Types of indwelling urinary catheters for long-term bladder drainage in adults (Review)


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Types of indwelling urinary catheters for long-term bladder drainage in adults

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ABSTRACT

Background

Prolonged urinary catheterisation is common amongst people in long-term care settings and this carries a high risk of developing a catheter-related urinary tract infection and associated complications. A variety of different kinds of urethral catheters are available. Some have been developed specifically to lower the risk of catheter-associated infection, for example antiseptic or antibiotic impregnated catheters. Ease of use, comfort and handling for the caregivers and patients, and cost-effectiveness are also important factors influencing choice.

Objectives

The primary objective was to determine which type of in-dwelling urinary catheter is best to use for long-term bladder drainage in adults.

Search strategy

We searched the Cochrane Incontinence Group Specialised Trials Register (searched 15 December 2004), MEDLINE (January 1950 to February 2005) and CINAHL (January 1982 to February 2005). We also handsearched 28 relevant journals and conference proceedings. We examined the bibliographies of relevant articles and contacted catheter manufacturers, scientific societies and experts for trials.

Selection criteria

All randomised trials comparing types of indwelling urinary catheters for long-term catheterisation in adults. Long-term catheterisation was defined as more than 30 days.

Data collection and analysis

Data extraction has been undertaken by two review authors independently and simultaneously. Any disagreement has been resolved by a third review author. The included trial data were handled according to the description of the Cochrane Collaboration Reviewers' Handbook.
Main results

Three trials were included involving 102 adults in various settings. Two trials had a parallel group design and one was a randomised cross-over trial.

Only two of the six targeted comparisons were assessed by these trials: antiseptic impregnated catheters versus standard catheters (one trial) and one type of standard catheter versus another standard catheter (two trials).

The single small cross-over trial was inadequate to assess the value of silver alloy (antiseptic) impregnated catheters. In the two trials comparing different types of standard catheters, estimates of differences were all imprecise because the trials also had small sample sizes: confidence intervals were too wide to rule out clinically important differences. One trial did suggest, however, that the use of a hydrogel coated latex catheter rather than a silicone catheter may be better tolerated (RR for need for early removal 0.41, 95% CI 0.22 to 0.77).

Authors’ conclusions

Very few trials have compared types of catheter for long-term bladder drainage. All were small and showed methodically 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.

Plain language summary

Types of indwelling urinary catheters for long-term bladder drainage in adults

Prolonged urinary catheterisation is common amongst people in long-term care settings, for example in nursing homes or home care. In addition, many people living in the community need to have a permanent catheter. Long-term catheterisation was defined as more than 30 days. We identified only three trials involving 102 adults in various settings. All the trials were too small to provide reliable evidence to indicate which types of catheters are best to use in which patients.

Background

Prolonged urinary catheterisation is most common amongst people in long-term care settings, e.g. nursing homes or home care. Common reasons are urinary incontinence and urinary retention (physical or neurogenic), which may have a specific underlying cause such as multiple sclerosis, spinal cord injury, or enlarged prostate, wound-management, and patient comfort (Gammack 2003; Wilde 1986). In the USA 4% to 15% of long-term care residents have used urinary catheters for more than 30 days (Gammack 2003; Getliffe 1990).

The urinary tract is the most common site (30% to 40%) of nosocomial infections and this is almost always associated with indwelling urinary catheters (NINSS 2002; NNIS 2003; RKI 2002). The incidence for catheter-associated bacteriuria is about 3% to 10% per day a catheter is in situ. Therefore, most users of catheters will have a detectable bacteriuria within 30 days (Warren 1992; Warren 1997). The most common definition of urinary tract infection is bacteriuria with $10^5$ or more colony forming units per ml (CFU/ml) (Garner 1996) together with symptoms such as fever.

Catheter-related infection is more common in women, the elderly and patients with co-morbidities (Stamm 1998).

An estimated two-thirds of catheter-associated urinary tract infections in hospitalised patients are extraluminal (bacteria ascending from the meatus along the catheter urethral interface), and one third are intraluminal (bacteria migrating into the catheter lumen as a result of disconnecting the catheter system) (Stamm 1998; Tambyah 1999). The micro-organism species responsible vary widely between and within hospitals. Escherichia coli remains the most common, and other important organisms are Enterococci, Pseudomonas aeruginosa, Klebsiella spp. and Candida spp. (Jarvis 1992; NINSS 2002; RKI 2002).

The most frequent complications associated with chronic catheterisation are symptomatic or asymptomatic bacteriuria, encrustation, irritation of the urethra tissue and leaking of urine due to blockage of the catheter itself. Less common are bacteraemia and renal disease (Warren 1997).

Indwelling urinary catheters are of varying design and material. The most common standard catheters include polyvinyl chloride (PVC), plain latex, polytetrafluoroethylene (PTFE), and particu-
larly for long-term use silicone-elastomer, hydrogel, polymer hy-
dromer and pure silicone (CF 2004; Pomfret 2000; Robinson
2001). Catheters may be impregnated with antiseptic or antibiotic
agents; the most common bactericidal agent is silver (Saint
1998).

This review investigates which type of indwelling urinary catheter
minimises the catheter-associated infection rate and related com-
plications during long-term catheterisation in adults. Other fac-
tors that may influence the choice of catheter are also examined -
these include ease of use, comfort and handling for the caregivers
and patients, and cost-effectiveness.

OBJECTIVES

To determine which is the best type of indwelling urinary catheter
to use in adults having long-term bladder drainage.

We have made the following comparisons.

1. Antiseptic impregnated urethral catheters versus standard ure-
thal catheters.
2. Antibiotic impregnated urethral catheters versus standard ure-
thal catheters.
3. Antibiotic impregnated urethral catheters versus antiseptic im-
pregnated urethral catheters.
4. One type of standard urethral catheter versus another.
5. One type of antiseptic impregnated urethral catheter versus
another.
6. One type of antibiotic impregnated urethral catheter versus
another.

METHODS

Criteria for considering studies for this review

Types of studies
Randomised controlled trials (RCTs) of parallel or crossover de-
sign comparing alternative types of indwelling urinary catheters in
adults having long-term bladder drainage (more than thirty days).

Types of participants
Adults with indwelling urethral or suprapubic catheters for more
than thirty days, irrespective of primary disease and care setting.

Types of interventions
Indwelling urinary catheters used for long-term bladder drainage.
These may be:

- indwelling urethral catheters (standard or antiseptic coated or antibiotic coated);
- suprapubic catheters (standard or antiseptic coated or antibiotic coated).

Types of outcome measures

The primary outcome is catheter-associated urinary tract infec-
tion (definitions of infection are those used in the trial reports). Secondary outcomes are:

Complications/adverse effects:

- asymptomatic bacteriuria;
- symptomatic urinary tract infection;
- other adverse effects of the intervention (e.g. encrusta-
tion, blockage, stone formation, retention).

Co-interventions:

- use of prophylactic antibiotics;
- use of antibiotics to treat infection.

