and abstracts, 549 citations were excluded and seven potentially relevant reports from the electronic search were retrieved for full-text review. No potentially relevant publications were retrieved from the grey literature search for full-text review. Of these potentially relevant articles, five publications were excluded for various reasons, and three publications (two SRs[4,5] and an NMA[6]) met the inclusion criteria. The overlap of primary studies included in the three publications was investigated and is presented in Appendix 5. It was determined that all of the primary studies included in the 2017 SR by Fasugba et al.[4] were also included in the 2018 NMA by Cao et al.[6] Therefore, the SR by Fasugba et al. was excluded from analysis in the CADTH review, and the remaining two publications were included in the review. Appendix 1 presents the PRISMA[7] flowchart of the study selection.

Summary of Study Characteristics

Additional details regarding the characteristics of included publications are provided in Appendix 2.

Study Design

Both the NMA and the SR were published in 2018 and the literature searches of both publications were conducted from the inception of the databases searched to October 2017.[5,6] The NMA[6] included 31 randomized controlled trials (RCTs) and three quasi-experimental trials. The SR[5] included five RCTs. Two primary studies (Nasiriani 2009 and Webster 2001) were included in both the NMA[6] and SR[5] (Appendix 5).

Country of Origin

The NMA and the SR were both conducted by research groups based in China.[5,6]

Patient Population

Patient characteristics were not well described in either the NMA or the SR. The authors of the NMA[6] limited inclusion to adult patients only. Huang et al.[5] included studies that enrolled both adult and pediatric patients. The scope of the CADTH review was adult patients only; however, two of the five studies in this review included pediatric patients and the results could not be separated by subgroup for the purposes of reporting in the CADTH review.

The patient populations incorporated into the NMA and SR included:

- Medical and surgical patients[6]
- Rehabilitation patients[6]
- Neurosurgery patients[6]
- Neurosurgery and orthopedic patients[6]
- Stroke patients[6]
- Elderly stroke patients[6]
- Community nursing service centre[5]
- Pregnant obstetric patients[5,6]
- Female gynecological surgery patients[5,6]
- Female intensive care unit patients[6]

- Male transurethral surgery patients[6]
- Male veterans in long-term care[6]
- Pediatric patients in an emergency department[5]
- Pediatric patients in the intensive care unit[5]

Interventions and Comparators

The comparisons examined in the NMA[6] were:

- Iodine versus tap water
- Chlorhexidine versus tap water
- Antibacterial use versus routine meatal care
- Iodine versus saline
- Iodine versus soap and water
- Iodine versus routine meatal care
- Soap and water versus routine meatal care
- Chlorhexidine versus saline
- Iodine versus chlorhexidine

The authors of the SR[5] were interested in the comparison of tap or sterile water with any antiseptic solutions for periurethral cleaning prior to the insertion of urinary catheters.

Outcomes

Both the NMA and the SR included primary studies that examined the incidence rate of CAUTIs.[5,6]

Summary of Critical Appraisal

Additional details regarding the strengths and limitations of included publications are provided in Appendix 3.

Network Meta-Analysis

Relevance

The population of the NMA, adults requiring a urinary catheter, was relevant. No relevant interventions or outcomes of interest were missing from the analysis and the studies were conducted in a variety of clinical settings.[6]

Credibility

The authors attempted to identify all relevant RCTs related to the research questions and the identified trials form one connected network of RCTs to allow for the indirect comparison of the interventions of interest.[6] It was possible that poor quality studies were included in the NMA. Although the authors provided an assessment of the risk of bias of the included studies, many assessment elements were categorized as having unclear or high risk of bias and an overall assessment of the risk of bias for each individual study was not provided.[6] It was unlikely that selective reporting bias was present as the only relevant clinical outcome identified for these studies was the incidence of CAUTIs. It was unclear whether there were any systematic differences in treatment effect modifiers. Baseline patient and study characteristics were not well described. Cao et al.[6] indicated that there was no significant heterogeneity detected amongst the primary studies; however, no details were provided regarding the assessment or calculations.

