APPENDIX 1

Full search strategy for MEDLINE, EMBASE, CINAHL and CENTRAL databases.

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations, Daily and Versions <1946 to June 2024>

1	Irrigation/	0
2	(bladder adj5 irrigat$).mp.	919
3	bladder washout$.mp.	119
4	(catheter$ adj5 irrigat$).mp.	1337
5	(catheter$ adj3 maintenanc$).mp.	465
6	catheter blockage$.mp.	238
7	Crystallization/	53874
8	encrustation$.mp.	1060
9	Anti-Bacterial Agents/ad, tu [Administration & Dosage, Therapeutic Use]	189316
10	Anti-Infective Agents/ad, tu [Administration & Dosage, Therapeutic Use]	24720
11	Antifungal Agents/ad, tu [Administration & Dosage, Therapeutic Use]	32651
12	Candidiasis/dt [Drug Therapy]	6984
13	Bacteriuria/dt [Drug Therapy]	1359
14	Bacteriuria/pc [Prevention & Control]	513
15	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14	303307
16	catheters, Indwelling/	19955
17	urinary catheter$.mp.	19182
18	Urinary Catheterization/	14842
19	((long term or longterm) adj2 catheter$).mp.	1466

20	((indwelling or in dwelling) adj2 catheter$).mp.	26158
21	bladder catheter$.mp.	1813
22	urethral catheter$.mp.	3519
23	16 or 17 or 18 or 19 or 20 or 21 or	2244838
24	Catheterization, Central Venous/	17288
25	Postoperative Care/	60916
26	Vascular Patency/	16895
27	24 or 25 or 26	94658
28	15 and 23	3611
29	28 not 27	3165
30	randomized controlled trial.pt.	614384
31	controlled clinical trial.pt.	95542
32	randomized.ab.	647895
33	placebo.ab.	248848
34	drug therapy.fs.	2701644
35	randomly.ab.	434783
36	trial.ab.	700431
37	groups.ab.	2687055
38	30 or 31 or 32 or 33 or 34 or 35 or 36 or 37	5976801
39	exp animals/ not humans.sh.	5227826
40	38 not 39	5229119
41	29 and 40	1707

Combined 29 with the Cochrane Highly Sensitive Search Strategy for identifying reports of randomised controlled trials in MEDLINE (Appendix 5b.2, Cochrane Reviewers Handbook, version 4.2, March 2003 / ISSG Search Filters Resource) using the Boolean operator 'AND'.

Embase <1974 to June 2024>

1 irrigation.mp. or BLADDER IRRIGATION/ 50120

2 (catheter$ adj3 maintenanc$).mp. 775

3 bladder washout$.mp. 183

4 catheter blockage$.mp. 410

5 encrustation$.mp. or Catheter Occlusion/ 4045

6 Crystallization/ 87970

7 antiinfective agent/ad, do, dt [Drug Administration, Drug Dose, Drug Therapy] 69533

8 antifungal agent/ad, do, dt [Drug Administration, Drug Dose, Drug Therapy] 24140

9 antibacterial agent$.mp. 16729

10 candidiasis/dm, dt, th [Disease Management, Drug Therapy, Therapy] 10184

11 bacteriuria/dm, dt, pc, th [Disease Management, Drug Therapy, Prevention, Therapy] 1216

12 catheter infection/dm, dt, pc, th [Disease Management, Drug Therapy, Prevention, Therapy] 6399