Patient reported:

- patient satisfaction;
- patient comfort.

Clinician reported:

- practitioners’ satisfaction;
- length of time catheters used.

Quality of life:

- generic health status or quality of life measures (e.g. SF
36, Ware 1992);
- psychological outcome measures (e.g. HADS, Zigmond
1983).

Economic outcomes:

- costs of the intervention;
- cost implications of differences in outcomes;
- formal economic evaluation, such as cost-effectiveness.

Search methods for identification of studies

The Cochrane Incontinence Group Specialised Register of Ran-
domised Controlled Trials, which forms a part of the Cochrane
Central Register of Controlled Trials (CENTRAL), was searched
for reports of trials about problems occurring with long-term
catheterisation of adults (date of last search: 15 December 2004).
The Trials Register has been developed and is maintained by regular searches of MEDLINE and CENTRAL. It is regularly updated using a highly sensitive search strategy for retrieving randomised controlled trials from electronic databases, as well as handsearching of journals and conference proceedings (For more details please see the ‘Specialized Register’ section of the Group’s module in The Cochrane Library).

The Incontinence Group’s trials register was searched using the Group’s own keyword system, the search terms used were: "topic.urine.incon" AND "(design.cct*) OR (design.rct*)" AND "(invent.mech.cath*)"

(All searches were of the keyword field of Reference Manager 9.5 N, ISI ResearchSoft).

For this review there have been no restrictions on date of publication, language of publication, or publication status (published or unpublished work) on any of the searches.

Extra specific searches were performed for this review. Brief details are given below, a fuller description of the search methods and terms used can be found in Appendix 1.

Electronic searches

In addition to the Cochrane Incontinence Group Specialised Trials Register, MEDLINE and CINAHL were searched by two reviewers working independently of each other, building and running their strategies separately. For more details, including the search terms used please see Appendix 1.

- First search in CINAHL via WebSPIRS - (searched: 1 January 1982 to February 2005) (last searched 26 February 2005)
- Second search in CINAHL via WebSPIRS (searched: 1 January 1982 to February 2005) (last searched 26 February 2005)

The listed databases have been searched by the authors for eligible studies for the earliest entrance date possible until the latest search date (searched 26 February 2005).

Searching other resources

A handsearch of the following conference proceedings and journals has been carried out to identify any research or relevant studies. The following conference proceedings have been searched by hand:


The following journals have been searched by hand:

- BJU International, 83.1999 - 88.2004
- Contemporary Urology, 7.1995 - 16.2004
- Current Urology Reports 1.2000 - 5.2004
- Der Urologe A, 34.1995 - 43.2004
- Der Urologe B, 35.1995 - 42.2002
- European Urology, 27.1995 - 46.2004
- Excerpta Medica, Section 28, Urology and Nephrology, 1995 - 49.1997
- International Urology and Nephrology, 27.1995 - 36.2004
- Techniques in Urology, 1.1995 - 7.2001
- Urological Research, 23.1995 - 32.2004
- Urology, 45.1995 - 63.2004

Experts in the field such as scientific societies for continence and urology were contacted and asked whether they had been involved in any further potentially eligible studies or are aware of recent or ongoing studies about problems occurring with long-term catheterisation of adults. Catheter manufacturers were also contacted. Details of all the societies and manufacturers contacted can be found in Appendix 1.

The reference lists of all retrieved studies have been scanned for additional studies.

Data collection and analysis

Results from the search were assessed for potential eligibility by two people independently and disagreement was resolved by discussion with a third reviewer. Potentially relevant studies were retrieved in full and two reviewers decided independently whether they met the inclusion criteria. Any disagreement was again resolved by a third reviewer. Details of eligible studies were extracted and summarised by two reviewers using a data extraction sheet. Studies that had been published in duplicate have been included only once using the most up to date data available for each outcome.
All studies that met the selection criteria were assessed for methodological quality. The system for classifying methodological quality of controlled trials is based on an assessment of the three principal potential sources of bias. These are:

1. selection bias from insecure random allocation of treatments;
2. attrition bias from dropouts or losses to follow-up, particularly if there is a differential dropout rate between groups;
3. biased ascertainment (detection bias) of outcome where knowledge of the allocation might have influenced the measurement of outcome.

Data extraction was undertaken by two reviewers (MP & PJ) independently and simultaneously. Any disagreement was resolved by a third reviewer (AK).

The included trial data were handled according to the Cochrane Collaboration Reviewers’ Handbook (Alderson 2004). Undertaking a meta-analysis was not appropriate because the interventions were not comparable. Data from cross-over trials were presented in Other Data Tables. Crossover studies were indicated by the suffix *. Comparisons were categorised by type of intervention catheter.

Categorical outcomes were expressed as relative risks (RR) with 95% confidence intervals. Continuous data are presented using weighted mean difference (WMD). If quantitative synthesis was appropriate, the pooled relative risks, weighted mean differences and their 95% confidence intervals would have been calculated using a fixed effects model. Heterogeneity would have been explored using the I squared statistic (Higgins 2003).

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

A sensitive search strategy has been used in this review. 11,457 studies were retrieved by searching MEDLINE via PubMed and an additional 740 studies by searching CINAHL via WebSPIRS. 384 studies were added from the Specialised Register of Randomised Controlled Trials of the Cochrane Incontinence Review Group, 50 studies from handsearching and additional 190 from experts, scientific societies and manufactures. From this pool 1432 duplicates were removed and 11,389 studies were screened for relevance by reading the title and abstract. 74 studies were read in full text including four translations from Finnish, Swedish, Japanese and French language.


Three trials were eligible for inclusion (Bergqvist 1979; Bull 1991; Nakada 1996*). Two were parallel-group RCTs (Bergqvist 1979; Bull 1991) and one was a randomised cross-over trial (Nakada 1996*) which used alternation to allocate participants to the first arm of the trial.

The studies were conducted in Europe (Bergqvist 1979; Bull 1991) and Japan (Nakada 1996*). One parallel-group RCTs (Bull 1991) included 69 community based adults. Two trials (Bergqvist 1979; Nakada 1996*) included 21 and 12 long-term catheterised patients from unknown settings.

Participants

The population within the three included trials was heterogeneous. Bergqvist 1979 included female (N = 13) and male (eight) geriatric patients in an unspecified setting. Bull 1991 included male (57) and female (12) participants catheterised for a variety of diagnoses (e.g. prostatic enlargement or cerebrovascular accident). The male to female ratio was well-balanced between the control (26 out of 7) and intervention (31out of 5) group. Nakada 1996* included 12 adults, one of whom was a woman.

Interventions and outcomes

Each trial involved different catheters and different populations, and thus precluded meta-analysis.

