



Best Practice

Evidence Based Practice Information Sheets for Health Professionals

Management of Short Term Indwelling Urethral Catheters to Prevent Urinary Tract Infections

Information Source

This *Best Practice* Information Sheet is based on a systematic review of research published by The Joanna Briggs Institute entitled *Management of Indwelling Urethral Catheters to Prevent Urinary Tract Infections*¹. The primary references on which this information sheet is based are published in the systematic review which is available from The Joanna Briggs Institute www.joannabriggs.edu.au

Introduction

Indwelling urethral catheters (IDC) are part of a disposable system consisting of catheter, tubing and drainage bag, and are common tools used in the management of patients. They are used in 15% to 25% of all hospital patients, to monitor urine output or to provide bladder drainage. IDC are passed via the urethra into the bladder, and because they bypass the normal defence mechanisms of the body, there are risks associated with their use. Urinary tract infections are the most common problem associated with the use of IDC. Other potential complications include urethritis, urethral strictures, haematuria, bladder perforation and encrustation of the catheter leading to blockage of the urine flow.

This Best Practice Information Sheet Covers the Following Concepts:

1. Catheterisation Technique
2. Meatal Care
3. Catheter Composition
4. Bladder Irrigation
5. Drainage Systems
6. Indwelling Catheterisation vs Intermittent Catheterisation
7. Care Delivery
8. Education

Levels of Evidence

All studies were categorised according to the strength of the evidence based on the following classification system.

Level I

Evidence obtained from a systematic review of all relevant randomised controlled trials.

Level II

Evidence obtained from at least one properly designed randomised controlled trial.

Level III.1

Evidence obtained from well designed controlled trials without randomisation.

Level III.2

Evidence obtained from well designed cohort or case control analytic studies preferably from more than one center or research group.

Level III.3

Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments.

Level IV

Opinion of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees.

Urinary tract infections (UTI) are one of the most common nosocomial infections accounting for approximately 20% to 40% of all hospital acquired infections and 80% of these are associated with the use of urinary catheters. Most studies advise that between 10% and 30% of patients with short term catheters will develop bacteriuria.

Multi-centre studies of intensive care units found the prevalence of UTI to range from 2.4% to 17.6%. Catheter associated UTI have been shown to prolong the mean length of hospital stay by 2.4 to 4.5 days and are associated with an increased in-hospital mortality. Because of the significance and risk of UTI, a major component of the management of the patient with an IDC is the prevention of infectious complications, which is reflected in the studies identified in the preliminary review of the research literature.

Interventions to prevent catheter related urinary tract infections/bacteriuria have focused on preventing intra-luminal or extra-luminal entry of organisms into the urinary drainage system, and the introduction of organisms during insertion of the catheter. Research has explored various practices including catheter insertion technique, meatal care, specially coated catheters, flushing solutions, use of sealed drainage systems and changes in care delivery practices.

This systematic review was initiated to identify and summarise the best available evidence relating to the

prevention of urinary tract infections/bacteriuria associated with the use of short term indwelling urethral catheters. The systematic review method was based on the work of Cochrane Collaboration and Centre for Reviews and Dissemination at The University of York. The parameters of the review were set by an expert panel.

As infections are well-documented as a complication of long term indwelling catheters, it was agreed that the review should be restricted to patients with short-term catheters. Due to changes in technology, the review panel considered that studies prior to 1980 had less relevance to practice and were therefore excluded from the analysis. The review was restricted to English language studies that evaluated the effectiveness of interventions in adults.

Only randomised control trials (RCT) were included as studies of effectiveness are best addressed using this research design. However, in order to present the reader with the best available clinical evidence, some studies not meeting the inclusion criteria are also discussed in this information sheet. Recommendations are based only on randomised controlled trials.

Summary of Results

1. Catheterisation Technique

Based on the results of a single included study, there is no difference in rates of infection using either sterile or non-sterile techniques for catheterisation. This study compared sterile catheterisation involving a surgical scrub, sterile gloves, strict aseptic no touch technique, savlon solution (chlorhexidine and cetrimide), sterile catheter pack, lignocaine and sterile water to inflate balloon, to a clean non-sterile catheterisation. The clean non-sterile catheterisation involved hand washing with soap and water, wearing non-sterile gloves, genitalia cleaned with tap water, no catheter pack and the balloon filled with tap water. The discussion also highlighted the substantial cost savings when using the non-sterile technique.

