

Do prophylactic catheter washouts reduce catheter-associated UTIs and blockage compared to standard care in adults with long-term catheters?

A systematic review with meta-analysis

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ABSTRACT

INTRODUCTION: Prophylactic catheter washouts (PCWs) are often recommended to patients with long-term catheters (LTCs) to reduce symptomatic catheter-associated urinary tract infection (S-CAUTI) and catheter blockage. This systematic review summarizes current evidence on the benefits and harms of regular PCWs for adults using LTCs.

METHODS: A literature search was conducted using MEDLINE, EMBASE, CINAHL, and CENTRAL (database inception to June 2024) for randomized controlled trials (RCTs) and quasi-RCTs comparing PCWs to standard care, or different catheter washout solutions to each other. The review followed Cochrane Handbook methodology. Certainty of evidence was assessed using GRADE. Detailed protocol registered with PROSPERO (CRD42024553575).

RESULTS: Seven RCTs were included. The review found lower S-CAUTI rates in saline washout groups (SWGs) than no washout groups (NWGs) (mean difference [MD] -0.10, 95% confidence interval [CI] -0.50–0.29; low certainty evidence; $p=0.61$) and lower S-CAUTI rates in any washout groups (WG) compared to NWGs (MD -0.05, 95% CI -0.42–0.32; low certainty evidence; $p=0.79$). The review found reduced odds of catheter blockage in acidic washout groups (AWGs) than SWGs (odds ratio [OR] 0.51, 95% CI 0.25–1.03; very low certainty evidence; $p=0.06$). Airaksinen 1979 also found increased odds of greater encrustation in their NWG compared to their SWG (OR 0.62, 95% CI 0.17–2.25; very low certainty evidence; $p=0.46$). The review found that WGs had reduced hematuria incidence (relative risk [RR] 0.99, 95% CI 0.87–1.12; moderate certainty evidence; $p=0.86$) compared to NWGs. Furthermore, WGs had higher EQ-5D-5L scores than NWGs, with SWGs MD -0.056 (97.5% CI -0.022–0.134, $p=0.11$) and AWGs MD -0.053 (97.5% CI -0.024–0.131, $p=0.12$), indicating possible improvement in quality of life (QoL).

CONCLUSIONS: PCWs may have more benefits and less harms than previously thought and could improve patients' QoL. Tailoring washout solutions to patients' needs may be beneficial. International RCTs abiding by SPIRIT and CONSORT guidelines are recommended, as most outcomes were of low certainty.

INTRODUCTION

The National Institute for Health and Care Excellence (NICE) CG139¹ and Cochrane Incontinence Group² define long-term catheters (LTCs) as catheters in situ for ≥ 28 days, with expected use over 6–12 months.³ LTCs are recommended for patients with urinary issues such as intractable urinary incontinence or chronic urinary retention.³

As LTCs are a foreign body, they can provide a surface for bacterial colonization and biofilm formation.⁴ This can lead to encrustations, catheter blockage, and/or catheter-associated urinary tract infection (CAUTI), the most common problems for LTC users. Approximately 40–50% of LTC patients experience debris or encrustation,⁵ which can cause catheter blockages leading to distress and increased healthcare utilisation.³ CAUTI has an average incidence of 13.79 per 1000 hospitalized patients, and a prevalence of 9.33%.⁶ Gage et al found that the average annual cost to the NHS for management of LTC-related complications totals £125 million.⁷

Catheter washouts (CW) involve injecting liquid solutions into catheters, clearing any debris and potentially preventing or treating blockages.⁸ Several types of washouts are used in clinical practice: acidic solutions are meant to dissolve encrustations,⁵ normal saline works as a sterile solution,⁹ while antimicrobial solutions reduce biofilm formation and bacterial load.⁵ Their respective clinical and cost effectiveness are currently unproven.^{5,9}