- Nakada 1996* compared a silver impregnated catheter (Silver Lubricath Foley) with a silicone-coated catheter. This study used a cross over design, with participants changing to the alternative catheter every two weeks. Data were reported for UTI rate, leakage of urine, urethra pain, residual urine sensation, pain on removing catheter and degree of urinary turbidity.
- Bergqvist 1979 randomised participants to a PVC catheter group, latex catheter group and silicone catheter group. The outcomes of interest were the numbers of bacteriuria, complications and encrustation of the catheter surface and frequency of catheter changes.
Duration of catheterisation

The duration of catheterisation varied between the three studies. The evaluation period for catheterisation within the Bergqvist 1979 was six weeks. Bull 1991 evaluated catheterisation 16 weeks, the mean length of catheterisation was 89.61 days (±35.31) in hydrophilic polymer (hydrogel) coated latex catheter and 56.7 days (±38.8) in silicone (Silicone Elastomer) coated urethral catheter.

Nakada 1996* evaluated catheterisation periods from 1 to 74 months, with a mean of 26 months (±23); however, participants had a catheter change (to the alternative catheter) every two weeks.

Outcome measures

Nakada 1996* defined UTI as uropathogenic colonisation of urinary tract greater than 10^5 CFU/ml. Bergqvist 1979 and Bull 1991 did not specify a definition of UTI. Nakada 1996* analysed the bacterial biofilm on the surfaces of catheters. Encrustation was defined as the build-up of salts on the catheters surface as a result of the bacterial production of ureases which break down urine. Scanning electron microscopy (SEM) was used for detecting encrustation (Bull 1991). Bergqvist 1979 assessed encrustation through measuring the wet and dry weight of the concrement on the surface of the extracted catheters. Bergqvist 1979 also reported the complications of pain, bleeding, purulent discharge, urethral stricture, increased temperature, local irritation, swelling and reddening and frequency of catheter changes.

Patient satisfaction was investigated in two trials (Bull 1991; Nakada 1996*). Economic implications were discussed in one trial (Bull 1991).

Summary details are given in the “Characteristics of Included Studies” section.

Risk of bias in included studies

Generation of randomisation sequence was described in one trial as using computer generated random numbers (Bull 1991). Two trials (Bergqvist 1979; Nakada 1996*) did not provide any details regarding their generation of allocation code, except the information that group allocation was randomised. Adequate allocation concealment was described in one trial: Bergqvist 1979 used sealed envelopes. Allocation concealment remained unclear in two trials (Bull 1991; Nakada 1996*).

Bull 1991 described his trial as single-blinded, but it remains unclear whether it was the patients or the investigators who were blinded. Bergqvist 1979 did not perform blinding. Blinding was not mentioned in the other trial (Nakada 1996*).

One trial (Bergqvist 1979) reported no loss to follow up. Nakada 1996* had a follow up of 83% and Bull 1991 reported 69.6%. Both of these trials reported analysis of their drop-outs. In one (Bull 1991), one patient in the hydrophilic polymer coated latex catheter group discontinued due to catheter-related problems compared to seven patients within the silicone coated urethral catheter group. Two patients of another trial (Nakada 1996*) were excluded because their catheterisation was short-term (for only two weeks).

Intention-to-treat analysis was used in one trial (Bergqvist 1979). Two trials (Bull 1991; Nakada 1996*) analysed data on the basis of treatment received.

Effects of interventions

1. Antiseptic impregnated urethral catheters versus standard urethral catheters (Comparison 01, Other Data Table 01).

Only one very small crossover trial (12 participants) compared a type of silver alloyed (silver and hydrogel coated) Foley catheter with a standard silicone coated catheter (Nakada 1996*). There were no significant differences between the different types of catheters in terms of urinary tract infections because all the participants had UTIs (Other Data Table 01.01.01). There were no significant differences in adverse effects such as: events of leakage of urine (4 out of 10 versus 7 out of 10 patients, Other Data Table 01.02.01); urethral pain and discomfort (1 out of 10 versus 4 out of 10, Other Data Table 01.03.01); residual urine sensation (2 out of 10 versus 5 out of 10, Other Data Table 01.04.01); and turbid urine (1 out of 10 versus 4 out of 10, Other Data Table 01.06.01).

2. Antibiotic impregnated urethral catheters versus standard urethral catheters.

No trials were found that addressed this comparison.

3. Antibiotic impregnated urethral catheters versus antiseptic impregnated urethral catheters.

No trials were found that addressed this comparison.

4. One type of standard urethral catheter versus another (Comparison 04).

Two small trials using different outcome measures compared four different types of standard catheters to investigate UTI:

- Hydrogel coated latex catheter (Bull 1991);
- Latex catheter (Bergqvist 1979);
- PVC catheter (Bergqvist 1979);
Silicone catheter (Bergqvist 1979; Bull 1991)

Data from the two trials could not be combined because there were significant clinical differences between the trials regarding the types of standard catheters and outcome measurements. There were no significant differences between the different types of catheters in terms of urinary tract infections because all the participants had UTIs (Comparison 04.01). In one trial, fewer patients were unable to retain the hydrogel coated latex catheter (9 out of 36) for 16 weeks compared with the silicone catheter (20 out of 33) (RR 0.41, 95% CI 0.22 to 0.77, Comparison 04.03.04) (Bull 1991), and they also preferred the latex catheter (RR for dissatisfaction 0.68, 95% CI 0.49 to 0.95, Comparison 04.06.04) (Bull 1991). The numbers were too few to detect plausible differences in other outcomes such as pain or purulent discharge (Comparison 04.04), stricture on the catheter surface (Comparison 04.08 & 04.09) (Bergqvist 1979). The significant difference in the length of time the catheter remained in situ suggests that the hydrogel coated latex catheter (90 days) might be more cost-effective than the silicone coated catheter (57 days) (MD 33 days, 95% CI 15 to 50, Comparison 04.03.04, Bull 1991).

5. One type of antiseptic impregnated urethral catheter versus another.

No trials were found that addressed this comparison.

6. One type of antibiotic impregnated urethral catheter versus another.

No trials were found that addressed this comparison.

5. One type of standard urethral catheter versus another.

This comparison included two trials in 90 adults who were randomized to different types of standard catheters (Bergqvist 1979; Bull 1991). There were significant clinical differences between the trials regarding the types of standard catheters and outcome measurements. Therefore the data from these trials were not statistically combined. Both trials were small and the data insufficient to draw conclusions. The only finding of statistical significance was that the hydrogel coated latex catheter was retained for longer in one of the trials (Bull 1991). This might suggests that the hydrogel coated latex catheter would be more cost-effective than the silicone coated catheter, depending on relative costs.

Authors’ Conclusions

Implications for practice

The main finding of this review is the astonishing lack of evidence for this clinically highly relevant problem. Generally, the three included trials were very small and showed methodological weaknesses. The evidence was not sufficient as a reliable basis for practice, and should be interpreted cautiously.

