BMJ

BMJ 2013;346:f3147 doi: 10.1136/bmj.f3147 (Published 11 June 2013)

RESEARCH

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

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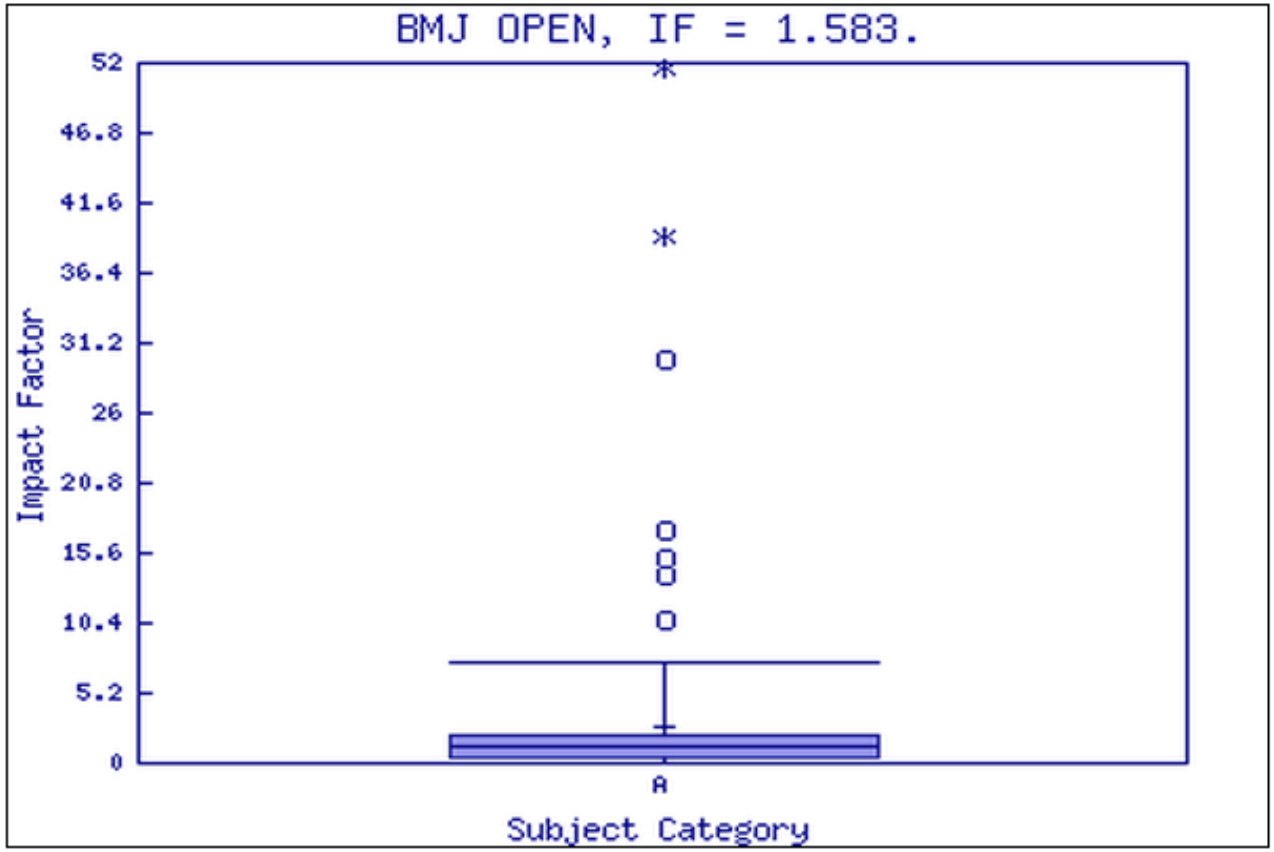
Category Name	Total Journals in Category	Journal Rank in Category	Quartile in Category
MEDICINE, GENERAL & INTERNAL	155	61	Q2



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Key

A - MEDICINE, GENERAL & INTERNAL

Introduction

- Catheterization of the urinary tract, associated with an increased risk of bacteriuria and symptomatic urinary tract infection, the risk being associated with the duration of catheterization.