13 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 262734

14 Indwelling Catheter/ 13694

15 indwelling catheter$.mp. 16822

16 Urine Catheter/ 9227

17 urine catheter$.mp. 1954

18 urinary catheter$.mp. 15507

19 Suprapubic Catheter/ 1799

20 suprapubic catheter$.mp. 2870

21 suprapubic bladder catheterization/ 57

22 (long term adj2 catheter$).mp. 2073

23 Bladder Catheterization/ 8626

24 bladder catheter$.mp. 10535

25 urethral catheter$.mp. 9072

26 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 48356

27 13 and 26 3594

28 Postoperative Care/ 111434

29 Vascular Patency/ 13110

30 Central Venous Catheterization/ 10495

31 28 or 29 or 30 134603

32 27 not 31 3367

33 exp randomized controlled trial/ 826813

34 controlled clinical trial/ 473279

35 random$.ti,ab. 2075063

36 randomization/ 99382

37 intermethod comparison/ 306870

38 placebo.ti,ab. 377889

39 (compare or compared or comparison).ti,ab. 7985137

40 ((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab. 2933371

41 (open adj label).ti,ab. 115882

42 ((double or single or doubly or singly) adj (blind or blinded or blindly)).ti,ab. 283031

43 double blind procedure/ 219670

44 parallel group$1.ti,ab. 33629

45 (crossover or cross over).ti,ab. 128530

46 ((assign$ or match or matched or allocation) adj5 (alternate or group$1 or intervention$1 or patient$1 or subject$1 or participant$1)).ti,ab. 434413

47 (assigned or allocated).ti,ab. 513304

48 (controlled adj7 (study or design or trial)).ti,ab. 473152

49 (volunteer or volunteers).ti,ab. 289844

50 human experiment/ 661447

51 trial.ti. 425565

52 33 or 34 or 35 or 36 or 37 or 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51 10479923

53 (random$ adj sampl$ adj7 ("cross section$" or questionnaire$1 or survey$ or database$1)).ti,ab. not (comparative study/ or controlled study/ or randomi?ed controlled.ti,ab. or randomly assigned.ti,ab.) 9979

54 cross sectional study/ not (exp randomized controlled trial/ or controlled clinical trial/ or controlled study/ or randomi?ed controlled.ti,ab. or control group$1.ti,ab.) 394084

55 (((case adj control$) and random$) not randomi?ed controlled).ti,ab. 22446

56 systematic review.ti,ab. not (trial or study).ti. 357301

57 (nonrandom$ not random$).ti,ab. 19530

58 "random field$".ti,ab. 3079

59 (random cluster adj3 sampl$).ti,ab. 1653

60 (review.ab. and review.pt.) not trial.ti. 1200344

61 "we searched".ab. and (review.ti. or review.pt.) 53046

62 "update review".ab. 142

63 (databases adj4 searched).ab. 68465

64 (rat or rats or mouse or mice or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset$1).ti. and animal experiment/ 1254241

65 animal experiment/ not (human experiment/ or human/) 2637299

66 53 or 54 or 55 or 56 or 57 or 58 or 59 or 60 or 61 or 62 or 63 or 64 or 65 4584604

67 20 not 34 2831

68 32 and 67 178

Combined 32 with the Cochrane suggested search strategy for identifying reports of randomised controlled trials in EMBASE (Embase RCT filter for Ovid 30 April 2023 revision ISSG Search Filters Resource) using the Boolean operator 'AND'.

Wong et al. Do prophylactic catheter washouts reduce catheter associated urinary tract infections and catheter blockage compared to standard care in adults living with long-term catheters? A systematic review with meta-analysis

Cumulative Index to Nursing and Allied Health Literature (CINAHL) on EBSCO

#	Query	Results
S51	S26 AND S50	149
S50	S39 AND S49	795
S49	(S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48 OR S49) AND (S40 OR S41 OR S42 OR S43 OR S44 OR S45 OR S46 OR S47 OR S48)	8,033
S48	urethral catheter*	808
S47	bladder catheter*	1,127
S46	(long-term or longterm) N2 catheter*	705
S45	MH "Catheter Care, Urinary"	586
S44	MH "Catheters, Urinary"	2,272
S43	urinary catheter*	7,330
S42	MH "Urinary Catheterization"	2,908
S41	urinary catheterisation	4,729
S40	urinary catheterization	4,729
S39	S27 OR S28 OR S29 OR S30 OR S31 OR S32 OR S33 OR S34 OR S35 OR S36 OR S37 OR S38	19,496