Analysis

Bayesian methods with both fixed- and random-effects multiple treatment comparisons were used to assess odds ratios. Heterogeneity was explored and reported to be non-significant; however, no further detail was provided regarding the inputs or the results of the analysis.[6]

Reporting quality and transparency

A graphical representation of the evidence network was provided but the information on the number of RCTs per direct comparison was presented only within the text of the report. Individual study results were presented separately but the results of the direct and indirect comparisons of the NMA were not. Pairwise contrasts between interventions were presented along with 95% confidence intervals and the interventions were ranked. The effect of patient characteristics on treatment effects was not reported.[6]

Interpretation and Conflict of interest

The conclusions of the report appeared to be fair and balanced. The authors reported no potential conflicts of interest.[6]

Systematic Reviews

The SR by Huang et al.[5] was generally well conducted. The authors indicated the review was conducted according to the Cochrane Handbook for Systematic Reviews of Interventions. The objective of the review was stated only in the abstract and no specific research questions were presented. The inclusion criteria were clearly outlined including criteria for the population, interventions, comparisons, and outcomes of interest. A search of multiple databases was conducted; however there was no clear explanation for limiting inclusion to only RCTs and no list of excluded studies was provided. Study selection and data extraction were done in duplicate. Individual study characteristics were well described. The authors used the Cochrane Risk of Bias tool to assess the risk of bias of the individual studies included in the SR and the authors assessed the potential impact of the risk of bias of individual studies when discussing the reporting of the SR results. No information was provided regarding any potential conflicts of interest or the possible impact of publication bias on the results of the SR.[5]

Summary of Findings

Appendix 4 presents a table of the main study findings and authors' conclusions.

Clinical Effectiveness of Antiseptic Agents or Procedures

The results of the NMA did not show any statistically significant differences in the incidence of CAUTIs between the different cleaning methods.[6] Although the differences in effectiveness were not statistically significantly different, the authors used probability sequencing to rank the interventions for effectiveness from one to seven. Chlorhexidine ranked first, clean water was second, soap and water third. Iodine, saline, routine meatal care, and antibacterial use ranked from four to seven.[6]

The results of the meta-analysis[5] comparing water and antiseptics (all types grouped together) showed no statistically significant difference in the rate of CAUTI between groups (12.9% versus 12.5%). Subgroup analyses were conducted comparing water with povidone-iodine and water with chlorhexidine and the lack of statistically significant differences in bacteriuria rates remained.[5] Based on the data provided in the individual

studies included in the SR, the authors concluded that either tap water or sterile water could be used as an option for periurethral cleaning prior to urinary catheter insertion.

Evidence-based Guidelines

No relevant evidence-based guidelines regarding the use of antiseptic procedures or agents to reduce infection in patients undergoing urinary catheter insertion were identified; therefore, no summary can be provided.

Limitations

Both of the publications included in this review were conducted by groups based in China and 20 of the 34 trials included in the NMA by Cao et al.[6] were conducted in China. It is unclear from the information provided in the reviews whether the healthcare systems or incidence rates of CAUTIs are different enough between China and Canada to present a limitation to the generalizability of these results to a Canadian context.

Cao et al.[6] indicated that many of the studies included in their NMA did not adequately describe their randomization methods and suggested that the results could be strengthened by the inclusion of large, multi-centre RCTs with a blinded and controlled design and indicated that the extrapolation of results is limited.[6]

Many of the studies included in both analyses included fewer than a hundred patients and were considered to be small sample sizes by the review authors.[5,6] Huang et al.[5] indicated that the inclusion of relatively few (five) publications despite the broad literature search criteria could pose a problem in relation to the applicability of the results.