Implications for research

Larger, well powered, better quality randomised trials with robust concealed randomisation methods are needed. Further research is needed to establish evidence-based practice for long-term catheter care. The following issues should be addressed to determine the effect of type of indwelling urethral catheter on the occurrence of UTI and other important outcomes in adults with long term voiding problems:

1. at risk groups - particularly women;
2. long-term care settings - e.g. home care, nursing homes;
3. UTI and asymptomatic bacteriuria;
4. use of antibiotics;
5. patients’ comfort, satisfaction and quality of life;
6. practitioners’ satisfaction;
7. economic evaluation.

The types of catheters compared should include standard, antibiotic impregnated and antiseptic impregnated catheters used for continuous urethral drainage.

ACKNOWLEDGEMENTS

We are grateful to Dr Jennifer Skelly and the Canadian Nurse Continence Advisor Association, Sheila Wallace and the rest of the Cochrane Incontinence Review Group, Prof. Dr. Johann Behrens and the Pflegeforschungsverbund Mitte-Süd as well as the Wilhelm-Roux-Program for support and encouragement. Thank you also to Professor Atsuo Kondo and Mari Imamura for translation of a trial published in Japanese.

REFERENCES

References to studies included in this review

Bergqvist 1979 (published data only)

Bull 1991 (published data only)

Nakada 1996* (published data only)

References to studies excluded from this review

Airaksinen 1979 (published data only)

Bennett 1997 (published data only)

Binder 1969 (published data only)

Bologna 1999 (published data only)

Brocklehurst 1988 (published data only)

Burke 1986 (published data only)

Burman 1987 (published data only)

Charbonneau 1993 (published data only)
Charbonneau-Smith R. No-touch catheterization and infection rates in a select spinal cord injured population. Rehabilitation nursing: the official journal of the Association of Rehabilitation Nurses 1993;18(5):296–9, 305. [: RefID_78]
Types of indwelling urinary catheters for long-term bladder drainage in adults (Review)

Copyright © 2009 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.
Horgan 1992  [published data only]

Jewes 1988  [published data only]

Johnson 1990  [published data only]

Kalmabaheri 1965  [published data only]

Karchmer 2000  [published data only]

Klarskov 1986  [published data only]

Kovindha 2004  [published data only]

Kunin 1965  [published data only]

Kunin 1987  [published data only]

Kunin 1987a  [published data only]

Lai 2002  [published data only]

Lazarus 1971  [published data only]

Liedberg 1990  [published data only]

Liedberg 1990a  [published data only]

Monson 1974  [published data only]

Morriss 1997  [published data only]

Nacey 1985  [published data only]

Newton 2002  [published data only]

Norden 1988  [published data only]

Pascoe 2001  [published data only]

Piergiovanni 1991  [published data only]

Pietro-Fingerhut 97  [published data only]

Riley 1995  [published data only]
Wilson 1997 {published data only}

Wyndaele 1999 {published data only}

Wyndaele 2000 {published data only}

Additional references

Alderson 2004

Brosnahan 2004

CF 2004

Gammack 2003

Garner 1996

Getliffe 1990

Higgins 2003

Jarvis 1992

NINSS 2002

Rubino 1983 {published data only}

Schaeffer 1988 {published data only}

Sethia 1987 {published data only}

Singh 1994 {published data only}

Stickler 1996 {published data only}

Tidd 1976 {published data only}

Vaidyanathan 1994 {published data only}

Vandoni 1994 {published data only}

Vapnek 2003 {published data only}

Waller 1997 {published data only}

Wille 1993 {published data only}
NNIS 2003

Pomfret 2000

RKI 2002

Robinson 2001

Saint 1998

Stamm 1998

Tambyah 1999

Ware 1992

Warren 1992

Warren 1997

Wilde 1986

Zigmond 1983

* Indicates the major publication for the study
### Characteristics of included studies  [ordered by study ID]

#### Bergqvist 1979

<table>
<thead>
<tr>
<th>Methods</th>
<th>RCT, parallel group study (no blinding), concealed allocation (sealed envelopes)</th>
</tr>
</thead>
</table>
| Participants | n= 21 (13 female, mean age 85 ± 6; 8 male, mean age 73 ±10)  
Group I (n=7): 5 female, 2 male; mean age 73  
Group II (n=7): 4 female, 3 male; mean age 80  
Group III (n=7): 4 female, 3 male; mean age 77  
Setting: geriatric patients in institutional setting |
| Interventions | Group I (7): silicon coated latex catheter (Folicon, Eschman Bros. and Walsh Ltd.)  
Group II (7): polyvinylchloride (PVC) catheter (Simplastic, J. G. Franklin and Sons)  
Group III (7): Silicon catheter (Silicath, Travenol Laboratories Ltd)  
-Catheter was changed every 6th week, or changed as necessary, e.g. because of complications or accidental self extraction |
| Outcomes | Symptomatic UTI or symptomatic bacteriuria: Group I: 7/7; Group II: 7/7; Group III: 7/7  
Catheter retained for <6 weeks: Group I: 5/7 patients; Group II: 8/7 patients*; Group III: 4/7 patients  
Complications/ adverse effects:  
Pain, bleeding, purulent discharge, regular rinsing required: Group I: 2/7; Group II: 0/7; Group III: 1/7  
Appearance of urethral stricture: Group I: 0/7; Group II: 1/7; Group III: 0/7  
Temperature increase, influence on general well-being following catheterisation: Group I: 0/7; Group II: 1/7; Group III: 0/7  
Marked local irritation (eg swelling and reddening): Group I: 0/7; Group II: 2/7; Group III: 0/7  
Concrement on catheter:  
Wet weight: Group I: 1.3 ± 0.5g; Group II: 1.2 ± 0.4g; Group III: 1.1 ± 0.4g  
Group I vs. Group II: p=0.35; Group III vs. Group I: p=0.13; Group III vs. Group II: p=0.45  
Dry weight: Group I: 0.27 ± 0.20g; Group II: 0.18 ± 0.05g; Group III: 0.09 ± 0.05g  
Group I vs. Group II: p=0.0625; Group III vs. Group I: p=0.0001; Group III vs. Group II: p=0.0001 |
| Notes | No power calculation  
Trial was conducted in Sweden  
No external funding  
Blinding not possible  
* as reported, but only 7 patients initially allocated to PVC catheter group |