A total of seven studies were excluded from the catheterisation technique meta-analysis due to issues such as not fulfilling the criteria of a randomised controlled trial, including supra pubic catheters or using an outcome

Objectives

The objective of this review was to present the best available evidence related to the prevention of urinary tract infections associated with the use of short term indwelling urethral catheters. The specific review questions addressed were:

1. Are interventions aimed at minimising the introduction of micro-organisms into the urinary system during catheterisation effective at reducing catheter related urinary tract infections/bacteriuria?
2. Are interventions aimed at preventing intra-luminal contamination of urinary catheters by micro-organisms effective at reducing catheter related urinary tract infections/bacteriuria?
3. Are interventions aimed at preventing extra-luminal contamination of urinary catheters by micro-organisms effective at reducing catheter related urinary tract infections/bacteriuria?
4. Are other interventions effective at reducing the incidence of catheter related urinary tract infections/bacteriuria?

measure other than rates of infection/bacteriuria. It is interesting to note, however, that four of these trials concluded that there was a lack of evidence to support either the use of antibiotic gels or sterile conditions in making any significant difference in the rates of urinary tract infection/bacteriuria.

2. Meatal Care

In three studies that investigated meatal care strategies to prevent bacteriuria, little or no benefit was found overall in using anything other than standard personal hygiene in caring for patients who have indwelling catheters. There was, however, some benefit indicated in a small subset of high-risk female patients. These three studies compared standard meatal care, such as washing with soap or a daily bath, to meatal care using povidine-iodine, neomycin-polymixin beta-bactracin ointment or poly-antibiotic cream.

3. Catheter Composition

The only reduction in bacteriuria highlighted in the included papers addressing catheter composition was in relation to the use of silver impregnated catheters. Other compositions evaluated, such as latex and silicone, found no advantage in terms of a reduction in bacteriuria. This conclusion is also borne out in a recent systematic review of the use of silver coated catheters².

Eighteen studies found on the subject of catheter composition unfortunately could not be included in the analysis. Of the excluded studies, 6 were based in the laboratory and did not involve patients, 2 were looking at long term catheterisation, 2 did not have bacteriuria as an outcome measurement and the rest were not RCT. Some of the excluded studies are, however, of clinical interest.

The trials set in the laboratory explored a number of areas such as surface

morphology and resistance to encrustation by organisms predominant in urinary tract infections. None of these trials found any particular catheter as offering significant advantage in these areas. The laboratory tests, however, did find the use of a silver releasing device to be beneficial in reducing colonisation.

A meta-analysis of the use of silver alloy coated catheters³ indicated a significant reduction in the incidence of urinary tract infection, however, critical analysis of the paper by Bandolier⁴ highlighted a number of questions and advised caution in using the results of the meta-analysis³. While research favours silver impregnated catheters, further research needs to be undertaken and should include issues related to cost-efficacy.

4. Bladder Irrigation

While a variety of bladder irrigation solutions have been evaluated, none can be recommended for the prevention of urinary tract infection in patients with an IDC. No RCT has evaluated the effectiveness of povidone-iodine in people with an IDC, however it has been used with success in patients undergoing intermittent catheterisation. One study found that 50 ml povidone-iodine 2% instilled in the bladder and then allowed to drain prior to catheter removal, reduced hospital acquired bacteriuria. Non-RCT studies suggest that povidone-iodine may also be effective for people with indwelling urinary catheters.

In people with long term catheters, comparisons of bladder irrigation using normal saline, chlorhexidine and non-bacteriostatic solutions, did not show any difference in infection rate. Based on current evidence, no recommendations can be made on the effectiveness of bladder irrigation to minimise urinary tract infection/bacteriuria.

5. Drainage Systems

Due to a wide variation in interventions and outcome measures it was difficult to summarise this category and compare studies for meta-analysis. Sealed drainage systems were found to be effective in some of the trials with one trial finding increased benefit for females compared to males. Issues of cost effectiveness were also highlighted by most of the studies as possibly counteracting any benefit gained.

With regard to adding solutions to the drainage bags, neither chlorhexidine nor hydrogen peroxide were found to be effective. A study looking at trichloroisocyanuric acid did recommend its use, however this study also used silver alloy coatings on the catheters, so it was impossible to determine which intervention was key in reducing infection/bacteriuria. This was also the case in studies looking at the use of a sealed drainage system in conjunction with an antibacterial solution.

Again a large number of studies were excluded from this section, eighteen in all. Three were too old to be included, four looked at long term catheterisation, one was in a laboratory setting and the rest did not fulfil the criteria for RCT.