S38	MH "Catheter-Related Infections/DT/PC"	2,551
S37	MH "Bacteriuria/DT/PC"	307
S36	MH "Candidiasis/DT"	904
S35	MH "Antifungal Agents/AD/TU"	5,081
S34	(MH "Antiinfective Agents/AD/TU")	6,019
S33	encrustation*	127
S32	catheter* N3 blockage*	124
S31	catheter* N3 maintenanc*	332
S30	TI irrigation OR AB irrigation	4,335
S29	(MH "Catheter Occlusion")	680
S28	(MH "Irrigation") OR (MH "Urinary Bladder Irrigation")	50
S27	(MH "Catheter Irrigation, Urinary") OR (MH "Urinary Catheter Irrigation (Saba CCC)")	59
S26	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25	1,145,007
S25	(MH "Comparative Studies")	477,855
S24	(MH "Clinical Research+")	14,104

S23	(MH "Static Group Comparison")	63
S22	(MH "Quantitative Studies")	39,495
S21	(MH "Crossover Design") OR (MH "Solomon Four-Group Design")	22,109
S20	(MH "Factorial Design")	1,330
S19	(MH "Community Trials")	116
S18	MH "Random Sample"	38,981
S17	(MH "Random Assignment")	84,986
S16	TI balance* N2 block* OR AB balance* N2 block*	138
S15	TI "latin square" OR AB "latin square"	260
S14	TI cross-over OR AB cross-over	5,723
S13	TI crossover OR AB crossover	18,720
S12	TI factorial OR AB factorial	8,143
S11	(TI (tripl* N25 (blind* or mask*))) OR (AB (tripl* N25 (blind* or mask*)))	2
S10	(TI (trebl* N25 (blind* or mask*))) OR (AB (trebl* N25 (blind* or mask*)))	410
S9	(TI (doubl* N25 (blind* or mask*))) OR (AB (doubl* N25 (blind* or mask*)))	54

S8	(TI (singl* N25 (blind* or mask*))) OR (AB (singl* N25 (blind* or mask*)))	32
S7	TI clin* N25 trial* OR AB clin* N25 trial*	188,155
S6	(MH "Study Design")	37,407
S5	(AB random*) OR (TI random*)	455,620
S4	(AB placebo*) OR (TI placebo*)	73,712
S3	(MH "Placebos")	14,058
S2	PT Clinical Trial	112,713
S1	(MH "Clinical Trials+")	354,350

Wong et al. Do prophylactic catheter washouts reduce catheter associated urinary tract infections and catheter blockage compared to standard care in adults living with long-term catheters? A systematic review with meta-analysis

Cochrane Central Register of Controlled Trials (CENTRAL)

Search Name: Prophylactic catheter washouts in adults with long-term catheters

Date Run: June 2024

Comment:

ID	Search	Hits
#1	MeSH descriptor: [Therapeutic Irrigation] explode all trees	2871
#2	bladder NEXT (irrigat* or washout*)	280
#3	Catheter NEXT (irrigat* or maintenance)	81
#4	MeSH descriptor: [Anti-Bacterial Agents] explode all trees and with qualifier(s): [administration & dosage - AD, therapeutic use - TU]	13461
#5	MeSH descriptor: [Anti-Infective Agents] explode all trees and with qualifier(s): [administration & dosage - AD, therapeutic use - TU]	33591
#6	MeSH descriptor: [Antifungal Agents] explode all trees and with qualifier(s): [administration & dosage - AD, therapeutic use - TU]	1960
#7	MeSH descriptor: [Catheter Obstruction] explode all trees	31
#8	catheter blockage*	278
#9	MeSH descriptor: [Crystallization] explode all trees	121
#10	crystallisation	293
#11	encrustation*	81
#12	MeSH descriptor: [Candidiasis] explode all trees and with qualifier(s): [drug therapy - DT]	695
#13	MeSH descriptor: [Bacteriuria] explode all trees and with qualifier(s): [drug therapy - DT, prevention & control - PC]	398
#14	MeSH descriptor: [Catheters, Indwelling] explode all trees	1287
#15	MeSH descriptor: [Urinary Catheters] explode all trees	170

