Prevention and management of urinary tract infections in paralyzed persons

Authors' objectives
To analyse the evidence on selected aspects of the prevention and management of urinary tract infections (UTI) in paralysed persons. The report addressed three specific questions:

1. What combination of signs, symptoms, and laboratory findings are associated with risks to persons with paralysis due to neurogenic bladder.

2. What are risk factors for recurrent UTIs.

3. What are the risks and benefits of antibiotic prophylaxis. This abstract focuses on the third question.

Searching
MEDLINE (from 1966 to Jan 1998), EMBASE (from 1974 to Jan 1998), and CINAHL (from 1982 to July 1998) were searched (search strategy reported). Additional articles were identified by panel members and by reviewing the bibliographies of retrieved articles. There were no restrictions on the language of publication.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs) with sufficient data. Studies using a cross-over design were also included in the review but not considered in the meta-analyses. Case reports, reviews, editorials and letters were excluded.

Specific interventions included in the review
Treatments given to prevent recurrent UTI. Interventions reported in the review included: drugs (mono- and combination therapies including the following: neomycin, polymycin B, trimethoprim, sulfamethoxazole, nitrofurantoin, methenamine hippurate, kanamycin, methenamine mandelate, ascorbic acid, nalidixic acid, ammonium chloride, ciprofloxacin, methenamine mandelate) and different bladder instillations (saline, hydrogen peroxide, kanamycin+colistin, hemiacidrin) and different drainage systems (silver oxide coated drainage system). Interventions were compared to placebo, no intervention or conventional/usual care.

Participants included in the review
Adults and adolescents with neurogenic bladder due to spinal cord dysfunction (including acute and non-acute spinal cord injury (SCI)and multiple sclerosis patients).

Outcomes assessed in the review
Incidence of bacteriuria or UTI. Symptomatic UTI was the main outcome measure. Asymptomatic infection was also considered. Analyses were stratified by symptomatic and asymptomatic disease and by whether patients had acute or non-acute spinal cord injury. Incidences were converted and reported in terms of weekly infection rates where possible.

How were decisions on the relevance of primary studies made?
All titles were reviewed by two physicians. Full-length articles were reviewed for accepted abstracts and for titles with no abstract. Twelve translators assisted in the screening and evaluation of articles in 14 different non-English languages.

Assessment of study quality
The Jadad scale was used (see Other Publications of Related Interest no.1). The three senior project staff assessed individual study validity. Studies were awarded a score based on a 0 to 5-point scale (0 points being the lowest and 5 points the highest quality).
Data extraction
Studies were examined and extracted by the three senior project staff. Information reported in the review included: bibliographic details, study design, study population details, intervention details, duration of treatment, quality, outcome measures used, and results as reported in article. Authors were contacted where possible for missing data.

Methods of synthesis
How were the studies combined?
Studies were pooled using a DerSimonian and Laird random-effects model (see Other Publications of Related Interest no.2). Effect sizes (number of weeks needed of prophylaxis to prevent one infection) were reported with accompanying 95% confidence intervals (CIs). P-values of <0.05 were considered statistically significant. In addition publication bias was assessed using the funnel plot method.

How were differences between studies investigated?
A chi-squared test was used to provide statistical evidence of heterogeneity. Clinical heterogeneity was also discussed. Where appropriate sensitivity analyses were conducted to assess the effects of study quality and outlying studies.

Results of the review
Nineteen RCTs (1053 participants in total) including 11 studies on patients with acute SCI (n=625) and eight on patients with non-acute SCI (n=428).

Pooled effects (number of weeks needed of prophylaxis to prevent one infection) for any drug vs no drug comparisons:

1. Acute asymptomatic.
   All (6 studies) 3.7 (95% CI: -0.40, -0.15), Chi-square p-value=0.50 Without one outlier (5 studies) 2.6 (95% CI: -0.58, -0.21), Chi-square p-value=0.85.

2. Acute symptomatic.
   All (2 studies) not significant (95% CI: -0.08, 0.02), Chi-square p-value=0.95.

3. Non-acute asymptomatic.
   All (6 studies) 16.7 (95% CI: -0.12, -0.00), Chi-square p-value=0.51 Quality score of 3+ (4 studies) not significant (95% CI: -0.20, 0.05), Chi-square p-value=0.25. Quality score of 2- (2 studies) not significant (95% CI: -0.27, 0.24), Chi-square p-value=0.87.

   All (4 studies) not significant (95% CI: -0.11, 0.04), Chi-square p-value=0.71.

   Quality score of 3+ (3 studies) not significant (95% CI: -0.16, 0.03), Chi-square p-value=0.77.

   Quality score of 2- (1 study) not significant (95% CI: -0.11, 0.13), Chi-square p-value=not applicable.