In the SR by Huang et al.[5] some of the studies in the meta-analysis included pediatric patients. Specifically, two of the three studies in the water versus iodine analysis and one of the studies in the water versus chlorhexidine analysis included pediatric patients.[5] Pediatric patients were not within the scope of the CADTH review; however, the results could not be separated as reported by Huang et al. The direction of the effect was the same across studies and no significant differences were identified between the effectiveness of the interventions so the inability to analyze the adult and pediatric studies separately is unlikely to impact the generalizability of the results.

Some studies in the analyses included both female and male participants which could impact the interpretation of the results.[5,6] Anatomy generally makes females more prone to UTIs than males, and the inclusion of both females and males within the same study would be expected to impact the absolute rate of UTIs observed. Whether there were differences between males and females in the clinical effectiveness of antisepsis procedures was not examined. In addition, Huang et al.[5] indicated that the definitions of UTI varied between studies and infection was quantified using different colony counts (10^3 to 10^5 colony forming units) which could result in measurement bias.

Neither publication provided any information regarding adverse events associated with the different antisepsis procedures. Information on possible harms could be important for more thorough discussion and decision-making.

Conclusions and Implications for Decision or Policy Making

One NMA[6] and one SR[5] were identified that examined the use of antisepsis procedures or agents to reduce the incidence of infection in patients undergoing urinary catheter insertion. No relevant evidence-based guidelines were identified.

Both analyses found there was no statistically significant difference in the rate of CAUTIs associated with any of the antiseptic agents that were studied for use prior to the insertion of urinary catheters.[5,6] These findings suggest that the choice of agent or procedure can be based on availability or preference since there is no conclusive evidence supporting superior effectiveness of any one method. Although the differences between them were not statistically significant, Cao et al.[6] did rank the interventions from one (being potentially the most effective) to seven based on probability sequencing, as follows: chlorhexidine, clean water, soap and water, iodine, saline, routine meatal care, and antibacterial use. The inclusion of studies with a relatively small number of patients and also the inclusion of individual studies that included both male and female patients could potentially impact the applicability of the results to all populations.