#16	urinary NEXT (catheter* or catheterization* or catheterisation*)	2118
#17	(long-term or longterm or long term) NEXT catheter*	189
#18	(indwelling or in-dwelling) NEXT catheter*	1005
#19	(bladder or urethral) NEXT catheter*	1281
#20	MeSH descriptor: [Catheter-Related Infections] explode all trees	549
#21	catheter associated urinary tract infection	578
#22	#1 or #2 or #3 or #4 or #5 or #6	36386
#23	#7 or #8 or #9 or #10 or #11 or #12 or #13 or #20 or #21	2760
#24	#14 or #15 or #16 or #17 or #18 or #19	4651
#25	#22 and #23 and #24	179

179 total results. 152 of these were trials.

Wong et al. Do prophylactic catheter washouts reduce catheter associated urinary tract infections and catheter blockage compared to standard care in adults living with long-term catheters? A systematic review with meta-analysis

APPENDIX 2

Detailed characteristics of included trials.

Study ID	Abdel-Fattah 2024
Study setting	United Kingdom (UK). Community-based study. Participants were recruited from 21 sites in Scotland, England and Wales including GP practices, community/secondary care hospitals.
Study duration	12-24 months (varied due to early closure of study)
Design	Parallel RCT
Participant eligibility criteria	**Age (mean, SD):** 64.8 years (16.6) **Inclusion criteria:** Adults (>18 years) with LTC (any type/route) ≥28 days in situ with no plans to discontinue and able to self-manage the washouts/study documentation with/without a carer. **Exclusion criteria:** Patients unable to consent or were pregnant/contemplating pregnancy were not eligible. Patients with a spinal cord injury at/above T6, suspected S-CAUTI, visible haematuria, known allergies to the washout solutions, current bladder cancer or bladder stones, or who the recruitment team considered unsuitable for other clinical or social reasons.
No. of patients randomised	80
How many received intended treatment and analysed	78
Trial arm	Arm 1: Saline

	Arm 2: Acidic Arm 3: Standard care (no washout)
Dose and frequency	Saline: 100mL of 0.9% NaCl, 2x a week Acidic: 2x30mL of 3.23% citric acid, 1x a week No washout: Standard care alone
Primary outcome	LTC blockages (/1000 catheter days) requiring treatment. The S-CAUTI rate (/1000 catheter days).
Funding sources	National Institute for Health Research Health Technology Assessment Programme. Supply of washout solutions for use in the CATHETER II study were donated by B. Braun Medical AG (not involved in study design, data collection, analysis and interpretation, writing of this paper) The study was co-sponsored by University of Aberdeen and Grampian Health Board.
Ethical approval	The study was ethically approved by Wales Research Ethics Committee 6 (19/WA/0015).

Study ID	Airaksinen 1979
Study setting	Finland. Hospital and home care.
Study duration	6 months
Design	Parallel RCT
Participant eligibility criteria	**Age:** Participants age range from 50 to 59 years up to 85 to 99 years **Inclusion criteria:** Patient needs a long-term indwelling catheter for at least 6 months (the investigation period) **Exclusion criteria:** Patients not in good general health or unlikely to survive the investigation period were excluded.
No. of patients randomised	40
How many received intended treatment and analysed	If ITT was carried out, there would be 37. However, the trial does not report how many patients the analyses are based on.
Trial arm	Arm 1: Saline washout + silicath catheter. Arm 2: Saline washout + silastic catheter Arm 3: No washout + silicath catheter Arm 4: No washout + silastic catheter
Dose and frequency	Saline washout: Every 2 weeks, 10ml or 20ml. Trial does not report how these were distributed among the study arms. No washout: Standard care alone

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Primary outcome	Bacteriuria rates, symptomatic UTI rates, visual encrustation rates, rate of catheter obstruction/blockage.
Funding sources	Not stated
Ethical approval	Not stated