Table 1. PICOS questions

P	Population	<p>Inclusion criteria:</p> <ul style="list-style-type: none"> - Adults aged ≥18 years - Catheter in situ for ≥28 days with no plan for discontinuation at time of recruitment - All types and routes of LTC - Able to perform catheter washouts and/or complete trial documentation or have a carer to assist them <p>Exclusion criteria:</p> <ul style="list-style-type: none"> - Intermittent self-catheterization - Pregnant or considering pregnancy - Spinal cord injury at or above T6 (risk of autonomic dysreflexia) - Ongoing S-CAUTI, bladder cancer, bladder stones. - Visible haematuria - Allergies to washout solution
I	Interventions	<p>Prophylactic catheter washouts included:</p> <ul style="list-style-type: none"> - Acidic solution - Antiseptic/antibiotic/antimicrobial solution - Saline solution
C	Comparators	<p>Control group:</p> <ul style="list-style-type: none"> - Standard care alone - Any solution mentioned above against another
O	Outcomes	<p>Primary outcome was objective measures of S-CAUTI and catheter blockage</p> <ul style="list-style-type: none"> - S-CAUTI rates - Rate of catheter blockage or obstruction - Catheter removal rates due to blockage or infection <p>Secondary outcomes:</p> <ul style="list-style-type: none"> - Washout acceptability measures - Health economic outcomes - Measures of complications or adverse effects of washouts - Health status or psychological health e.g., quality of life
S	Study design	<p>Inclusion criteria</p> <ul style="list-style-type: none"> - Randomized controlled trials - Quasi-randomized controlled trial and crossover trials comparing outcomes <p>Exclusion criteria</p> <ul style="list-style-type: none"> - Non-randomized controlled trials; cohort studies (prospective, retrospective); case reports; single-arm case series; ongoing clinical trials; editorials; letters

Arguably, washouts can damage bladder mucosa and potentially increase CAUTI risk.³ A 2017 Cochrane review found no high-level evidence on the effectiveness of various washout policies in preventing catheter encrustations.⁵ Thus, the practice is not currently recommended in the prevention of CAUTI or cath-

eter blockages.⁵ The European Association of Urology (EAU)⁶ guidelines reflect this and advise avoiding routine irrigation for LTC users.¹⁰

In the U.K., the prevalence of community LTC users is 0.14% or approximately 90 000 people.⁷ Elderly people have the highest prevalence of catheterization and, with an ageing population in the developed world, the incidence of LTC users and LTC complications are expected to rise.¹¹ Preventing LTC morbidity from catheter blockage and CAUTI is therefore crucial. The aim of this systematic review was to summarize the current evidence on the clinical and cost-effectiveness of prophylactic LTC washouts in preventing complications among LTC users.

This systematic review summarizes the evidence on the clinical and cost-effectiveness of prophylactic CWs in adults living with LTCs. The objectives are:

1. To determine if a policy of regular, prophylactic CWs plus standard LTC care would result in a reduction of catheter blockage and CAUTI requiring intervention compared to standard LTC care alone.
2. To evaluate if a policy of regular, prophylactic CWs plus standard LTC care would be more cost-effective than the current guidelines of standard LTC care alone.

METHODS

This systematic review was conducted according to standard methodology outlined by the Cochrane Handbook for Systematic Reviews of Interventions¹² and the PRISMA 2020 reporting guidelines.^{13,14} A priori protocol was registered at PROSPERO with registration number CRD42024553575.¹⁵

MEDLINE, EMBASE, CINAHL, and CENTRAL databases were searched for all relevant publications (database inception to June 2024). Detailed search strategy is included in Appendix 1 (available at cuaj.ca). The review referred to the search strategy and reference list of a Cochrane review on a similar topic by Shepherd et al.⁸

The identified trials were screened following the PICO approach, abiding by the PRISMA guidelines:¹³ participants (P), interventions (I), comparator(C), outcome (O) (Table 1).

Two independent review authors (EW, CY) performed abstract and full-text screening using Covidence. Any disagreements were resolved by discussion or consulting a third review author (MIO).

A standardized data extraction form was developed and piloted. One reviewer (EW) independently extracted data, which was cross-checked by a second review author (CY) for accuracy. Disagreements were