### Risk of bias

<table>
<thead>
<tr>
<th>Item</th>
<th>Authors' judgement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocation concealment?</td>
<td>Yes</td>
<td>A - Adequate</td>
</tr>
<tr>
<td>Methods</td>
<td>RCT, parallel group study (single-blinded), group allocation by computer-generated random numbers,</td>
<td></td>
</tr>
</tbody>
</table>
| Participants | n = 69  
Group I: (n=36); 5 females and 31 males; mean age 75.61 years (±12.6); pre-entry UTI 26/36 (72%)  
Group II: (n=33); 7 females and 26 males; mean age 70.03 years (± 16.6); pre-entry UTI 28/33 (86%)  
Inclusion: age of 18 and above; must require long-term catheterisation; mentally sound (5 points and above on a 10 point questionnaire testing their mental state)  
Exclusion: sensitivity to hydrogel materials; mental state score below 5  
Setting: community based |
| Interventions | Group I (36): hydrophilic polymer (hydrogel) coated latex catheter (Bard Biocath catheter - Bard Limited), 2-way, 16.5F, 10 ml balloon  
Group II (33): Silicone (Silicone Elastomer) coated urethral catheter (Dow Corning Silastic catheter - Dow Corning), 2-way, 16F, 10 ml balloon  
Over 16 weeks catheters were monitored at bi-weekly intervals and changed as necessary |
| Outcomes | Symptomatic UTI / asymptomatic bacteriuria: Group I: 36/36; Group II: 33/33  
Time catheter remained in situ: Group I: 89.61 d ± 35.31; Group II: 56.7 d ± 38.8  
Catheters remained for in situ <16 weeks: Group I: 9/36; Group II: 20/33  
Complications/ adverse effects:  
Adverse effects due to catheter: Group I: 1/36; Group II: 7/36 (pain, bypassing, not draining, catheter expelled)  
Bypassing episodes: Group I: 50/226; Group II: 62/179, (P < 0.007)  
Patients not satisfied: Group I: 20/36; Group II: 27/33, (P < 0.029)  
No significant differences between two groups were reported for comfort on insertion and removal. |
| Notes | No power calculation  
As-treated outcome analysis (intention-to-treat)  
Trial conducted in England  
Trial included patients with pre-existing UTIs |

**Risk of bias**

<table>
<thead>
<tr>
<th>Item</th>
<th>Authors' judgement</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Allocation concealment?</td>
<td>Unclear</td>
<td>B - Unclear</td>
</tr>
</tbody>
</table>

**Nakada 1996**

| Methods | RCT, crossover trial, initial group allocation by alternation after authors got consent  
As-Treated outcome analysis |
| Participants | n= 12, 1 female and 11 males, median age 82 years (71 to 95 years)  
Dropout: 2 participants were catheterised for <1 month, therefore not analysed |
Interventions

Group I (10): Silver Lubricath Foley catheter (silver catheter)
Group II (10): silicone-coated catheter (silicone catheter)
Duration of intervention: mean 26 ± 23 months, range 1 to 74
Catheters were alternately replaced every two weeks

Outcomes

Asymptomatic UTI: all patients with catheters in situ >30 days had bacteriuria >10⁵ CFU/mL, regardless of type of catheter.
Complications/adverse effects:
- Leakage of urine: Group I: 4/10, Group II: 7/10
- Urethral pain /discomfort: Group I: 1/10, Group II: 4/10
- Residual urine sensation: Group I: 2/10, Group II: 5/10
- Pain when removing catheter: Group I: 2/10, Group II: 2/10
- Turbid urine: Group I: 1/10, Group II: 4/10
- The patients reported that they preferred the silver catheter to the silicone catheter

Notes

No power calculation, randomised crossover design
Setting, exclusion criteria are unknown, frequency and interval of outcome measures unclear, blinding not mentioned
Study was conducted in Japan

Risk of bias

<table>
<thead>
<tr>
<th>Item</th>
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</table>

CFU = Colony Forming Units
UTI = Urinary Tract Infection

Characteristics of excluded studies  [ordered by study ID]

<table>
<thead>
<tr>
<th>Study</th>
<th>Reason for exclusion</th>
</tr>
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<tbody>
<tr>
<td>Airaksinen 1979</td>
<td>Co-intervention instillation of HIPREX (Methenamine Hippurate) (not only type of catheter)</td>
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<td>Controlled clinical trial without randomisation</td>
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<td>Controlled clinical trial without randomisation Length of catheterisation &lt; 30d</td>
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<td>Intervention urethral catheterisation with suprapubic catheterisation (not type of catheter)</td>
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<td>Wyndaele 2000</td>
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## DATA AND ANALYSES

### Comparison 1. Antiseptic impregnated urethral catheters versus standard urethral catheters

<table>
<thead>
<tr>
<th>Outcome or subgroup title</th>
<th>No. of studies</th>
<th>No. of participants</th>
<th>Statistical method</th>
<th>Effect size</th>
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<td>Other data</td>
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<tr>
<td>1.1 Silver alloyed catheter versus silicone catheter</td>
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<td>Other data</td>
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</tr>
<tr>
<td>2 Number with leakage of urine</td>
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<td>Other data</td>
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<td></td>
</tr>
<tr>
<td>2.1 Silver alloyed catheter versus silicone catheter</td>
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<td>Other data</td>
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</tr>
<tr>
<td>3 Number with urethral pain/discomfort</td>
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<td>Other data</td>
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<tr>
<td>3.1 Silver alloyed catheter versus silicone catheter</td>
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</tr>
<tr>
<td>4 Number with residual urine sensation</td>
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<td>4.1 Silver alloyed catheter versus silicone catheter</td>
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<td>5 Number with pain when removing the catheter</td>
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<td>5.1 Silver alloyed catheter versus silicone catheter</td>
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<td>Other data</td>
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</tr>
<tr>
<td>6 Number with turbid urine</td>
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<td>6.1 Silver alloyed catheter versus silicone catheter</td>
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### Comparison 4. One type of standard urethral catheter versus another standard urethral catheter

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<th>No. of participants</th>
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<th>Effect size</th>
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<td>1.2 Latex catheter versus silicone catheter</td>
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<td>1.3 PVC catheter versus silicone catheter</td>
<td>1</td>
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<tr>
<td>1.4 Hydrogel coated latex catheter versus silicone catheter</td>
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<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
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</tr>
<tr>
<td>Number retaining catheter for less than 6 weeks</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>Totals not selected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>---------------------------------</td>
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<td></td>
</tr>
<tr>
<td>2.1 Latex catheter versus PVC catheter</td>
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<td>2.2 Latex catheter versus silicone catheter</td>
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<td>2.3 PVC catheter versus silicone catheter</td>
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<table>
<thead>
<tr>
<th>Number retaining catheter for less than 16 weeks</th>
<th>Risk Ratio (M-H, Random, 95% CI)</th>
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<td>3.4 Hydrogel coated latex catheter versus silicone catheter</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Number with pain, bleeding or purulent discharge</th>
<th>Risk Ratio (M-H, Fixed, 95% CI)</th>
<th>Totals not selected</th>
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<td>4.1 Latex catheter versus PVC catheter</td>
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<td>4.2 Latex catheter versus silicone catheter</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
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</tr>
<tr>
<td>4.3 PVC catheter versus silicone catheter</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
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</tr>
<tr>
<td>4.4 Hydrogel coated latex catheter versus silicone catheter</td>
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</table>