A total of seven of the excluded papers looked at the instillation of antibacterial agents to the drainage bags as a preventative measure for catheter associated bacteriuria. Three were based in long term settings and four were not RCT. This area was the subject of considerable discussion in letters to the editor in the early 1980's. The results were divided with some studies advocating the addition of antibacterial agents such as chlorhexidine and povidone to drainage bags while others found no significant benefit in their use. One paper highlighted a potential benefit with the addition of formaldehyde.

A study of long term patients who had diluted bleach added daily to their

drainage bags showed no difference in infection rates between weekly or four weekly bag changes.

Two studies explored technique in the maintenance of urinary drainage systems, however, study protocols were not readily generalised to the practice setting. One of the studies found no clear trends in errors of catheter care, concluding that reducing bacteriuria involved a number of complex factors such as immunological, environmental, microbiological and behavioural.

The results of studies were divided regarding the comparisons of drainage bags with some favouring particular brands while others found no significant difference. Of the two studies specifically addressing this issue neither trial met the review criteria. A further non RCT compared anti reflux valves with complex closed systems with no significant benefits found.

6. Indwelling Catheterisation vs Intermittent Catheterisation

The only study eligible for inclusion examined post-operative patients. This RCT compared bacteriuria in patients with an IDC versus 'in-out' catheters. There was a reduced incidence of bacteriuria with 'in-out' catheters however, there were complications such as retention associated with these. As with other areas considered in this review, further studies are needed to draw stronger conclusions.

7. Care Delivery

The results of two studies indicated that there is a lower rate of bacteriuria in surgical patients who have a catheter for only one day versus three days, however when the catheter was removed after one day the retention and re-catheterisation rate was higher. Possible complications need to be considered when deciding on the length of time of catheterisation. As patients with positive pre-operative urine cultures were included in the studies, it was difficult to establish the rate of bacteriuria that occurred as a result of catheterisation.

Six other studies were found but subsequently excluded from analysis. One was based in a long term setting, two did not have infection/bacteriuria as an outcome measure and the rest did not fulfil the criteria for RCT.

A small study in men residing in a nursing home showed a lower rate of infection if catheters were changed on a monthly basis compared to PRN changes. This regular catheter change protocol resulted in fewer complications including infections and blockages.

In the remaining studies, none fulfilled the RCT criteria as set out in the review protocol. The first, set in nursing homes, indicated that there was a higher infection rate from possible transmission when catheterised patients were nursed together in the same room, however this study was not an RCT.

A retrospective review of 100 renal transplant patients who had their catheters removed

within 48 hours of surgery revealed a significantly lower rate of UTI than in patients with catheters left in for longer periods supporting previous study findings. A case matched and controlled study showed a significant increase in the post-operative stay for patients with catheter related urinary tract infection that, in turn, accounted for substantial hospitalisation cost per patient.

8. Education

Unfortunately no studies addressing education in relation to catheterisation could be included in this review because of non-randomisation or failure to use infection/bacteriuria as an outcome measure.

One study found that education increased the performance of handwashing in relation to bag emptying and changing, however this increase did not persist over time. This study supported the need for continued education and reinforcement of the required behaviours.

In another study, guidelines were developed and promoted to reduce the incidence of 'convenience catheters'. With a reduction in the catheterisation rate and vigilance with established protocols there was a substantial decrease in the number of catheter associated UTI.

Introduction of an infection control liaison nurse based on the ward and an education program for staff was found to lead to a substantial reduction in the rate of catheter associated infections.

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Recommendations

These recommendations are based on the best available clinical evidence. There is a need for further trials to strengthen these findings as some of the recommendations are based on single studies often with limited numbers of participants.

1. The use of a surgical sterile catheterisation technique has not been demonstrated to reduce the rate of catheter associated urinary tract infections(5). There is no evidence to suggest any benefit from using antimicrobial solutions(5). Tap water is sufficient for cleaning genitalia. **Level II**
2. Catheter care should consist of good personal hygiene around the meatal area carried out on a regular basis (6-8) **Level I**
3. In terms of catheter composition, catheters which have been impregnated with silver may reduce the incidence of catheter associated bacteriuria, however, there is no clear evidence regarding which patient groups are likely to benefit from this strategy, nor on the cost effectiveness of its implementation.(9) **Level II**
4. Sealed (e.g. taped, pre-sealed) drainage systems are better at preventing bacteriuria, however cost issues should also be considered (10-13) **Level I**
5. Adding anti bacterial solutions to drainage bags has no effect in reducing the incidence of catheter associated infection (14,15) **Level I**
6. Catheters should be removed from post operative patients as soon as possible. Indwelling catheterisation is preferable to intermittent catheterisation for some groups of post operative patients in the reduction of complications (16) **Level II**

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