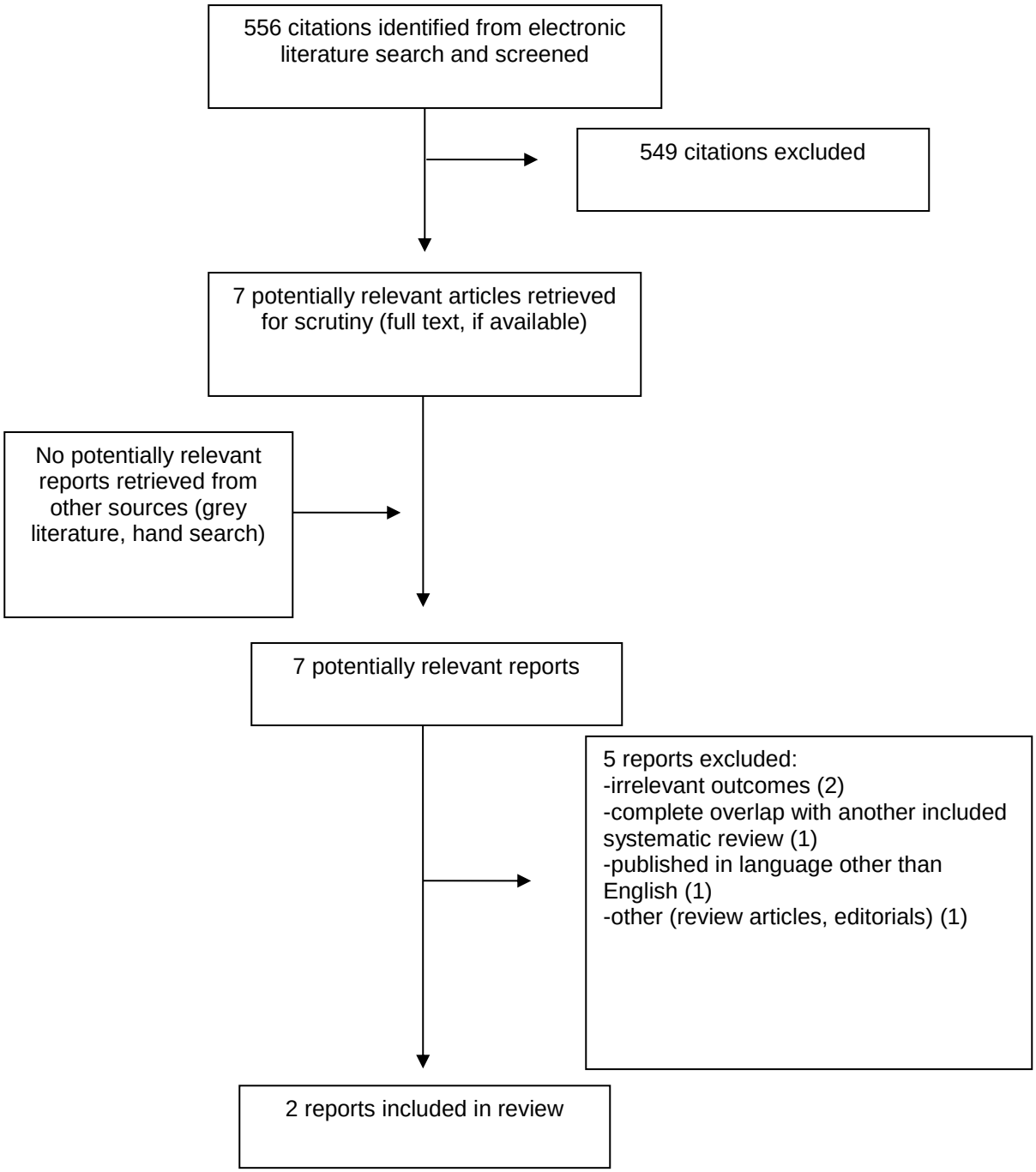
Further investigation of adverse events associated with any of the antiseptic interventions could be helpful for future decision making. Additionally, further larger scale and longer term randomized studies could potentially be helpful to reduce any remaining uncertainty regarding the antiseptic interventions used prior to catheter insertion.

A previous CADTH report[8] was produced in 2017 that examined cleaning methods for the insertion and maintenance of indwelling urinary catheters. While the previous report was based on the content of the abstracts of the publications, the general conclusions were similar to the current CADTH review with no significant differences being reported in the rate of CAUTI between different pre-insertion cleansing methods.[8] Seven guidelines were identified in the previous CADTH report; however, none of them were eligible for inclusion in the current review due to publication dates or ineligible guideline development methods.[8] Generally, the recommendations of the older guidelines align with the results of the NMA and SR presented in this CADTH review. A guideline on healthcare infection prevention from the National Institute for Health and Care Excellence (NICE) recommends that the meatus should be cleaned before the insertion of a urinary catheter, but did not specify what methods should be used for this cleaning. The guideline also recommends that the meatus of any patient with a urinary catheter should be cleaned daily with soap and water.[9] The Centers for Disease Control concludes that there is not sufficient evidence to recommend any specific solution for cleaning prior to urinary catheter insertion.[10]

