Antibiotic prophylaxis for urinary tract infections after removal of urinary catheter: meta-analysis

Marschall J, Carpenter CR, Fowler S, Trautner BW

CRD summary
The review concluded that patients with short-term urinary catheterisation might benefit from antimicrobial prophylaxis following catheter removal but it was important to identify the right patients. The authors acknowledged limitations in the review such as diverse populations and variation in treatment across studies. Their statement that it was difficult to make a standardised recommendation seems appropriate and reliable.

Authors’ objectives
To assess whether administering prophylactic antibiotics at the time of urinary catheter removal reduced the risk of subsequent symptomatic urinary tract infection.

Searching
PubMed (1947 to November 2012), EMBASE, Scopus, The Cochrane Library and ClinicalTrials.gov were searched without language restrictions. Search terms were reported. Abstracts of relevant conference proceedings between 2006 and 2012 and reference lists of relevant studies were searched.

Study selection
Randomised and non-randomised controlled trials (RCTs) that compared antibiotic prophylaxis with placebo or a control group at the time of removal of a transurethral urinary catheter in adults who had short-term catheterisation (maximum duration of 14 days) were eligible for inclusion. The outcome of interest was episodes of symptomatic urinary tract infection defined as measurable bacteriuria and the presence of at least one symptom or sign compatible with urinary tract infection.

Five out of seven studies focused on surgical patients who underwent general surgery, prostatectomy and abdominal surgery. Observation periods ranged from four days to six weeks. Median duration of catheterisation ranged from 1.8 to 33 days. Various antibiotics (such as ciprofloxacin, trimethoprim/sulphamethoxazole, nitrofurantoin and cefotaxime) were used for prophylaxis antibiotics. Treatment duration ranged from single-dose administrations to three-day courses.

Two reviewers independently screened the titles and abstracts of eligible studies.

Assessment of study quality
Two reviewers independently assessed study quality with the Cochrane risk of bias tool to assess selection, performance, attrition and detection bias. The reliability of quality assessment between reviewers was evaluated with Cohen’s K. Any discrepancies were resolved by consensus.

Data extraction
Data were extracted to calculate relative risks (RR) and their 95% confidence intervals. One study author was contacted for clarification of data.

The authors did not state how many reviewers were involved in data extraction.

Methods of synthesis
Pooled relative risks and 95% CI were calculated using a random-effects model. Heterogeneity among the studies was assessed with $X^2$ and $I^2$ statistics. An $I^2$ value of 25% was considered low heterogeneity, 50% as moderate heterogeneity and 75% as high heterogeneity.

Sensitivity analysis excluded a non-randomised controlled trial and an unpublished study. Subgroup analyses were performed for the surgical patients and mixed hospital populations. Publication bias was assessed with a funnel plot.
Results of the review
Seven studies (1,520 participants) were included in the review: five published RCTs, one unpublished RCT and one non-RCT. The quality of the included studies varied. Most studies had low risk of detection and performance biases and high risk of selection and attrition biases. Randomisation and adequate allocation concealment were inadequate in four studies.

The meta-analysis showed an overall reduction of symptomatic urinary infection with prophylactic antibiotics compared to controls (RR 0.45, 95% CI 0.28 to 0.72; I²=16%; seven studies). The absolute reduction of symptomatic urinary tract infection was 5.8% and the number needed to treat to prevent one symptomatic urinary tract infection was 17 (95% CI 12 to 30).

Similar results were observed when removing the non-RCT or the unpublished study. The result favoured the subgroup of surgical patients; the subgroup of mixed populations showed no significant effect. The funnel plot suggested some evidence of publication bias.

Authors' conclusions
Patients admitted to hospital who undergo short-term urinary catheterisation might benefit from antimicrobial prophylaxis when the catheter is removed as they experience fewer subsequent urinary tract infections. Potential disadvantages of more widespread antimicrobial prophylaxis (side-effects and cost of antibiotics, development of antimicrobial resistance) might be mitigated by the identification of which patients are most likely to benefit from this approach.

CRD commentary
The review addressed a clear question and was supported by appropriate inclusion criteria. Attempts to identify relevant studies in any language were undertaken by searching electronic databases, Google and conference proceedings. Appropriate methods to reduce reviewer error and bias were used for some stages of the study selection process and quality assessment; it was unclear whether similar methods were used for data extraction. An appropriate quality assessment tool was applied and the results of this were presented. Statistical heterogeneity was assessed and appropriate methods were used for pooling data and performing subgroup and sensitivity analyses.

The authors acknowledged limitations of the review such as possible publication bias, diverse populations, type/duration of antimicrobial prophylaxis and the period of observation among studies. Their statement that it was difficult to make a standardised recommendation seems appropriate and reliable.

Implications of the review for practice and research
Practice: The authors stated that certain populations of patients were most likely to benefit from antibiotic prophylaxis on catheter removal and prophylaxis should be focused on these groups as acknowledged in the American Urological Association (AUA) guidelines. Clinicians should take into consideration adverse events associated with antibiotics when weighing advantages and disadvantages of implementing antibiotic prophylaxis after urethral catheterisation.

Research: The authors stated that future studies should attempt to identify specific populations at risk of development of urinary tract infections after catheter removal for eligibility of antibiotic prophylaxis. Studies should examine medical patients (including those in long-term care facilities) who might be catheterised for long periods.

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