Study ID	Kennedy 1992
Study setting	United Kingdom (UK). Three geriatric hospitals.
Study duration	12 weeks – 1 week run-in saline, 3 x 3 weeks with each solution, 1 week normal saline washout
Design	Crossover RCT
Participant eligibility criteria	**Age (mean, range):** 82 years (65 - 100 years) **Inclusion criteria:** Elderly women in long-term geriatric care with long-term catheter in situ. **Exclusion criteria**: No exclusion criteria stated.
No. of patients randomised	25
How many received intended treatment and analysed	**Total**: 14
Trial arm	Arm 1: Saline (0.9% NaCl) Arm 2: Suby G washout (citric acid 3.23%, light magnesium oxide 0.38%, sodium bicarbonate 0.7%, and disodium edetate 0.01%

	Arm 3: Solution R washout (citric acid 6%, gluconolactone 0.6%, light magnesium carbonate 2.8%, disodium edetate 0.01%
Dose and frequency	Saline: 100mL, 2x a week for 3 weeks. Suby G: 100mL, 3.23% citric acid, 2x a week for 3 weeks. Solution R: 100mL, 6% citric acid, 2x a week for 3 weeks Each washout was administered by attaching 100 mL sterile pre-packed sachet to catheter and allowing to drain into bladder via gravity, clamped for 20 minutes to 30 minutes and then allowed to drain out. Catheters changed at weeks 1, 5, 9 and 12.
Primary outcome	Bacteriuria, Catheter blockage, Degree of visual encrustation, Type and volume of crystals observed in washout fluid, Mean episodes of bypassing per week, Catheter removal/replacement, Patients with red blood cells in washout fluid, Patients with urothelial cells in washout fluid.
Funding sources	Not stated
Ethical approval	Approval for the study was given by the local Ethical Committee.

Wong et al. Do prophylactic catheter washouts reduce catheter associated urinary tract infections and catheter blockage compared to standard care in adults living with long-term catheters? A systematic review with meta-analysis

Study ID	Linsenmeyer 2014
Study setting	United States of America (USA)
Study duration	8 weeks Part 1 was 2 weeks Part 2 was 2 weeks Part 3 was 4 weeks
Design	Crossover RCT
Participant eligibility criteria	**Age (mean, range):** 46.6 years (21 years - 81 years) **Inclusion criteria:** Adult neurogenic bladder patients with long-term indwelling transurethral or suprapubic urinary catheters were enrolled. Aged 18 years and older, spinal cord injury or other neurogenic bladder patient requiring a chronic indwelling urinary catheter with a history of 2 episodes of catheter blockage and/or encrustation, and urine pH $\geq$ 6.5. **Exclusion criteria:** Antibiotics within 7 days, current infections, recent history of autonomic dysreflexia
No. of patients randomised	67
How many received intended treatment and analysed	Parts 1 – 14 Part 2 – 20 Part 3 – 14 Results are given from Part 3 of the study (N = 14 completed) only.

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Trial arm	Arm 1: Auriclosene (acidic) Arm 2: Saline
Dose and frequency	Part 1: 2x25mL 0.2% Auriclosene, 3x a week for 2 weeks. Part 2: 2x25mL Auriclosene, 3x a week for 2 weeks. Part 3: 2x25mL Auriclosene, 2x a week for 4 weeks. Control for all parts was normal saline. Participants randomised to one irrigation solution for the first treatment regimen and after a washout period, irrigated with the other solution. A single treatment consisted of 2 sequential irrigations of 25 mL retained in the catheter for 15 minutes
Primary outcome	Mean % encrustation 'catheter patency' (95% CI), Percent of catheters removed for clinical blockage, Percent of removed catheters that have 100% encrustation.
Funding sources	NovaBay Pharmaceuticals
Ethical approval	Not stated

Study ID	McNicoll 2003
Study setting	United Kingdom (UK). Community.
Study duration	12 weeks
Design	Parallel RCT
Participant eligibility criteria	**Age:** Not stated **Inclusion criteria:** Community-based patients with long-term catheters known to block with encrustation **Exclusion criteria:** Not stated
No. of patients randomised	11
How many received intended treatment and analysed	4
Trial arm	Arm 1: Acidic solution Arm 2: Catheter change
Dose and frequency	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.
Primary outcome	Catheter replacements, time and cost resources.
Funding sources	Not stated