References

1. Canadian Patient Safety Institute, Canadian Institute for Health Information. Urinary tract infection. *Hospital Harm Improvement Resource*. Ottawa (ON): Canadian Patient Safety Institute; 2016 Apr: http://www.patientsafetyinstitute.ca/en/toolsResources/Hospital-Harm-Measure/Documents/Resource-Library/HHIR%20UTI.pdf. Accessed 2018 Dec 30.
2. Jansen J. Indirect treatment comparison/network meta-analysis study questionnaire to assess relevance and credibility to inform health care decision making: An ISPOR-AMCP-NPC Good Practice Task Force report. *Value Health.* 2014:157-173.
3. Shea BJ, Reeves BC, Wells G, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. *BMJ.* 2017;358:j4008. http://www.bmj.com/content/bmj/358/bmj.j4008.full.pdf. Accessed 2018 Dec 30.
4. Fasugba O, Gardner A. Catheter associated urinary tract infections (CAUTIS): a research update. *Aust Nurs Midwifery J.* 2017;24(8):43.
5. Huang K, Liang J, Mo T, Zhou Y, Ying Y. Does periurethral cleaning with water prior to indwelling urinary catheterization increase the risk of urinary tract infections? A systematic review and meta-analysis. *Am J Infect Control.* 2018.
6. Cao Y, Gong Z, Shan J, Gao Y. Comparison of the preventive effect of urethral cleaning versus disinfection for catheter-associated urinary tract infections in adults: a network meta-analysis. *Int J Infect Dis.* 2018;76:102-108.
7. Liberati A, Altman DG, Tetzlaff J, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *J Clin Epidemiol.* 2009;62(10):e1-e34.
8. Young C, Argáez C. Cleansing methods during the insertion and maintenance of indwelling urinary catheters: clinical effectiveness and guidelines. Ottawa (ON): CADTH; 2017: https://cadth.ca/sites/default/files/pdf/htis/2017/RB1110%20Infection%20Control%20Final.pdf. Accessed 2019 Jan 08.
9. National Institute for Health and Care Excellence. Healthcare-associated infections: prevention and control in primary and community care. *(Clinical guideline CG139)* 2017: https://www.nice.org.uk/guidance/cg139/resources/healthcareassociated-infections-prevention-and-control-in-primary-and-community-care-pdf-35109518767045. Accessed 2019 Jan 09.
10. Gould C, Umscheid C, Agarwal R, Kuntz G, Pegues D, Healthcare Infection Control Practices Advisory Committee (HICPAC). Guideline for prevention of catheter-associated urinary tract infections Atlanta (GA): CDC; 2009: https://www.cdc.gov/infectioncontrol/pdf/guidelines/cauti-guidelines.pdf Accessed 2019 Jan 08.
11. Fasugba O, Koerner J, Mitchell BG, Gardner A. Systematic review and meta-analysis of the effectiveness of antiseptic agents for meatal cleaning in the prevention of catheter-associated urinary tract infections. *J Hosp Infect.* 2017;95(3):233-242.

Appendix 1: Selection of Included Studies



Appendix 2: Characteristics of Included Publications

Table 2: Characteristics of Included Network Meta-Analyses and Systematic Reviews

First Author, Publication Year, Country	Study Designs and Numbers of Primary Studies Included	Population Characteristics	Interventions and Comparator(s)	Clinical Outcomes, Length of Follow-Up
Cao, 2018[6] **China**	31 RCTs and 3 quasi-experimental trials Literature search: Inception to October 1, 2017	N = 6490 Participants: • Medical and surgical patients • Male transurethral surgery patients • Rehabilitation inpatients • Male veterans in long-term care • Pregnant obstetric patients • Neurosurgery and orthopedic patients • Neurosurgery patients • Female gynecological surgery patients • Female ICU patients • Elderly stroke patients • Stroke patients	Comparisons: • Iodine vs tap water (n = 13) • Chlorhexidine vs tap water (n = 6) • Antibacterial use vs routine meatal care (n = 4) • Iodine vs saline (n = 3) • Iodine vs soap and water (n = 3) • Iodine vs routine meatal care (n = 2) • Soap and water vs routine meatal care (n = 1) • Chlorhexidine vs saline (n = 1) • Iodine vs chlorhexidine (n = 1)	Primary outcome • Incidence rate of CAUTIs

Huang, 2018[5]
 	