<table>
<thead>
<tr>
<th>Number with urethral stricture</th>
<th>Risk Ratio (M-H, Fixed, 95% CI)</th>
<th>Totals not selected</th>
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<tr>
<td>5.1 Latex catheter versus PVC catheter</td>
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<td>5.2 Latex catheter versus silicone catheter</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
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<tr>
<td>5.3 PVC catheter versus silicone catheter</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>Not estimable</td>
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<tr>
<td>5.4 Hydrogel coated latex catheter versus silicone catheter</td>
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<table>
<thead>
<tr>
<th>Number of participants not satisfied</th>
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<th>Totals not selected</th>
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<td>6.1 Latex catheter versus PVC catheter</td>
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</tr>
<tr>
<td>6.2 Latex catheter versus silicone catheter</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
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<td>6.3 PVC catheter versus silicone catheter</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
<td>Not estimable</td>
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<tr>
<td>6.4 Hydrogel coated latex catheter versus silicone catheter</td>
<td>Risk Ratio (M-H, Fixed, 95% CI)</td>
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</table>

<table>
<thead>
<tr>
<th>Number with marked local irritation</th>
<th>Risk Ratio (M-H, Random, 95% CI)</th>
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<tbody>
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<td>7.1 Latex catheter versus PVC catheter</td>
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<td>7.2 Latex catheter versus silicone catheter</td>
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<td>7.4 Hydrogel coated latex catheter versus silicone catheter</td>
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</table>
8 Concrement on the catheter (wet weight)  
8.1 Latex catheter versus PVC catheter  
8.2 Latex catheter versus silicone catheter  
8.3 PVC catheter versus silicone catheter  
8.4 Hydrogel coated latex catheter versus silicone catheter

9 Concrement on the catheter (dry weight)  
9.1 Latex catheter versus PVC catheter  
9.2 Latex catheter versus silicone catheter  
9.3 PVC catheter versus silicone catheter  
9.4 Hydrogel coated latex catheter versus silicone catheter

10 Time catheter remained in situ  
10.1 Latex catheter versus PVC catheter  
10.2 Latex catheter versus silicone catheter  
10.3 PVC catheter versus silicone catheter  
10.4 Hydrogel coated latex catheter versus silicone catheter

Analysis 1.1. Comparison of antiseptic-impreganted urethral catheters versus standard urethral catheters, Outcome 1 Number with urinary tract infections.

<table>
<thead>
<tr>
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<th>Number with urinary tract infections</th>
<th>Total selected</th>
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<tbody>
<tr>
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### Analysis 1.2. Comparison 1 Antiseptic impregnated urethral catheters versus standard urethral catheters,
Outcome 2 Number with leakage of urine.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Silver alloyed catheter</th>
<th>Silicone catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996*</td>
<td>4/10</td>
<td>7/10</td>
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</table>

### Analysis 1.3. Comparison 1 Antiseptic impregnated urethral catheters versus standard urethral catheters,
Outcome 3 Number with urethral pain/discomfort.

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Silver alloyed catheter</th>
<th>Silicone catheter</th>
</tr>
</thead>
<tbody>
<tr>
<td>1996*</td>
<td>1/10</td>
<td>4/10</td>
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### Analysis 1.4. Comparison 1 Antiseptic impregnated urethral catheters versus standard urethral catheters,
Outcome 4 Number with residual urine sensation.

<table>
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<tr>
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<th>Silver alloyed catheter</th>
<th>Silicone catheter</th>
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<tbody>
<tr>
<td>1996*</td>
<td>2/10</td>
<td>5/10</td>
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### Analysis 1.5. Comparison 1 Antiseptic impregnated urethral catheters versus standard urethral catheters,
Outcome 5 Number with pain when removing the catheter.

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<td>2/10</td>
<td>2/10</td>
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</table>

### Analysis 1.6. Comparison 1 Antiseptic impregnated urethral catheters versus standard urethral catheters,
Outcome 6 Number with turbid urine.

<table>
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<th>Outcome</th>
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<tbody>
<tr>
<td>1996*</td>
<td>1/10</td>
<td>4/10</td>
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</tbody>
</table>
### Analysis 4.1. Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 1 Number with urinary tract infections.

**Review:** Types of indwelling urinary catheters for long-term bladder drainage in adults

**Comparison:** 4 One type of standard urethral catheter versus another standard urethral catheter

**Outcome:** 1 Number with urinary tract infections

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Catheter 1 n/N</th>
<th>Catheter 2 n/N</th>
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<th>Risk Ratio M-H,Fixed 95% CI</th>
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<tbody>
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<td>7/7</td>
<td>0.0 [ 0.0, 0.0 ]</td>
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</tr>
<tr>
<td>2 Latex catheter versus silicone catheter</td>
<td>7/7</td>
<td>7/7</td>
<td>0.0 [ 0.0, 0.0 ]</td>
<td></td>
</tr>
<tr>
<td>3 PVC catheter versus silicone catheter</td>
<td>7/7</td>
<td>7/7</td>
<td>0.0 [ 0.0, 0.0 ]</td>
<td></td>
</tr>
<tr>
<td>4 Hydrogel coated latex catheter versus silicone catheter</td>
<td>36/36</td>
<td>33/33</td>
<td>0.0 [ 0.0, 0.0 ]</td>
<td></td>
</tr>
</tbody>
</table>

### Analysis 4.2. Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 2 Number retaining catheter for less than 6 weeks.

**Review:** Types of indwelling urinary catheters for long-term bladder drainage in adults

**Comparison:** 4 One type of standard urethral catheter versus another standard urethral catheter

**Outcome:** 2 Number retaining catheter for less than 6 weeks

<table>
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<tr>
<th>Study or subgroup</th>
<th>Catheter 1 n/N</th>
<th>Catheter 2 n/N</th>
<th>Risk Ratio M-H,Fixed 95% CI</th>
<th>Risk Ratio M-H,Fixed 95% CI</th>
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</thead>
<tbody>
<tr>
<td>1 Latex catheter versus PVC catheter</td>
<td>5/7</td>
<td>0/7</td>
<td>11.00 [ 0.72, 167.68 ]</td>
<td></td>
</tr>
<tr>
<td>2 Latex catheter versus silicone catheter</td>
<td>5/7</td>
<td>4/7</td>
<td>1.25 [ 0.56, 2.77 ]</td>
<td></td>
</tr>
<tr>
<td>3 PVC catheter versus silicone catheter</td>
<td>0/7</td>
<td>4/7</td>
<td>0.11 [ 0.01, 1.74 ]</td>
<td></td>
</tr>
</tbody>
</table>
Analysis 4.3.  Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 3 Number retaining catheter for less than 16 weeks.

Review: Types of indwelling urinary catheters for long-term bladder drainage in adults

Comparison: 4 One type of standard urethral catheter versus another standard urethral catheter

Outcome: 3 Number retaining catheter for less than 16 weeks

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Catheter 1</th>
<th>Catheter 2</th>
<th>Risk Ratio M-H,Random,95% CI</th>
<th>Risk Ratio M-H,Random,95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hydrogel coated latex catheter versus silicone catheter</td>
<td>Bull 1991</td>
<td>9/36</td>
<td>20/33</td>
<td>0.41 [ 0.22, 0.77 ]</td>
</tr>
</tbody>
</table>

Analysis 4.4.  Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 4 Number with pain, bleeding or purulent discharge.