Table 2. Characteristics of included trials

Trial ID	Setting	Duration	Design	Patients randomized	Arms	Dose and frequency	Primary outcome
Airaksinen 1979	Finland/hospital and home care	6 months	Parallel RCT	40	Arm 1: Saline washout + silicath catheter. Arm 2: Saline washout + silastic catheter Arm 3: No washout + silicath catheter Arm 4: No washout + silastic catheter	Arm 1 and 2: Every 2 weeks, 10mL or 20mL saline ^a	Bacteriuria rates, symptomatic UTI rates, visual encrustation rates, rate of catheter obstruction/blockage
Muncie 1989	U.S./hospital and medical center	24 weeks – 10 weeks per phase	Crossover RCT	44	Arm 1: Saline Arm 2: No washout	Saline: 30 mL, 1x a day for 10 weeks	The incidence of catheter obstructions and febrile episodes and bacteriuria (4 most prevalent organisms in each phase)
Kennedy 1992	U.K./three geriatric hospitals	12 weeks – 1 week run-in saline, 3 x 3 weeks with each solution, 1 week normal saline washout	Crossover RCT	25	Arm 1: Saline Arm 2: Suby G ^b Arm 3: Solution R ^c	Saline: 100 mL, 2x a week for 3 weeks. Suby G: 100 mL, 3.23% citric acid, 2x a week for 3 weeks. Solution R: 100 mL, 6% citric acid, 2x a week for 3 weeks	Catheter blockage, degree of visual encrustation, type and volume of crystals observed in washout fluid
McNicol 2003	U.K./community.	12 weeks	Parallel RCT	11	Arm 1: Acidic Arm 2: Catheter change	Acidic: Daily instillation, volume and type not stated Catheter changes: 1 patient had catheter changed 2x a week, 1 patient had catheter changed on signs of blocking, 1 patient had catheter changed at start and end of study	Catheter replacements, time, and cost resources
Moore 2009	Canada/long-term care setting or received home care	8 weeks	Parallel RCT	73	Arm 1: Saline Arm 2: Contisol ^d (acidic) Arm 3: Standard care (no washout)	Saline: 50 mL, 1x a week for 8 weeks Contisol (acidic): 50 mL, 1x a week for 8 weeks	Mean time to first catheter change, Measurement of cross-sectional catheter lumen (abandoned as method did not prove useful)
Linsenmeyer 2014	U.S.	8 weeks – Part 1 was 2 weeks, Part 2 was 2 weeks and Part 3 was 4 weeks	Crossover RCT	67	Arm 1: Auriclosene (acidic) Arm 2: Saline	Part 1: 2x25 mL 0.2% Auriclosene, 3x a week for 2 weeks. Part 2: 2x25 mL Auriclosene, 3x a week for 2 weeks. Part 3: 2x25 mL Auriclosene, 2x a week for 4 weeks Control for all parts was normal saline	Mean % encrustation 'catheter patency' (95% CI), percent of catheters removed for clinical blockage, percent of removed catheters that have 100% encrustation
Abdel-Fattah 2024	U.K. / community-based study	12-24 months (varied due to early closure of study)	Parallel RCT	80	Arm 1: Saline Arm 2: Acidic Arm 3: Standard care (no washout)	Saline: 100 mL of 0.9% NaCl, 2x a week Acidic: 2x30 mL of 3.23% citric acid, 1x a week No washout: Standard care alone	LTC blockages (/1000 catheter days) requiring treatment. The S-CAUTI rate (/1000 catheter days)

^aThe trial did not report how these volumes were distributed among the study arms. ^bSuby G washout (citric acid 3.23%, light magnesium oxide 0.38%, sodium bicarbonate 0.7%, and disodium edetate 0.01%). ^cSolution R washout (citric acid 6%, gluconolactone 0.6%, light magnesium carbonate 2.8%, disodium edetate 0.01%). ^dContisol (citric acid 3.23%, light magnesium oxide 0.38%, sodium bicarbonate 0.7%, and disodium edetate 0.01%).

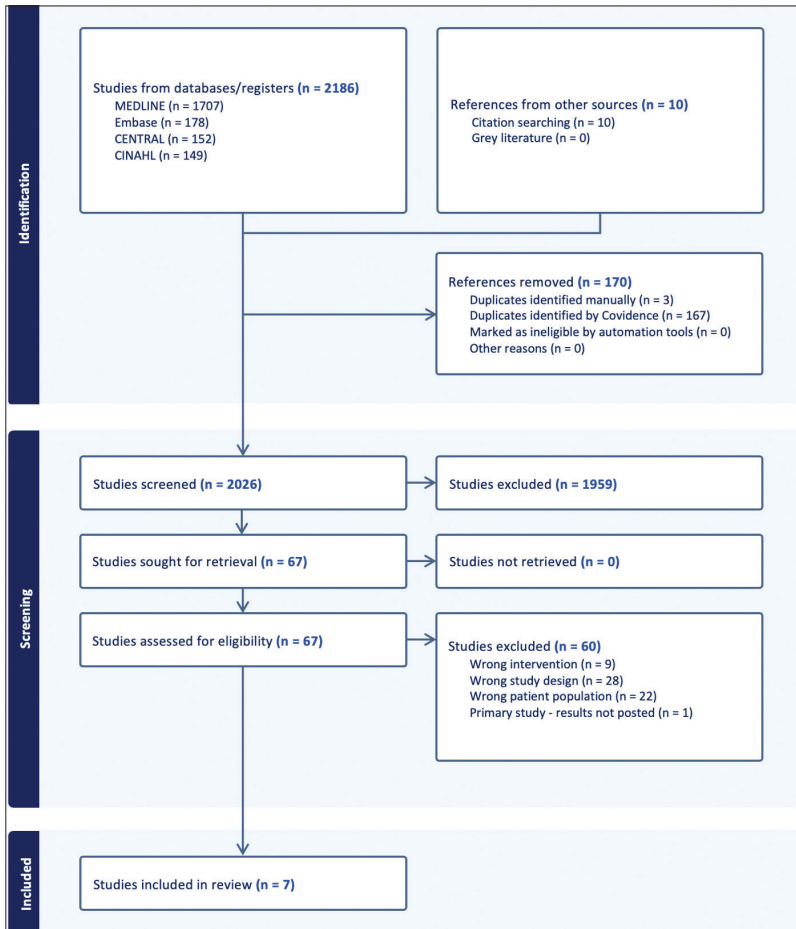


Figure 1. PRISMA flowchart. PRISMA: preferred reporting items for systematic reviews and meta-analysis.

resolved by discussion or by consulting a third review author (MIO). Trial authors were contacted for any missing data where possible. Refer to “Characteristics of included trials” for detailed information (Table 2). More detailed characteristics of included trials are shown in Appendix 2 (available at *cuaj.ca*).