Ethical approval	Not stated

Study ID	Moore 2009
Study setting	Canada. Long-term care setting or received home care.
Study duration	8 weeks
Design	Parallel RCT
Participant eligibility criteria	**Age (mean, SD):** 66.24 years (17.66) **Inclusion criteria:** Indwelling catheter in situ longer than 30 days, regular blocker (>1 a month) that required catheter changed every 3 weeks or less. Additional inclusion criteria for participants were 18 years or older and sufficiently alert according to the Mini-Mental State Examination (MMSE score > 24) to consent to participation in the study and respond to verbal questions about experiences associated with catheterization or washout. **Exclusion criteria:** Symptomatic UTI (individuals were eligible for the study following successful treatment of the UTI after a symptom-free period of 14 days); urethral erosion allowing continuous bypassing (leakage) around urinary catheter; history of bladder cancer, or radiation or interstitial cystitis; impaired renal function as evidenced by a serum creatinine level of 2.0 mg/dL or higher; gross haematuria; or indwelling catheter that was changed less frequently than every 8 weeks.
No. of patients randomised	73
How many received intended treatment and analysed	Arm 1 (Saline): 16 Arm 2 (Contisol): 20 Arm 3 (Standard care): 17

Trial arm	Arm 1: Saline Arm 2: Contisol (citric acid 3.23%, light magnesium oxide 0.38%, sodium bicarbonate 0.7%, and disodium edetate 0.01%) Arm 3: Standard care (no washout)
Dose and frequency	Saline: 50mL, 1x a week for 8 weeks Contisol: 50mL, 1x a week for 8 weeks.
Primary outcome	Mean time to first catheter change, Measurement of cross-sectional catheter lumen (abandoned as method did not prove useful), Incidence of symptomatic UTI, Incidence of microscopic haematuria, Incidence of microscopic leukocytes, Urine pH, Measurement of cross sectional catheter lumen (abandoned as not efficient)
Funding sources	Alberta Heritage Foundation for Medical Research and the Canadian Nurses Foundation
Ethical approval	Approval from the 2 joint university and health region research ethics boards overseeing the study sites/agencies was obtained.

Study ID	Muncie 1989
Study setting	United States of America (USA). Hospital and medical centre.
Study duration	24 weeks – 10 weeks per phase
Design	Crossover RCT
Participant eligibility criteria	**Age (mean, age range):** 71 years (37 to 88 years)

	Inclusion criteria: Indwelling catheter in situ > 30 days, Females aged 18 years +, were afebrile (temperature ≤ 37.7º) for 7 days, had not received antibiotics for 14 days. **Exclusion criteria:** Patients with malignant bladder neoplasms or patients whose physician insisted on continued bladder irrigation
No. of patients randomised	44
How many received intended treatment and analysed	32 23 women completed the 24 week intervention (A first 10, B first 13), 9 women completed at least one phase and five weeks of the second phase of the study
Trial arm	Arm 1: Saline Arm 2: No washout
Dose and frequency	Saline: 30mL, 1x a day for 10 weeks
Primary outcome	The incidence of catheter obstructions and febrile episodes and bacteriuria (4 most prevalent organisms in each phase), Number of catheter replacements due to leakage and number due to obstruction.
Funding sources	National institute of Aging, National Institutes of Health.
Ethical approval	Not stated

APPENDIX 3

Excluded papers and reasons for exclusion.

Arego 1986	Wrong study design – review
Baltimore 2005	Wrong study design – article. In addition, intervention is reminders not irrigation.
Brill 2018	Wrong population – in vitro study
Bruun 1978	Wrong population – Unable to determine duration of catheterisation.
Chang 2018	Language – Non-English and no official translation available. On translation, most participants had indwelling catheters (<28 days) only sub-populations are relevant and if we did that it would no longer be randomised.
Clark 1973	Wrong population – catheter <28 days indwelling.
Classen 1991	Wrong intervention – solution instilled into drainage bag
Cox 1966	Wrong population – post-operative patients. Describes catheter in situ up to 7 days and beyond (<28 days)
Davies 1987	Wrong population – catheter <28 days indwelling.
Dean 2019	Wrong study design – review
Downs 2010	Wrong study design – mini review
Dudley 1981	Wrong study design – review
Durani 2008	Wrong study design – review
Eisen 1976	Wrong population – not indwelling catheters.
Elliot 1989	Wrong study design – Study methods insufficiently described and insufficient data reported.