Review: Types of indwelling urinary catheters for long-term bladder drainage in adults

Comparison: 4 One type of standard urethral catheter versus another standard urethral catheter

Outcome: 4 Number with pain, bleeding or purulent discharge

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Catheter 1</th>
<th>Catheter 2</th>
<th>Risk Ratio M-H,Fixed,95% CI</th>
<th>Risk Ratio M-H,Fixed,95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Latex catheter versus PVC catheter</td>
<td>Bergqvist 1979</td>
<td>2/7</td>
<td>0/7</td>
<td>5.00 [ 0.28, 88.53 ]</td>
</tr>
<tr>
<td>2 Latex catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>2/7</td>
<td>1/7</td>
<td>2.00 [ 0.23, 17.34 ]</td>
</tr>
<tr>
<td>3 PVC catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>0/7</td>
<td>1/7</td>
<td>0.33 [ 0.02, 7.02 ]</td>
</tr>
<tr>
<td>4 Hydrogel coated latex catheter versus silicone catheter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Types of indwelling urinary catheters for long-term bladder drainage in adults (Review)

Copyright © 2009 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.
### Analysis 4.5. Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 5 Number with urethral stricture

**Review:** Types of indwelling urinary catheters for long-term bladder drainage in adults

**Comparison:** 4 One type of standard urethral catheter versus another standard urethral catheter

**Outcome:** 5 Number with urethral stricture

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Catheter 1</th>
<th>Catheter 2</th>
<th>Risk Ratio (M-H, Fixed, 95% CI)</th>
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<td></td>
<td>n/N</td>
<td>n/N</td>
<td></td>
</tr>
<tr>
<td>1 Latex catheter versus PVC catheter</td>
<td>Bergqvist 1979</td>
<td>0/7</td>
<td>1/7</td>
</tr>
<tr>
<td>2 Latex catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>0/7</td>
<td>0/7</td>
</tr>
<tr>
<td>3 PVC catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>1/7</td>
<td>0/7</td>
</tr>
<tr>
<td>4 Hydrogel coated latex catheter versus silicone catheter</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Analysis 4.6. Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 6 Number of participants not satisfied

**Review:** Types of indwelling urinary catheters for long-term bladder drainage in adults

**Comparison:** 4 One type of standard urethral catheter versus another standard urethral catheter

**Outcome:** 6 Number of participants not satisfied

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Catheter 1</th>
<th>Catheter 2</th>
<th>Risk Ratio (M-H, Fixed, 95% CI)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>n/N</td>
<td>n/N</td>
<td></td>
</tr>
<tr>
<td>1 Latex catheter versus PVC catheter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Latex catheter versus silicone catheter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 PVC catheter versus silicone catheter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Hydrogel coated latex catheter versus silicone catheter</td>
<td>Bull 1991</td>
<td>20/36</td>
<td>27/33</td>
</tr>
</tbody>
</table>
Analysis 4.7. Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 7 Number with marked local irritation.

Review: Types of indwelling urinary catheters for long-term bladder drainage in adults

Comparison: 4 One type of standard urethral catheter versus another standard urethral catheter

Outcome: 7 Number with marked local irritation

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Catheter 1</th>
<th>Catheter 2</th>
<th>Risk Ratio</th>
<th>Risk Ratio</th>
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<tbody>
<tr>
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<td>n/N</td>
<td>n/N</td>
<td>M-H,Random,95% CI</td>
<td>M-H,Random,95% CI</td>
</tr>
<tr>
<td>1 Latex catheter versus PVC catheter</td>
<td>Bergqvist 1979</td>
<td>0/7</td>
<td>2/7</td>
<td>0.20 [ 0.01, 3.54 ]</td>
</tr>
<tr>
<td>2 Latex catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>0/7</td>
<td>0/7</td>
<td>0.00 [ 0.00, 0.00 ]</td>
</tr>
<tr>
<td>3 PVC catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>2/7</td>
<td>0/7</td>
<td>5.00 [ 0.28, 88.53 ]</td>
</tr>
<tr>
<td>4 Hydrogel coated latex catheter versus silicone catheter</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Analysis 4.8. Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 8 Concrement on the catheter (wet weight).

Review: Types of indwelling urinary catheters for long-term bladder drainage in adults

Comparison: 4 One type of standard urethral catheter versus another standard urethral catheter

Outcome: 8 Concrement on the catheter (wet weight)

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Catheter 1</th>
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<th>Mean Difference</th>
<th>Mean Difference</th>
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<td>Mean(SD)</td>
<td>N</td>
<td>Mean(SD)</td>
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<tr>
<td></td>
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<td>M-H,Random,95% CI</td>
<td>M-H,Random,95% CI</td>
</tr>
<tr>
<td>1 Latex catheter versus PVC catheter</td>
<td>Bergqvist 1979</td>
<td>7</td>
<td>1.3 (0.5)</td>
<td>7</td>
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<tr>
<td>2 Latex catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>7</td>
<td>1.3 (0.5)</td>
<td>7</td>
</tr>
<tr>
<td>3 PVC catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>7</td>
<td>1.2 (0.4)</td>
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<td>4 Hydrogel coated latex catheter versus silicone catheter</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
### Analysis 4.9. Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 9 Concrement on the catheter (dry weight).

**Review:** Types of indwelling urinary catheters for long-term bladder drainage in adults

**Comparison:** 4 One type of standard urethral catheter versus another standard urethral catheter

**Outcome:** 9 Concrement on the catheter (dry weight)

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Catheter 1</th>
<th>Catheter 2</th>
<th>Mean Difference</th>
<th>Mean Difference</th>
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<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean(SD)</td>
<td>N</td>
<td>Mean(SD)</td>
</tr>
<tr>
<td>1 Latex catheter versus PVC catheter</td>
<td>Bergqvist 1979</td>
<td>7</td>
<td>0.27 (0.2)</td>
<td>7</td>
</tr>
<tr>
<td>2 Latex catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>7</td>
<td>0.27 (0.2)</td>
<td>7</td>
</tr>
<tr>
<td>3 PVC catheter versus silicone catheter</td>
<td>Bergqvist 1979</td>
<td>7</td>
<td>0.18 (0.05)</td>
<td>7</td>
</tr>
<tr>
<td>4 Hydrogel coated latex catheter versus silicone catheter</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

### Analysis 4.10. Comparison 4 One type of standard urethral catheter versus another standard urethral catheter, Outcome 10 Time catheter remained in situ.