The risk of bias for each trial was assessed independently by two review authors (EW, CY) using recommended tools in the Cochrane Handbook.¹² For parallel RCTs, the Risk of Bias tool 2 (RoB 2) was used.¹⁶ For crossover RCTs, the RoB 2 for crossover trials was used.¹⁷ Disagreements were resolved through discussion or by consulting a third review author (MIO).

RevMan Web (version 5.4) was used to calculate treatment effects.¹⁸ Dichotomous outcomes were combined using the Mantel-Haenszel method for risk ratios (RR) or odds ratios (OR). For continuous outcomes, means and standard deviations (SD) were used to derive mean difference (MD) using the inverse variance mean difference method. Standardized MD was

calculated if trials used different scales. A priori, a fixed-effects model was used to calculate pooled estimates of treatment effects and 95% confidence intervals (CIs) for trials with comparable outcome measures.

Heterogeneity between trials was identified through visually inspecting forest plots, using a standard Chi-squared test for heterogeneity, and/or the I² statistic.¹² Where there was evidence of heterogeneity, the review examined individual trials, analyzed subgroup characteristics, or used a random effects model.¹⁴ The primary analysis was per participant (randomized). Meta-analysis was conducted when appropriate; otherwise, narrative synthesis was used.¹⁹ Detailed methods in the PROSPERO protocol.¹⁵

RESULTS

Study selection

The literature search identified 2026 citations; 67 were selected for full-text screening. Abdel-Fattah et al was identified from other sources and included.²⁰ Overall, seven RCTs and quasi-RCTs were included in the review.²⁰⁻²⁶ The study selection process is described using a PRISMA flow diagram (Figure 1).^{13,19} Excluded studies with reasons are provided (Appendix 3; available at *cuaj.ca*). A summarized characteristics of included trials is shown in Table 2.

Risk of bias 2 assessment

Cochrane RoB 2 tool¹⁶ was used to assess the four parallel RCTs (Abdel-Fattah 2024,²⁴⁻²⁶ Airaksinen 1979, McNicoll 2003, Moore 2009).²⁰⁻²³ Cochrane RoB 2 tool for crossover trials¹⁷ was used to assess the three crossover RCTs (Kennedy 1992, Linsenmeyer 2014, Muncie 1989).²⁴⁻²⁶ Abdel-Fattah 2024,²⁰ Kennedy 1992,²⁴ and Moore 2009²³ had three intervention arms. These were grouped into washout vs. no washout groups, and/or acidic vs. saline groups.

Respective Excel tools were used to answer signalling questions.^{16,17} A “low,” “some concerns,” and “high” risk of bias for each domain was assigned using an algorithm and author judgement where appropriate. The RoB assessment tables can be found in Appendix 4 (available at *cuaj.ca*).

Evidence synthesis

PRIMARY OUTCOMES

S-CAUTI

Abdel-Fattah 2024²⁰ and Muncie 1989²⁶ reported data on symptomatic (S)-CAUTI rates (per 100 catheter

days) for their washout and no washout groups. These are presented in a forest plot (Figure 2). Pooled analysis (Abdel-Fattah 2024,²⁰ Muncie 1989²⁶) found that the S-CAUTI rate was lower in the saline washout groups compared to the no washout groups, with a MD of 0.10 per 100 catheter days (95% CI -0.50–0.29; low certainty evidence); however, this result was statistically insignificant ($p=0.61$). Furthermore, pooled analysis (Abdel-Fattah 2024,²⁰ Muncie 1989²⁶) found lower S-CAUTI rates in the any washout (acidic or saline) groups compared to the no washout groups with a mean difference of 0.05 per 100 catheter days (95% CI -0.42–0.32; low certainty evidence) (Figure 2). This result is statistically insignificant ($p=0.79$); however, Abdel-Fattah 2024²⁰ reported a significantly lower S-CAUTI rate (per 1000 catheter days) in their saline group (3.71, SD 8.45) compared to their no washout group (8.05, SD 11.29).