China
	5 RCTs
	
	Literature search: Inception to October 2017
		N = 822
		
		Participants:
		• Adult and pediatric patients undergoing urinary catheterization
		  ○ Gynecologic surgery (n = 60)
		  ○ Emergency department of a pediatric hospital (n = 186)
		  ○ Obstetrics (n = 436)
		  ○ Community nursing service center (n = 20)
		  ○ Pediatric ICU (n = 122)
			Interventions:
			• Periurethral cleaning with water (tap or sterile)
			
			Comparators:
			• Periurethral cleaning with any antiseptic solution
				Primary outcome
				• Incidence of UTIs (symptomatic or asymptomatic)

CAUTI = catheter-associated urinary tract infection; ICU = intensive care unit; RCT = randomized controlled trial; UTI = urinary tract infection.

Appendix 3: Critical Appraisal of Included Publications

Table 3: Strengths and Limitations of Network Meta-Analysis Using ISPOR-taskforce Questionnaire[2]

Item	Cao, 2018[6]		
	Yes	No	Cannot Answer
Relevance			
1. Is the population relevant?	X		
2. Are any relevant interventions missing?		X	
3. Are any relevant outcomes missing?		X	
4. Is the context (settings and circumstances) applicable?	X		
Credibility			
Evidence Base Used for the Indirect Comparison or Network Meta-Analysis			
1. Did the researchers attempt to identify and include all relevant RCTs?	X		
2. Do the trials for the interventions of interest form one connected network of RCTs?	X		
3. Is it apparent that poor quality studies were included, thereby leading to bias?	X		
4. Is it likely that bias was induced by selective reporting of outcomes in the studies?		X	
5. Are there systematic differences in treatment effect modifiers (i.e., baseline patient or study characteristics that have an impact on the treatment effects) across the different treatment comparisons in the network?			X
6. If yes (i.e., there are such systematic differences in treatment effect modifiers), were these imbalances in effect modifiers across the different treatment comparisons identified before comparing individual study results?			NA
Analysis			
7. Were statistical methods used that preserve within-study randomization? (No naive comparisons)	X		
8. If both direct and indirect comparisons are available for pairwise contrasts (i.e., closed loops), was agreement in treatment effects (i.e., consistency) evaluated or discussed?		X	
9. In the presence of consistency between direct and indirect comparisons, were both direct and indirect evidence included in the network meta-analysis?			X
10. With inconsistency or an imbalance in the distribution of treatment effect modifiers across the different types of comparisons in the network of trials, did the researchers attempt to minimize this bias with the analysis?			X

Table 3: Strengths and Limitations of Network Meta-Analysis Using ISPOR-taskforce Questionnaire[2]

Item	Cao, 2018[6]		
11. Was a valid rationale provided for the use of random-effects or fixed-effect models?		X	
12. If a random-effects model was used, were assumptions about heterogeneity explored or discussed?			X
13. If there are indications of heterogeneity, were subgroup analyses or meta-regression analysis with prespecified covariates performed?			NA
Reporting Quality and Transparency			
14. Is a graphical or tabular representation of the evidence network provided with information on the number of RCTs per direct comparison?	X		
15. Are the individual study results reported?	X		
16. Are results of direct comparisons reported separately from results of the indirect comparisons or network meta-analysis?		X	
17. Are all pairwise contrasts between interventions as obtained with the network meta-analysis reported along with measures of uncertainty?	X		
18. Is a ranking of interventions provided given the reported treatment effects and its uncertainty by outcome?	X		
19. Is the effect of important patient characteristics on treatment effects reported?		X	
Interpretation			
20. Are the conclusions fair and balanced?	X		
Conflict of Interest			
21. Were there any potential conflicts of interest?		X	
22. If yes, were steps taken to address these?			NA

NA = not applicable; RCT = randomized controlled trial.