**Review:** Types of indwelling urinary catheters for long-term bladder drainage in adults

**Comparison:** 4 One type of standard urethral catheter versus another standard urethral catheter

**Outcome:** 10 Time catheter remained in situ

<table>
<thead>
<tr>
<th>Study or subgroup</th>
<th>Catheter 1</th>
<th>Catheter 2</th>
<th>Mean Difference</th>
<th>Mean Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean(SD)</td>
<td>N</td>
<td>Mean(SD)</td>
</tr>
<tr>
<td>1 Latex catheter versus PVC catheter</td>
<td>Bull 1991</td>
<td>36</td>
<td>-89.61 (35.31)</td>
<td>33</td>
</tr>
</tbody>
</table>
Appendix 1. Search methods and terms used for the extra specific searching performed for this review

In addition to the Cochrane Incontinence Group Specialised Trials Register, MEDLINE and CINAHL were searched by two reviewers working independently of each other.


#3 #1 AND #2


#5 #3 AND #4


#1 "Urinary Catheterization"[MeSH] OR "Catheterization"[MeSH] OR "Catheters, Indwelling"[MeSH] OR catheter*[Text Word] OR (CATHETER* near BLADDER) OR (CATHETER* near INTERMITTENT) OR (CATHETER* near URIN*) OR (CATHETER* near INFECT*) OR (CATHETER* near INDWELLING) OR (CATHETER* near SUPRAPUBIC)


#3 #1 AND #2

#4 ("Adult"[MeSH] OR "Aged"[MeSH] OR "Middle Aged"[MeSH] OR "Aged, 80 and over"[MeSH]) NOT "Child"[MeSH]

#5 #3 AND #4

#6 "Clinical Trial"[Publication Type] OR "Clinical Trials"[MeSH] OR "Meta-Analysis"[MeSH] OR "Meta-Analysis"[Publication Type] OR "Review"[Publication Type] OR "Randomized Controlled Trial"[Publication Type] OR "Randomized Controlled Trials"[MeSH]

#7 #5 AND #6

First search in CINAHL via WebSPIRS - (searched: 1 January 1982 to February 2005) (last searched 26 February 2005):

#1 ((Urinary-Tract-Infections) or (Urinary-Tract) or (Catheters-Urinary) or (Urinary-Incontinence) or (Urinary-Catheterization) or (Urinary-Catheterization-Intermittent)) or (("Urinary-Tract" / all TOPICAL SUBHEADINGS / all AGE SUBHEADINGS in DE) or ("Urinary-Infected" / all TOPICAL SUBHEADINGS / all AGE SUBHEADINGS in DE))

#2 ((research methodology) or (data analysis) or (meta analysis) or (systematic review) or (data collection) or (study design) or (crossover design) or (empirical research) or (experimental studies) or (clinical trials) or (double-blind studies) or (intervention trials) or (preventive trials) or (single-blind studies) or (therapeutic trials) or (comparative studies) or (random) and ("Urinary-Tract-Infections" or (Urinary-Tract) or (Catheters-Urinary) or (Urinary-Incontinence) or (Urinary-Catheterization) or (Urinary-Catheterization-Intermittent))) or (("Urinary-Tract-Infections" / all TOPICAL SUBHEADINGS / all AGE SUBHEADINGS in DE) or ("Urinary-Tract-Infections" / all TOPICAL SUBHEADINGS / all AGE SUBHEADINGS in DE) or ("Urinary-Catheterization" / all TOPICAL SUBHEADINGS / all AGE SUBHEADINGS in DE) or ("Urinary-Catheterization" / all TOPICAL SUBHEADINGS / all AGE SUBHEADINGS in DE))
The listed databases have been searched by the authors for eligible studies for the earliest entrance date possible until the latest search date (searched 26 February 2005).

A handsearch of the following conference proceedings and journals has been carried out to identify any research or relevant studies.

The following conference proceedings have been searched by hand:


Types of indwelling urinary catheters for long-term bladder drainage in adults (Review)
The following journals have been searched by hand:

- BJU International, 83.1999 - 88.2004
- Contemporary Urology, 7.1995 - 16.2004
- Current Urology Reports, 1.2000 - 5.2004
- Der Urologe A, 34.1995 - 43.2004
- Der Urologe B, 35.1995 - 42.2002
- European Urology, 27.1995 - 46.2004
- Excerpta Medica, Section 28, Urology and Nephrology, 1995 - 49.1997
- International Urology and Nephrology, 27.1995 - 36.2004
- Techniques in Urology, 1.1995 - 7.2001
- Urological Research, 23.1995 - 32.2004
- Urology, 45.1995 - 63.2004

Experts in the field such as scientific societies for continence and urology were contacted and asked whether they had been involved in any further potentially eligible studies or are aware of recent or ongoing studies about problems occurring with long-term catheterisation of adults.

Contacted experts and scientific societies for continence and urology:

- American Urological Association
- American Urogynecological Society
- Berufsverband der Deutschen Urologen e.V.
- Deutsche Gesellschaft für Urologie e.V
- European Association of Urology (EAU)
- International Urogynecological Association (IUGA)
- Jennifer Skelly, RN PhD, Director of the Continence Program at St. Joseph’s Centre for Ambulatory Health Services, and an Associate Professor in the School of Nursing, McMaster University, President of the Canadian Nurse Continence Advisor Association
- Österreichische Gesellschaft für Urologie und Andrologie
- Schweizerische Gesellschaft für Urologie / Société Suisse d’Urologie
- The Continence Foundation
- The International Continence Society

Contacted catheter manufacturers:

- B. Braun Melsungen AG
- Johnson & Johnson
- Neo Medical GmbH
- Medicoplast GmbH
- Medinorm Medizintechnik GmbH
- Paul Hartmann AG
- Rüsch GmbH
- Tyco Healthcare Deutschland GmbH
- Urotech Medizinische Technologie GmbH
- Wiruter Rüsch Medical GmbH

For this review there have been no restrictions on date of publication, language of publication, or publication status (published or unpublished work). The reference lists of all retrieved studies have been scanned for additional studies.
WHAT'S NEW

Last assessed as up-to-date: 22 May 2007.

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HISTORY

Protocol first published: Issue 4, 2004

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<td>New citation required and conclusions have changed</td>
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CONTRIBUTIONS OF AUTHORS

All reviewers contributed towards the writing of the protocol.

MP and PJ independently searched electronic databases and performed hand search. AKN and ASH independently assessed all titles and abstracts identified by the search. PJ, MP, AKN, and ASH completed the data extraction and quality assessment of all trials. PJ, MP, AKN, and ASH drafted the text. All authors contributed to the editing of the text. GL also provided methodological help.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- German Center for Evidence-based Nursing, Martin-Luther-University, Halle, Germany.
- Institute of Health and Nursing Sciences, Martin-Luther-University, Halle, Germany.
External sources

- Jennifer Skelly, RN PhD, Canadian Nurse Continence Advisor Association, Canada.
- Wilhelm-Roux-Program, Vice Dean of Research and Research Structures, Medical Faculty, Martin Luther University Halle Wittenberg, Germany.

INDEX TERMS

Medical Subject Headings (MeSH)
*Urinary Bladder; Catheters, Indwelling; Drainage [instrumentation]; Randomized Controlled Trials as Topic; Urinary Catheterization [*instrumentation; *standards]

MeSH check words
Adult; Humans