Airaksinen 1979²¹ and Moore 2009²³ reported incidence of urinary tract infections (UTIs) (Figure 2). In contrast to the S-CAUTI rate, pooled analysis found that the odds of UTI were 1.26 times higher in saline washout groups than no washout groups (95% CI 0.44–3.60; very low certainty evidence). This difference was not statistically significant ($p=0.67$).

Catheter blockage

Kennedy 1992²⁴ and Linsenmeyer 2014²⁵ reported catheter blockage incidence for their acidic and saline washout groups (Figure 2). Pooled analysis suggests that the odds of catheter blockage in acidic groups were 0.51 times that of saline groups (95% CI 0.25–1.03; very low certainty evidence); however, the difference was not statistically significant ($p=0.06$).

Airaksinen 1979²¹ reported on incidence of visual encrustation. In the saline washout group, 9/21 had 'little' encrustation and 12/21 had 'a lot' of encrustation. In the no washout group, 6/19 had 'little' encrustation and 13/19 had 'a lot' of encrustation. Though $p<0.05$, the trial concludes that this was not statistically significant. The review analysis found that the odds of having 'a lot' of encrustation in the saline washout group was 0.62 times that of the no washout group (95% CI 0.17–2.25; very low certainty evidence). The result was not statistically significant ($p=0.46$).

McNicol 2003²² states that CW do not reduce encrustation formation; however, this was a small trial and had only one participant in the washout group.

Moore 2009²³ measured mean time to first catheter change to determine washout effect on encrustation. Combining means and SDs from the trial's acidic and saline groups gave a mean of 4.48 weeks (SD 2.72)

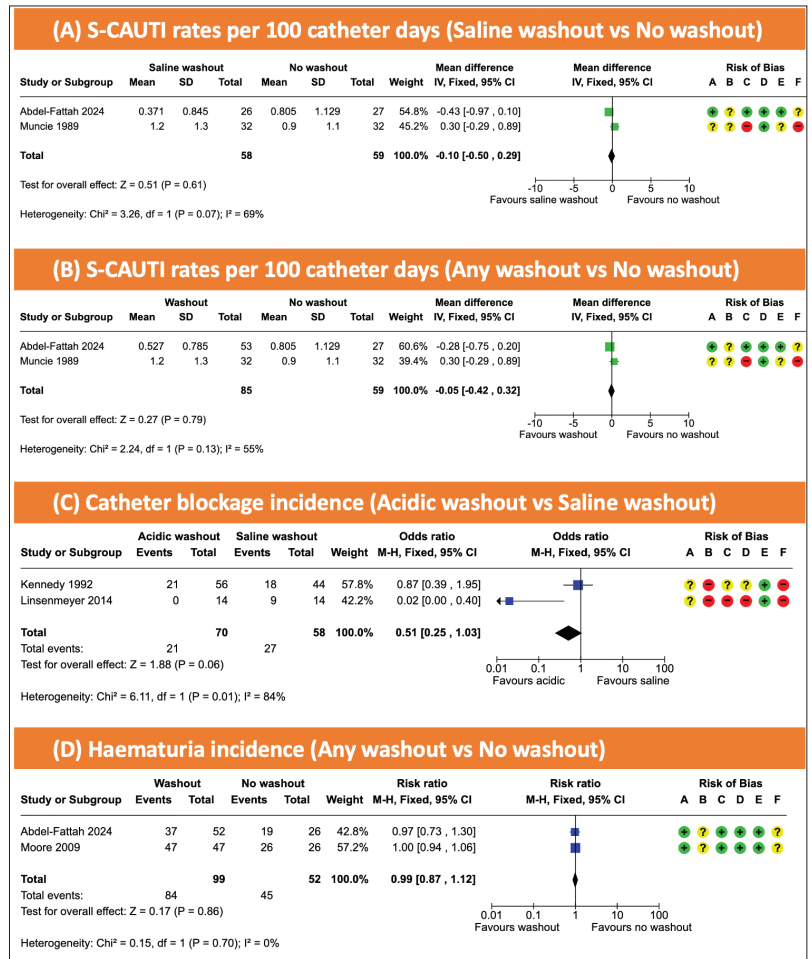


Figure 2. Forest plot analysis.

