

CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

Coated Catheters to Reduce Urinary Tract Infections: Clinical Effectiveness, Cost- Effectiveness, and Guidelines

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Research Questions

1. What is the clinical effectiveness of coated catheters compared to standard non-coated catheters for patients requiring long-term urinary catheter use for the prevention of urinary tract infections and blockage?
2. What is the cost-effectiveness of coated catheters compared to standard non-coated catheters for patients requiring long-term catheter use?
3. What are the evidence-based guidelines regarding urinary catheters for patients requiring long-term catheter use?

Key Findings

Three systematic reviews, one randomized controlled trial, and one non-randomized study were identified regarding the effectiveness of coated catheters for the prevention of urinary tract infections and blockage. In addition, five evidence-based guidelines were identified regarding urinary catheters for patients requiring long-term catheter use.

Methods

A limited literature search was conducted on key resources including Ovid MEDLINE, 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. No filters were applied to limit the retrieval by study type for Q1 and Q2. For Q3 a methodological filter was applied to limit retrieval to guidelines. Where possible, retrieval was limited to the human population. The search was also limited to English language documents published between January 1, 2007 and April 10, 2019. Internet links were provided, where available.

Selection Criteria

One reviewer screened citations and selected studies based on the inclusion criteria presented in Table 1.

Table 1: Selection Criteria

Population	Adults requiring long-term (greater than or equal to 30 days) use of urinary catheters
Intervention	Coated urinary catheters (e.g., coated either with silver, antimicrobial agents, antiseptic agents, or hydrophilic agents)
Comparator	Q1-2: Non-coated or standard catheters Q3: No comparators
Outcomes	Q1: Clinical Effectiveness (reduction of urinary tract infections, prevention of urinary tract infections, prevention of blockages) Q2: Cost effectiveness Q3: Guidelines
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized trials, economic evaluations, evidence-based guidelines

Results

Rapid Response reports are organized so that the higher quality evidence is presented first. Therefore, health technology assessment reports, systematic reviews, and meta-analyses are presented first. These are followed by randomized controlled trials, non-randomized studies, economic evaluations, and evidence-based guidelines.

Three systematic reviews, one randomized controlled trial, and one non-randomized study were identified regarding the use of coated catheters for the prevention of urinary tract infections and blockage. In addition, five evidence-based guidelines were identified regarding urinary catheters for patients requiring long-term catheter use. No health technology assessment reports, meta-analyses, or economic evaluations were identified.

Additional references of potential interest are provided in the appendix.

Overall Summary of Findings

Three systematic reviews,¹⁻³ one randomized controlled trial,⁴ and one non-randomized study⁵ were identified regarding the use of coated catheters for the prevention of urinary tract infections and blockage. A wide range of health outcomes were reported and the conclusions were inconsistent.¹⁻⁵ Detailed study characteristics are provided in Table 2.

Five evidence-based guidelines were identified.⁶⁻¹⁰ The 2017 National Institute for Health and Care Excellence (NICE) guideline update recommended that clinicians should select the type of an indwelling urinary catheter based on an assessment of the patient's characteristics, such as age, allergy, gender, history of symptomatic urinary tract infection, patient preference and comfort, previous catheter history, and reason for catheterization.⁶ The guideline authors reported the absence of high-quality evidence on the effectiveness of different types of long-term indwelling catheters.⁶ The 2015 guideline by European Association of Urology stated that no clear recommendations could be given regarding silver alloy catheters due to the weak evidence and contradictory study results.⁷ The 2012 European Association of Urology Nurses guideline recommended that for long-term cauterization of more than two weeks, catheter materials designed for long-term use (100% silicone, hydrogel coating or silicone coating) should be used; antibiotic-impregnated

catheters were not recommended by the guideline due to lack of evidence on the reduction of symptomatic infection.⁸ The 2010 Infectious Disease Society of America (IDSA) guideline reported that there was insufficient data to make a recommendation for silver alloy-coated or antibiotic-coated catheters to reduce catheter-associated bacteriuria or CAUTI in patients with long-term catheterization.⁹ The 2009 guideline by Healthcare Infection Control Practices Advisory Committee (HICPAC) recommended clinicians to consider the use of antimicrobial/antiseptic-impregnated catheters if the catheter-associated urinary tract infections (CAUTI) rate was not decreasing after implementing a comprehensive strategy; it also recommended that in long-term catheterized patients who have frequent obstruction, silicone was preferred over other materials to reduce encrustation.¹⁰