Flack 1993	Wrong population – in vitro study
Galloway 1997	Wrong study design – review
Gelman 1980	Wrong study design – Unable to determine if patients randomised. Duration of catheterisation at start of study less than 28 days for some patients.
Getliffe 1994	Wrong population – in vitro study (model of bladder).
Gladstone 1968	Wrong population – catheter <28 days indwelling.
Hagen 2010	Wrong study design – review
Hutinel 1978	Language – Non-English and no official translation available. Google translate also revealed that most participants were catheterised for short duration.
Khorrami 2011	Wrong population – patients had ileal neobladder, which comes with its own set of potential infections.
King 1992	Population – in vitro (model of bladder).
Kumar 2018	Wrong population – catheter <28 days indwelling.
Leone 2003	Wrong intervention – comparing catheter drainage systems.
Leroyer 1979	Language – Non-English and no official translation available. On translation, average catheter use was 13 days (range 6-39 days).
Levin 1964	Wrong study design – review
Lisenmeyer 1999	Wrong study design – chart review (not RCT)
Macfarlane 1985	Wrong study design – review article
Mayes 2003	Wrong study design – review of reviews
Meddings 2014	Wrong study design – narrative review
Mehtar 1986	Wrong intervention – oral antibiotics rather than antibiotic washout.

Murphy 2018	Wrong study design – guideline
NCT05775614 2022	Primary study – results not posted.
Niel-Weise 2005	Wrong study design – review. Also compared indwelling urethral catheterisation vs suprapubic catheterisation, indwelling vs intermittent, supra vs intermittent.
Pannek 2011	Language – Non-English and no official translation available. On translation, prospective, open, non-interventional observational study.
Ramezani 2018	Wrong population – short term catheters.
Reid 2021	Wrong study design – guideline
Rew 1999	Wrong study design – review
Rieger 2022	Wrong population – catheter <28 days indwelling.
Rutschmann 1995	Wrong intervention – oral antibiotics rather than antibiotic washout
Samimi 2010	Wrong population – includes all types of catheters, not just urinary catheters.
Schneeberger 1992	Wrong population – catheter <28 days indwelling. Irrigation only prior to removal, not regular.
Sharpe 1981	Wrong population – intermittent catheters used.
Shepherd 2017	Wrong study design – review.
Sperling 2014	Wrong intervention – inflation of catheter balloon, not catheter or bladder washout.
Stickler 2010	Wrong study design – review.
Stickler 1981	Wrong study design – not RCT, looked at two patients in total.
Suresh 2019	Wrong study design – review.

Sweeney 2017	Wrong study design – prospective cohort study.
Tambyah 2012	Wrong study design – guideline.
Thompson 1984	Wrong intervention – solution instilled into drainage bag
Van Poppel 1986	Wrong intervention – oral antibiotics rather than antibiotic washout
Warren 1978	Wrong population – catheter <28 days indwelling.
Washington 2001	Wrong intervention – solution instilled into drainage bag
Weidner 2000	Language – Non-English and no official translation available.
Weyler 2021	Wrong study design – retrospective cohort study
Wise 1987	Wrong population – conditions suggest that participants likely had short-term catheterisation.
Zacharias 2009	Wrong population – conditions suggest that participants likely had short-term catheterisation.

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APPENDIX 4

Excluded papers and reasons for exclusion.