Table 4: Strengths and Limitations of Systematic Review and Meta-Analysis using AMSTAR2[3]

Strengths	Limitations
Huang, 2018[5]	
• Review was conducted according to the Cochrane Handbook for Systematic Reviews • Inclusion criteria included PICO components • Review methods were established a priori • A comprehensive literature strategy was used (at least 2 databases, key words/search strategy, justified publication restrictions, hand searched reference lists, trial registries) • Study selection and data extraction in duplicate • Described included studies in adequate detail regarding PICO and study design • Authors used the Cochrane Collaboration Tool to assess the risk of bias of the individual studies included in the SR • Authors discussed the RoB assessment results of individual studies when discussing the reporting their results • Authors provided adequate explanation for heterogeneity observed in the results of the primary studies through statistical analysis • Authors assessed the potential impact of RoB in individual studies on the results of the meta-analysis using a random effects model	• Research questions were not specifically stated • Selection of study designs included in the review was not clearly explained • Authors did not provide a list of excluded studies with reasons for exclusion • Authors did not provide any information regarding sources of funding or conflicts of interest • Authors did not adequately investigate the impact of publication bias on the results of the SR

PICO = population, intervention, comparators, outcomes; RoB = risk of bias; SR = systematic review.

Appendix 4: Main Study Findings and Authors' Conclusions

Table 5: Summary of Findings of Included Network Meta-Analyses and Systematic Reviews and Meta-Analyses

Main Study Findings	Authors' Conclusion
Cao, 2018[6]	

Effect of urethral cleaning vs. disinfection for CAUTIs
• Iodine vs. routine meatal care
  ○ OR 1.19 (95% CI, 0.75 to 1.86 [*P* = 0.46])
• Iodine vs. tap water
  ○ OR 0.75 (95% CI, 0.51 to 1.10 [*P* = 0.14])
• Iodine vs. saline
  ○ OR 1.10 (95% CI, 0.60 to 2.02 [*P* = 0.77])
• Iodine vs. soap and water
  ○ OR 0.88 (95% CI, 0.48 to 1.61 [*P* = 0.69])
• Iodine vs. chlorhexidine
  ○ OR 0.36 (95% CI, 0.09 to 1.44 [*P* = 0.15])
• Antibacterial vs. routine meatal care
  ○ OR 0.74 (95% CI, 0.55 to 1.00 [*P* = 0.05])
• Chlorhexidine vs. tap water
  ○ OR 1.09 (95% CI, 0.69 to 1.71 [*P* = 0.72])
• Chlorhexidine vs. saline
  ○ OR 1.16 (95% CI, 0.32 to 4.30 [*P* = 0.82])
• Soap and water vs. routine meatal care
  ○ OR 1.59 (95% CI, 0.85 to 2.96 [*P* = 0.15)]
	• "The forest plots of risk differences (Figure 2) showed no significant differences in the incidence rates of CAUTI among the different urethral cleaning versus disinfection methods." (p106)
	• "With regard to efficacy, chlorhexidine ranked first, clean water ranked second, soap and water ranked third, and the other methods (iodine, saline, routine meatal care, and antibacterial use) ranked from 4 to 7." (p107)
	• "The Bayesian meta-analysis showed no significant difference between the various cleaning and disinfecting methods with regard to the prevention of CAUTIs, but the probability of sequencing results showed that the effects of chlorhexidine and iodophor were better than those of clean water and saline. Taking into consideration the existing medical conditions in developing countries, it is recommended that chlorhexidine or iodophor be used to clean the urethra only in critically ill patients or those with fecal incontinence in areas with relatively poor hygiene." (p 107)
	• "…cleaning and care using water, warm water, or saline results in less or no skin irritation compared to disinfectant, and will not cause an allergic reaction, which makes this type of care easier for the patient to accept. From the staff perspective, cleaning and care is easier and more manageable than disinfection." (p107)

Huang, 2018[5]	

Rate of bacteriuria
 	
<u>Meta-analysis</u>
• Water vs. antiseptics (5 trials, 822 patients)
  ○ The overall difference between groups was not significant (12.9% vs 12.5%)
  ○ RR 1.07 (95% CI, 0.77 to 1.49 [*P* = 0.89])
 	