Pooled effects (number of weeks needed of prophylaxis to prevent one infection) for specific drugs vs instillation methods comparisons:

1. Nitrofurantoin.
   Acute asymptomatic (2 studies) 4.5 (95% CI: -0.36, 0.08), Chi-square p-value=0.34.
   Acute symptomatic (0 studies).

   Non-acute asymptomatic (3 studies) not significant (95% CI: -0.13, 0.01), Chi-square p-value=0.34.
Non-acute symptomatic (1 study) not significant (95\% CI: -0.18, 0.12), Chi-square p-value=not applicable.

2. Methenamine.

Acute asymptomatic (2 studies) 1.8 (95\% CI: -0.87, 0.22), Chi-square p-value=0.34.

Acute symptomatic (no studies).

Non-acute asymptomatic (2 studies) not significant (95\% CI: -0.65, 0.14), Chi-square p-value=0.23.

Non-acute symptomatic (no studies).

3. Trimethoprim+sulfamethoxazole.

Acute asymptomatic (2 studies) not significant (95\% CI: -0.03, 0.35), Chi-square p-value=0.97.

Acute symptomatic (2 studies) not significant (95\% CI: -0.08, 0.02), Chi-square p-value=0.95.

Non-acute asymptomatic (3 studies) not significant (95\% CI: -0.16, 0.17), Chi-square p-value=0.76.

Non-acute symptomatic (2 studies) not significant (95\% CI: -0.11, 0.09), Chi-square p-value=0.59.

4. Instillations.

Acute asymptomatic (3 studies) not significant (95\% CI: -0.52, 0.10), Chi-square p-value=0.28.

Acute symptomatic (no studies).

Non-acute asymptomatic (no studies).

Non-acute symptomatic (no studies).

Quality of studies:

Quality of the acute patient studies ranged from 1 to 5 points, with only one study scoring 5 points and six of the studies scoring 1 point. Quality of the non-acute patient studies ranged from 0 to 5 points, with one study scoring 5 points, 3 studies scoring 4 points and only one study scoring 0 points.

Publication bias:

The funnel plot does not support a significant bias due to the lack of publication of significant results.

**Authors' conclusions**

Due to the high frequency of urinary tract infection or bacteriuria in persons with neurogenic bladder, assessment of the impact of prophylactic antibiotic treatment is an important issue. The meta-analysis showed that antibiotic prophylaxis is significantly associated with a reduced amount of bacteriuria among patients with neurogenic bladder in the acute phase of illness (p=0.05) and approaches a statistically significant association for non-acute patients (p=0.06). This conclusion is tempered by the fact that there were relatively few trials, and none of them were double-blinded.

**CRD commentary**

This is a well-conducted review with clear inclusion criteria. A reasonable search of the literature was conducted with no restrictions on the language of publication. Although no specific attempts were made to locate unpublished material, the funnel plot results suggest that the risk of publication bias is not statistically significant. Multiple reviewers are involved in all stages of the review methodology in order to reduce the risk of selection bias and reporting bias. The validity of the included studies was assessed using a published quality assessment procedure and sensitivity analyses.
were conducted on the basis of this assessment to examine the effects of study quality on the overall pooled findings. Clearly presented summaries of the studies are presented in tabular form.

Prior to pooling the studies in a meta-analysis, heterogeneity was considered using a statistical test and by considering the clinical characteristics of the studies. The pooling of the studies would therefore appear appropriate and pooled effect sizes were not quoted where significant heterogeneity was detected. Overall, the findings of the review would appear to be valid and the implications for further research reasonable, given the data presented.

**Implications of the review for practice and research**

**Practice:** The authors do not state any implications for practice.

**Research:** The authors state that future research should focus on the following areas.

1. Prospective cohort studies to assess the short-term and long-term significance of signs, symptoms and laboratory findings (level of bacteriuria and type of organism, pyuria, others).

2. Randomised controlled trials in the subgroup of patients who have frequent, recurrent urinary tract infections that limit their functioning. Studies should include both patients with spinal cord injuries and patients with multiple sclerosis, where feasible. State-of-the-art methods for maximising the quality of the study designs and the statistical power of the studies should be employed.

In addition to traditional clinical measures, studies should also measure quality-of-life outcomes and costs.

**Bibliographic details**


**Original Paper URL**

http://www.ahrq.gov/clinic/epcsums/utisumm.htm

**Other publications of related interest**


This additional published commentary may also be of interest. Bloch R. Review: antimicrobial prophylaxis reduces asymptomatic bacteriuria in patients with neurogenic bladder. Evid Based Med 2000;5:118.

**Indexing Status**

Subject indexing assigned by CRD

**MeSH**

Adult; Bacteriuria /etiology; Clinical Trials as Topic; Cohort Studies; Cross-Sectional Studies; Risk Factors; Spinal Cord Injuries /complications; Urinary Bladder, Neurogenic /complications; Urinary Tract Infections /etiology

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.