Arego 1986	Wrong study design – review
Baltimore 2005	Wrong study design – article. In addition, intervention is reminders not irrigation.
Brill 2018	Wrong population – in vitro study
Bruun 1978	Wrong population – Unable to determine duration of catheterisation.
Chang 2018	Wrong intervention – comparator was external abdominal wrapping and bladder irrigation
Clark 1973	Wrong population – catheter <28 days indwelling.
Classen 1991	Wrong intervention – solution instilled into drainage bag
Cox 1966	Wrong population – post-operative patients. Describes catheter in situ up to 7 days and beyond (<28 days)
Davies 1987	Wrong population – catheter <28 days indwelling.
Dean 2019	Wrong study design – review
Downs 2010	Wrong study design – mini review
Dudley 1981	Wrong study design – review
Durani 2008	Wrong study design – review
Eisen 1976	Wrong population – not indwelling catheters.
Elliot 1989	Wrong study design – Study methods insufficiently described and insufficient data reported.
Flack 1993	Wrong population – in vitro study
Galloway 1997	Wrong study design – review

Gelman 1980	Wrong study design – Unable to determine if patients randomised. Duration of catheterisation at start of study less than 28 days for some patients.
Getliffe 1994	Wrong population – in vitro study (model of bladder).
Gladstone 1968	Wrong population – catheter <28 days indwelling.
Hagen 2010	Wrong study design – review
Hutinel 1978	Wrong population – catheter <28 days indwelling.
Khorrami 2011	Wrong population – patients had ileal neobladder, which comes with its own set of potential infections.
King 1992	Wrong population – in vitro (model of bladder).
Kumar 2018	Wrong population – catheter <28 days indwelling.
Leone 2003	Wrong intervention – comparing catheter drainage systems.
Leroyer 1979	Wrong population – catheter <28 days indwelling. Average catheter use was 13 days (range 6-39 days).
Levin 1964	Wrong study design – review
Lisenmeyer 1999	Wrong study design – chart review (not RCT)
Macfarlane 1985	Wrong study design – review article
Mayes 2003	Wrong study design – review of reviews
Meddings 2014	Wrong study design – narrative review
Mehtar 1986	Wrong intervention – oral antibiotics rather than antibiotic washout.
Murphy 2018	Wrong study design – guideline
NCT05775614 2022	Primary study – results not posted.

Niel-Weise 2005	Wrong study design – review. Also compared indwelling urethral catheterisation vs suprapubic catheterisation, indwelling vs intermittent, supra vs intermittent.
Pannek 2011	Wrong study design – Prospective, open, non-interventional observational study.
Ramezani 2018	Wrong population – short term catheters.
Reid 2021	Wrong study design – guideline
Rew 1999	Wrong study design – review
Rieger 2022	Wrong population – catheter <28 days indwelling.
Rutschmann 1995	Wrong intervention – oral antibiotics rather than antibiotic washout
Samimi 2010	Wrong population – includes all types of catheters, not just urinary catheters.
Schneeberger 1992	Wrong population – catheter <28 days indwelling. Irrigation only prior to removal, not regular.
Sharpe 1981	Wrong population – intermittent catheters used.
Shepherd 2017	Wrong study design – review.
Sperling 2014	Wrong intervention – inflation of catheter balloon, not catheter or bladder washout.
Stickler 2010	Wrong study design – review.
Stickler 1981	Wrong study design – not RCT, looked at two patients in total.
Suresh 2019	Wrong study design – review.
Sweeney 2017	Wrong study design – prospective cohort study.
Tambyah 2012	Wrong study design – guideline.
Thompson 1984	Wrong intervention – solution instilled into drainage bag

Wong et al. Do prophylactic catheter washouts reduce catheter associated urinary tract infections and catheter blockage compared to standard care in adults living with long-term catheters? A systematic review with meta-analysis

Van Poppel 1986	Wrong intervention – oral antibiotics rather than antibiotic washout
Warren 1978	Wrong population – catheter <28 days indwelling.
Washington 2001	Wrong intervention – solution instilled into drainage bag
Weidner 2000	Wrong study design – editorial
Weyler 2021	Wrong study design – retrospective cohort study
Wise 1987	Wrong population – conditions suggest that participants likely had short-term catheterisation.
Zacharias 2009	Wrong population – conditions suggest that participants likely had short-term catheterisation.