<u>Subgroup analysis</u>
• Water vs. povidone-iodine (3 trials, 306 patients)
  ○ No significant difference in the rate of bacteriuria was observed (17.6% vs. 15.9%)
  ○ RR 1.10 (95% CI, 0.66 to 1.83 [*P* = 0.79])
• Water vs. chlorhexidine (3 trials, 516 patients)
  ○ No difference was noted in the rates of bacteriuria (10.1% vs. 10.4%)
  ○ RR 1.05 (95% CI, 0.68 to 1.62 [*P* = 0.41])
	• "We performed a systematic review and meta-analysis comparing the use of water and antiseptics for periurethral cleaning before indwelling urinary catheterization. The studies in our sample concluded that periurethral cleaning with water is not associated with increased UTIs. The same conclusion can be drawn from our subgroup analysis (based on different antiseptic solutions, povidone iodine or chlorhexidine gluconate)." (p1402)
	• "Both tap water and sterile water can be used for meatal cleaning before indwelling urinary catheterization based on the fact that all the included studies led to the same conclusion with some studies using tap water and others using sterile water." (p1402)

CAUTI = catheter-associated urinary tract infection; CI = confidence interval; OR = odds ratio; RR = risk ratio.

Appendix 5: Overlap between Included Systematic Reviews

Table 6: Primary Study Overlap between Included Network Meta-Analysis and Systematic Reviews

Primary Study Citation	Systematic Review Citation		
	Cao, 2018[6]	Huang, 2018[5]	Fasugba, 2017[a11]
Duzkaya, 2017		X	
Wang, 2017	X		
Liu, 2015	X		
Wu, 2015	X		
Liu, 2014	X		
Weng, 2014	X		
Zhong, 2014	X		
Chen, 2013	X		
Qin, 2013	X		
Pan, 2012	X		
Wang, 2012[b]	X		
Wang, 2012[c]	X		
Zhang, 2012	X		
Huang, 2011	X		
Zhou and Li, 2011	X		
Jeong, 2010	X		X
Li, 2010	X		
Ping, 2010	X		
Zhang, 2010	X		
Al-Farsi, 2009		X	
Nasiriani, 2009	X	X	X
Cheung, 2008		X	
Lang and Zhuang, 2008	X		
Shen and Wang, 2008	X		
Xu, 2006	X		
Ibrahim and Rashid, 2002	X		X
Webster, 2001	X	X	X
Carapeti, 1996	X		X
Duffy, 1995	X		X
Huth, 1992	X		X

Table 6: Primary Study Overlap between Included Network Meta-Analysis and Systematic Reviews

Primary Study Citation	Systematic Review Citation		
	Cao, 2018[6]	Huang, 2018[5]	Fasugba, 2017[a11]
King, 1992	X		X
Classen, 1991[d]	X		X
Classen, 1991[e]	X		X
Lynch, 1991	X		X
Burke, 1983	X		X
Burke, 1981[f]	X		X
Burke, 1981[g]	X		X

Note: Footnotes “b” to “g” denote study titles when there were multiple publications from the same author in the same year.
[a] = excluded from CADTH review due to complete overlap with Cao, 2018
[b] = “Comparison of effects of urethral nursing in indwelling catheterization patients”
[c] = “Comparison of the effects of disinfection and cleaning care on urethral orifice of patients with indwelling catheter”
[d] = “Daily Meatal care for prevention of catheter-associated bacteriuria: results using frequent applications of polyantibiotic cream”
[e] = “Prevention of catheter-associated bacterieuria: clinical trial of methods to block three known pathways of infection”
[f] = “Prevention of catheter-associated urinary tract infections: efficacy of daily meatal care regimens” (first study)
[g] = “Prevention of catheter-associated urinary tract infections: efficacy of daily meatal care regimens” (second study)