Table 2: Characteristics of Included Literature

First Author, Publication Year, Country	Study Designs, Number of Studies Included and Population Characteristics	Intervention and Comparator(s)	Outcomes	Conclusions
Systematic Reviews				
Mauger Rothenberg, 2012¹ US	149 articles included N = NR Age: NR	Silver-coated catheters; antibiotic-coated catheters Comparator unclear	<ul style="list-style-type: none"> • Infection rate • Cost reduction 	“The authors state that the costs of purchasing antibiotic coated catheters and preparing insertion kits cost less than \$5,000 per year. No additional information was provided about other costs of implementation, for example, costs of education and supervision.” ¹
Jahn, 2012² Germany	3 trials included N = 102 Age: adults	Silver alloyed vs. silicone coated catheters PVC catheter group vs. latex catheter group vs. silicone catheter Hydrogel coated latex catheter vs. silicone catheter	<ul style="list-style-type: none"> • Urinary tract infection • Bacterial biofilm on the surfaces of catheters • Encrustation • Safety complications • Patient satisfaction 	“The updated search could not reveal any additional evidence. Very few trials have compared different types of catheter for long - term bladder drainage. All trials were small and showed methodological weaknesses. Therefore, the evidence was not sufficient as a reliable basis for practical conclusions. Further, better quality trials are needed to address the current lack of evidence in this clinically important area.” ²
Beattie, 2011³ UK	11 articles included 8 studies N = NR Age: NR	Silver alloy vs. uncoated urinary catheters	<ul style="list-style-type: none"> • CAUTI 	“The collective evidence divulged an emerging pattern favouring the efficacy of silver-alloy urinary catheters to reduce catheter-associated urinary tract infection. Owing to the poor quality of some individual studies included in other systematic reviews and the inability to carry out meta-analysis because of significant heterogeneity, definitive conclusions cannot be drawn from the study.” ³

First Author, Publication Year, Country	Study Designs, Number of Studies Included and Population Characteristics	Intervention and Comparator(s)	Outcomes	Conclusions
Randomized Controlled Trials				
Sarica, 2010⁴ Turkey	N = 25 Age: NR Male patients with spinal cord injuries.	Conventional vs. hydrophilic vs. gel-lubricated catheters	<ul style="list-style-type: none"> • Urethral trauma/urethral cell count • Number of leucocytes in the urine sediment • Microhematuri • Symptomatic urinary tract infection • Microbiological analysis of urine culture • Visual Analog Scale 	“The hydrophilic-coated catheter and especially the gel-lubricated non-hydrophilic catheter reduce trauma to the urethral surfaces and enable easy and comfortable catheterization...The hydrophilic and gel-lubricated catheters represent an attractive alternative to standard PVC catheters for urological rehabilitation in patients with spinal cord injuries.” ⁴
Non-Randomized Studies				
Lederer, 2014⁵ US	N = NR Age: NR	Standard catheter vs. silver-alloy hydrogel catheter	<ul style="list-style-type: none"> • CAUTI 	“Use of a silver-alloy hydrogel urinary catheter reduced symptomatic CAUTI occurrences as defined by both NHSN and clinical criteria.” ⁵

CAUTI = catheter-associated urinary tract infection; N = number of patients; NR = not reported; PCV = polyvinyl chloride; RCT = randomized controlled trial; vs. = versus.

References Summarized

Health Technology Assessments

No literature identified.