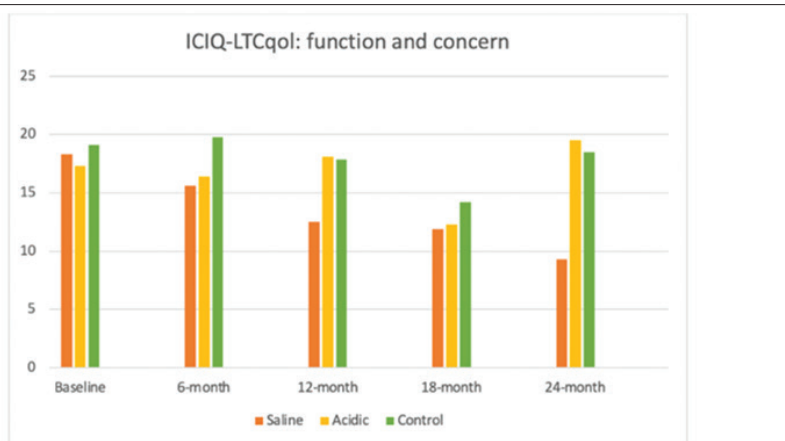
Table 3. TQSM scores Abdel-Fattah

	Saline, mean (SD)			Acidic, mean (SD)		
	6 months (n=17)	24 months (n=2)	Change	6 months (n=18)	24 months (n=3)	Change
Effectiveness	67.0 (27.9)	83.3 (23.6)	16.3	67.6 (31.3)	77.8 (25.5)	10.2
Convenience	82.0 (15.3)	91.7 (3.9)	9.7	73.8 (23.3)	74.1 (8.5)	0.3
Overall satisfaction	76.1 (22.7)	75 (15.2)	-1.1	78.2 (27.7) ^a	69.0 (28.9)	-9.2

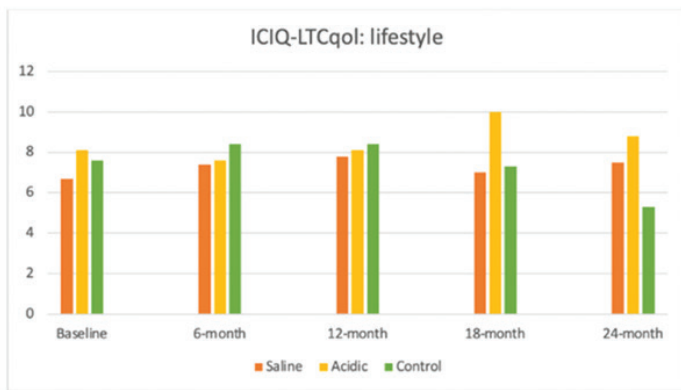
^aNumber of participants was 17.

for the washout group, compared to 4.55 weeks (SD 2.91) for the no washout group. This difference was not statistically significant ($p=0.71$).

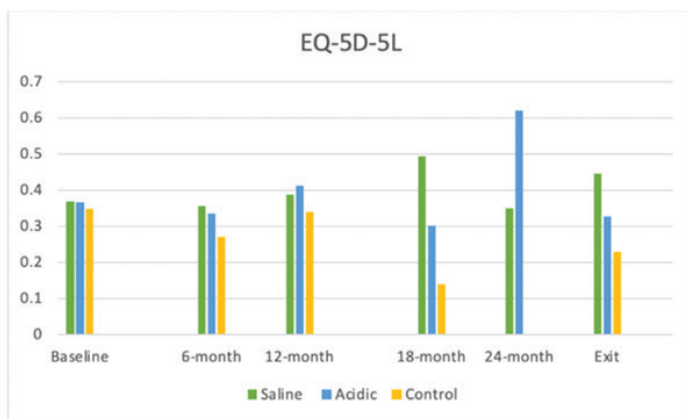
Abdel-Fattah 2024²⁰ found that the rate of LTC blockages per 1000 catheter days was 9.96, 10.53, 20.92 in the saline, acidic and no washout groups, respectively. The incidence rate ratio favors any wash-



A: ICIQ-LTCqol scores for function and concern from baseline to 24 months (Abdel-Fattah 2024).



B: ICIQ-LTCqol scores for lifestyle from baseline to 24 months (Abdel-Fattah 2024).



C: EQ-5D-5L scores from baseline to exit (Abdel-Fattah 2024).

Figure 3. Quality of life questionnaire bar charts.

out group (0.62, 97.5% CI 0.26–1.49) compared to no washout; however, these findings were not statistically significant ($p=0.22$).

Catheter removal or replacement

Muncie 1989²⁶ reported mean catheter replacement rate per 100 catheter days. For the saline washout period, the mean was 5.5 catheters compared to 4.7 catheters for the no washout period. The trial did not report standard deviations or if this was statistically significant.

Kennedy 1992²⁴ measured mean days of catheter in situ to determine washout effect on catheter removal or replacement (saline: 16.3, suby G: 14.3, solution R: 14.2). The trial did not report standard deviations or if this was statistically significant.

McNicoll 2003²² reported total catheter changes. For the one participant who had washouts, their catheter was changed nine (SD 0) times over the 12-week trial period. For the three participants in the catheter change group, the mean was 14.3 (SD 11.2); however, catheter changes being the comparator would result in a higher mean for that group and does not clarify washouts' impact on this outcome.