Systematic Reviews and Meta-analyses

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Randomized Controlled Trials

4. Sarica S, Akkoc Y, Karapolat H, Aktug H. Comparison of the use of conventional, hydrophilic and gel-lubricated catheters with regard to urethral micro trauma, urinary system infection, and patient satisfaction in patients with spinal cord injury: a randomized controlled study. *Eur J Phys Rehabil Med*. 2010 Dec;46(4):473-479.
[PubMed: PM20445490](#)

Non-Randomized Studies

5. Lederer JW, Jarvis WR, Thomas L, Ritter J. Multicenter cohort study to assess the impact of a silver-alloy and hydrogel-coated urinary catheter on symptomatic catheter-associated urinary tract infections. *J Wound Ostomy Continence Nurs*. 2014 Sep-Oct;41(5):473-480.
[PubMed: PM24922561](#)

Economic Evaluations

No literature identified.

Guidelines and Recommendations

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<https://www.nice.org.uk/guidance/cg139/resources/healthcareassociated-infections-prevention-and-control-in-primary-and-community-care-pdf-35109518767045>. Accessed 2019 Apr 29.
See: 2.3 Intermittent urinary catheters, page 30
2.4 Indwelling urinary catheters: catheter selection, page 31
10 Long term urinary catheters, pages 10-11
<https://www.ncbi.nlm.nih.gov/books/NBK115272/>
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See: 3E.5.1.3 Ineffective or counterproductive measures, page 29
8. Geng V, Cobusse-Boekhorst H, Farrell J et al. Evidence-based guidelines for best practice in urological health care. Catheterisation: indwelling catheters in adults. Urethral and suprapubic. Arnhem (NL): European Association of Urology Nurses; 2012 Feb: https://www.nursing.nl/PageFiles/11870/001_1391694991387.pdf. Accessed 2019 Apr 29.
9. Hooten TM, Bradley SF, Cardenas DD, et al. Diagnosis, prevention, and treatment of catheter-associated urinary tract infection in adults: 2009 international clinical practice guidelines from the Infectious Diseases Society of America. *Clin Infect Dis*. 2010 Mar 1;50(5):625-63: <https://academic.oup.com/cid/article/50/5/625/324341>. Accessed 2019 Apr 29.

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): Centers for Disease Control and Prevention (CDC); 2009: <https://www.cdc.gov/infectioncontrol/pdf/guidelines/cauti-guidelines.pdf>. Accessed 2019 Apr 29.

Appendix — Further Information

Previous CADTH Reports

11. Coated catheters to reduce risk of urinary tract infection. *Health Technology Inquiry Service*. Ottawa (ON): CADTH; 2007 Sep: <https://www.cadth.ca/coated-catheters-reduce-risk-urinary-tract-infection>

Randomized Controlled Trials

Alternative Population – Indwelling Catheter in for Less Than 30 Days

12. Bonfill X, Rigau D, Esteban-Fuertes M, et al. Efficacy and safety of urinary catheters with silver alloy coating in patients with spinal cord injury: a multicentric pragmatic randomized controlled trial. The ESCALE trial. *Spine J*. 2017 11;17(11):1650-1657.
[PubMed: PM28578163](#)

Alternative Population – Unspecified Time for Indwelling Catheter

13. Menezes FG, Correa L, Medina-Pestana JO, Aguiar WF, Camargo LFA. A randomized clinical trial comparing Nitrofurazone-coated and uncoated urinary catheters in kidney transplant recipients: Results from a pilot study. *Transpl Infect Dis*. 2019 Apr;21(2):e13031.
[PubMed: PM30451342](#)
14. Leuck AM, Johnson JR, Hunt MA, et al. Safety and efficacy of a novel silver-impregnated urinary catheter system for preventing catheter-associated bacteriuria: a pilot randomized clinical trial. *Am J Infect Control*. 2015 Mar 01;43(3):260-265.
[PubMed: PM25728152](#)
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[PubMed: PM23895463](#)
16. Erickson BA, Navai N, Patil M, Chang A, Gonzalez CM. A prospective, randomized trial evaluating the use of hydrogel coated latex versus all silicone urethral catheters after urethral reconstructive surgery. *J Urol*. 2008 Jan;179(1):203-206.
[PubMed: PM18001794](#)

Non-Randomized Studies – Alternative Population

Unspecified Time for Indwelling Catheter

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Clinical Practice Guidelines – Methodology Unclear

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Review Articles

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Additional References

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