Abdel-Fattah 2024²⁰ reported on routine catheter changes per month. Combining means and standard deviations from the acidic and saline groups gave a mean of 0.33 (SD=0.22) for the washout group, and 0.36 (SD=0.23) for the no washout group. This difference was not statistically significant ($p=0.58$).

SECONDARY OUTCOMES

Washout acceptability

McNicoll 2003²² gave anecdotal evidence that regular prophylactic CWs caused intrusion into patients' lives. The trial also suggests that district nurses found washout schedules impractical and difficult to adhere to.

In Abdel-Fattah 2024²⁰ the incidence of pain at the catheter site was low for saline (1/25), acidic (2/27), and control groups (2/26). Differences between groups were not statistically significant. The mean monthly occurrence of bladder spasms was similar between washout groups (saline: 3.5, SD5.7; acidic: 3.2, SD5.9) and slightly higher in the no washout group (standard care: 4.4, SD6.5).

Abdel-Fattah 2024²⁰ also conducted a treatment satisfaction questionnaire. Scores for each theme range from 0–100, and higher scores are preferred. Both washout groups gave relatively high scores for all three questionnaire domains, suggesting high patient satisfaction (Table 3).

Furthermore, Abdel-Fattah 2024²⁰ also contained an embedded qualitative study,²⁷ which concluded that CW were acceptable to patients and carried good compliance when given appropriate patient training.²⁰

Participants in the washout groups felt that they experienced fewer LTC complications, required less healthcare provider support, and were empowered by their ability to self-manage their catheters. This effective self-management could allow for improved quality of life (QoL), reduced symptom burden, and lower healthcare costs. These benefits to patient QoL and high acceptability warrant further evaluations of prophylactic LTC washouts.

Health economic outcome

McNicol 2003²² conducted cost analysis for its four participants. The one participant in the daily washouts group cost £975.51 over the 12-week trial period. Over the same duration, the patient who changed catheters twice a week cost £197.97, the patient who changed catheters on clinical signs of blocking cost £286.66, and the patient who changed their catheter twice cost £81.48. District nurses performed all interventions.

In Abdel-Fattah 2024,²⁰ 80 participants performed allocated washouts themselves, with minimal dependence on healthcare resources. Washout groups had fewer interactions with and by healthcare professionals; however, a full economic analysis was not possible due to early termination of the trial and consequently small sample size

ADVERSE EFFECTS OF WASHOUTS

Abdel-Fattah 2024²⁰ and Moore 2009²³ reported the incidence of hematuria, which was analyzed in a forest plot (Figure 2). Moore 2009²³ noted microscopic haematuria for all participants regardless of washout solution and attributed this to LTC usage rather than washouts. Pooled analysis suggests that the risk of blood in the washout group is 0.99 times that of the no washout group (95% CI 0.87–1.12; moderate certainty evidence). This difference was not statistically significant ($p=0.86$). Abdel-Fattah 2024²⁰ also recorded patient-reported blood in urine (mean days per month). This was lowest for the saline group (0.25, SD 0.51) and highest for the acidic group (1.8, SD=3.8). The statistical significance of this is not reported. The trial also found that the rates of bleeding or discharge at the catheter site were similar between the washout and no washout group.

Kennedy 1992²⁴ reported the percentage of patients with urothelial cells in washout fluid. As proportions were consistently high across all three groups (saline: 100%, suby G: 86%, solution R: 100%), differences were unlikely clinically significant. The trial also reported the percentage of patients with red blood cells in washout fluid. This was higher for the suby G period compared

to the other two treatment periods to a statistically significant degree ($p=0.028$).

PATIENT QUALITY OF LIFE

Abdel-Fattah 2024²⁰ reported on patient QoL using the International Consultation on Incontinence Questionnaire (ICIQ) long-term catheterization QoL questionnaire (ICIQ-LTCqol) and EQ-5D-5L. The ICIQ-LTCqol assesses health-related QoL of LTC users (Figure 3). It has two scoring themes: function and concern, and lifestyle, with higher scores being worse. These differences were not statistically significant.

The EQ-5D-5L is a generic QoL measure and higher scores demonstrate better QoL (Figure 3). Participants in both washout groups had higher scores than the no washout group, indicating a potentially better QoL; however, this result was not statistically significant.

DISCUSSION

This systematic review summarized the results of seven randomized controlled trials (RCTs) (340 participants). We conclude that prophylactic CW did not have a statistically significant impact on S-CAUTI, catheter blockage, or catheter removal or replacement rates compared to standard LTC care alone; however, the review suggests that prophylactic CWs may have more benefits and less harms than previously thought.

This review found that there was no statistically significant difference between S-CAUTI rates in the washout groups compared to no washout groups; however, a recent and relatively well-powered RCT (Abdel-Fattah 2024²⁰) reported lower S-CAUTI rates in the saline group compared to the no washout group (incidence rate ratio [IRR] 0.40, 0.20–0.80, $p=0.003$), suggesting that prophylactic saline washouts may prevent S-CAUTI.

This contrasts current perceptions, as the European Association of Urology Nurses (EAUN) states that CWs do not prevent S-CAUTI.⁵ In addition, both the EAU⁶ and the American Urological Association (AUA)²⁸ guidelines do not include CWs as part of their recommendations for preventing S-CAUTI. The guidelines suggest that CWs requiring breaking the sterile, closed system could increase risk of infection; however, trials that used catheter washout methods that did not require breaking the closed system (Abdel-Fattah 2024,²⁰ Muncie 1989²⁶) showed a potential reduction in S-CAUTI rates.

The review also found that there was no statistically significant difference in catheter blockage between washout groups compared to no washout groups. The

7th International Consultation on Incontinence 2023 (ICI2023)²⁹ and the EAUN⁵ guidelines both advise against using acidic washouts to reduce encrustations, citing lack of evidence. These are based on the 2017 Cochrane review, which found insufficient evidence to conclude on the benefits or harms of catheter washouts;⁸ however, EAUN also reports that acidic washouts are sometimes used in practice to remove encrustations in LTC users, suggesting its efficacy against encrustations.⁵ It should also be noted that although statistically insignificant, acidic washout groups did show reduced catheter blockage compared to no washout groups. Further high-powered trials could yield definitive conclusions.

As Abdel-Fattah 2024²⁰ and McNicoll 2003²² differed on washout implementation and healthcare resource requirements, the review was unable to fairly evaluate the cost-effectiveness of prophylactic CWs compared to standard LTC care alone.

The review found that CWs do not cause more pain or discomfort for patients, and patients are satisfied with the procedure. CWs may even decrease the risk of some adverse effects, such as hematuria, and this evidence was of moderate certainty. This differs from EAUN⁵ and ICI2023²⁹ concerns that CWs could damage bladder urothelium and cause bleeding.

The EAUN⁵ also acknowledges that prophylactic CW could improve health-related QoL from a patient perspective. Abdel-Fattah 2024²⁰ echoes this, reporting that both washout groups had better overall QoL scores (EQ-5D-5L, ICIQ-LTCqol) than no washout groups. Although statistically not significant, this potential improvement in QoL deserves further investigation with a larger sample size.

This review found that prophylactic CW may have more benefits and less harms than previously thought and may improve patients' QoL; however, existing trials provide insufficient evidence and current recommendations to avoid routine irrigation in LTC users and using clinical judgement to decide on washouts still stand.⁶

Our findings also suggest a potential clinical benefit in investigating the different properties of different washout solutions for patients. Patients more prone to blockage may benefit from acidic washouts, while those susceptible to S-CAUTI may be more suitable for saline washouts.

Strengths and limitations

The major strengths of this present review are that we 1) used robust methods, as per the current edition of the Cochrane Handbook; 2) based on a PRISMA-adhering protocol registered with PROSPERO a priori;

3) conducted a comprehensive literature search with no language or date restriction; 4) reviewed evidence based upon RCTs; 5) applied RoB2 as best practice for determining the risk of bias; 6) used GRADE for evaluating quality of evidence. It is the largest and most comprehensive review on prophylactic catheter washouts, with the inclusion of the CATHETER II trial²⁰ and its embedded qualitative study.²⁷

Outcome measures across trials were highly heterogeneous, making meta-analyses challenging.³¹ Furthermore, some trials did not report on many of this review's outcomes of interest. The development of core outcome sets³² in comparing prophylactic CW would enable ease of future reviews in comparing and combining trial results as appropriate.²⁵

Regarding confounders, a main concern with CW is increased risk of S-CAUTI, as the sterile drainage system is often disconnected to instil the solution.⁶ As the washout methodology differed between trials, comparison of results was difficult. Future trials should standardize washout methods to minimize any confounding effect.

CONCLUSIONS

This systematic review found few high-quality trials evaluating the benefits and harms of prophylactic CW and highlights the need for large-scale, international RCTs;⁸ however, it did reveal trends suggesting that washouts may have greater benefits and fewer harms than previously assumed, particularly in tailoring the type of prophylactic washout to patients' needs and the potential to improve the QoL for LTC patients.

Future research should adhere to SPIRIT³³ and CONSORT³⁴ guidelines to address previous methodologic and reporting limitations and ensure adequately powered trials. Developing a standardized core outcome set would enable better data comparison and synthesis.³² Qualitative and economic evaluations should also be included for a holistic assessment.^{27,35}

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