- National guidelines recommend removal of urinary catheters once they are no longer needed.

- Surgical experts advocate discontinuation of catheterization as early as 24-48 hours postoperatively.

Introduction

- Manipulation of the catheter itself during removal might also predispose to infection.
- Current definitions ‘ from the National Healthcare Safety Network (NHSN) for catheter associated urinary tract infection (CAUTI) reflect this by identifying infections up to 48 hours after catheter removal.

(www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf)

Introduction

- Whether administration of prophylactic antibiotics when the catheter is removed will prevent subsequent symptomatic UTI infection is unclear.
- Randomized trials have yielded conflicting results, and there has been no meta-analysis.
- The 2009 Infectious Diseases Society of America (IDSA)guidelines for the diagnosis, management, and prevention of catheter associated urinary tract infection determined that there was insufficient evidence to recommend widespread antibiotic prophylaxis after catheterization.

Introduction

- In contrast, in their 2008 best practice policy statement the American Urological Association (AUA) concluded that antibiotic prophylaxis should be considered for patients with bacteriuria at time of catheter removal, particularly for those with certain risk factors
  - such as advanced age, immunodeficiency, or anatomic abnormalities of the urinary tract…

步驟 1：系統性文獻回顧探討的問題為何？

研究族群 / 問題 (Population/ Problem)	Patients admitted to hospital who undergo short term urinary catheterization
介入措施 (Intervention)	Antibiotic prophylaxis at the time of removal of a urinary catheter
比較 (Comparison)	Placebo / control
結果 (Outcomes)	Symptomatic urinary tract infection (measurable bacteriuria plus at least one s/s)

步驟 2：系統性文獻回顧的品質如何？

F - 研究是否找到 (Find) 所有的相關證據？

Methods

Search strategy and selection criteria

We followed the PRISMA guidelines for conducting and reporting meta-analyses.[11] We did two separate queries. First, we performed a systematic review of randomized and non-randomized controlled trials that compared antibiotic prophylaxis with placebo or a control group at the time of removal of a transurethral urinary catheter and tracked occurrence of symptomatic urinary tract infections in th subsequent period (JM). For this purpose, we screened medical literature in PubMed from 1947 up to Novembe with the search terms urinary catheter, removal, prophy antibiotic prophylaxis randomized, and trial, and evalua conference abstracts from 2006-2012 (from Infectious D Society of America (IDSA) annual meeting, Interscienc Conference on Antimicrobial Agents and Chemotherapy (ICAAC), Society for Healthcare Epidemiology of America (SHEA) annual meeting, and the European Congress of Clinical Microbiology and Infectious Diseases (ECCMID)). In addition, we used Google to search for the same terms. Next, a medical librarian (SF) created a systematic search strategy that included a combination of standardized index terms and straight keywords. She ran that search in Embase, Scopus, the Cochrane Library (including CENTRAL), and clinicaltrials.gov, in addition to PubMed. We reviewed the reference lists of all potentially relevant studies to identify additional research data. We included non-English language and unpublished studies (fig 1).⇓

Eligible studies were randomized and non-randomized controlled

recommendations.[13] Two investigators (JM, CRC) independently rated each trial across four domains of bias: selection, performance, attrition, and detection. A priori, both investigators agreed to evaluate selection bias based on adequacy of randomization and allocation concealment for each study, while performance bias was judged on the probability for systematic differences in care after randomization. Investigators judged attrition bias based on any systematic difference in withdrawals between intervention and control groups. Detection bias was

manuscript. After review, we excluded studies in which the patients had suprapubic catheters,[17 18] the endpoint was not symptomatic bacteriuria,[19-21] or antibiotic prophylaxis was started shortly after catheter insertion rather than at the time of removal.[22 23] We also excluded studies that lacked a concurrent control group.[24] Seven studies met eligibility criteria.

statistics (25%, 50%, and 75% representing low, moderate, and high heterogeneity).[15] We pooled the results of studies using random effects models, if appropriate, after consideration of heterogeneity among trials. We calculated individual and pooled statistics as relative risks and 95% confidence intervals. We conducted a sensitivity analysis of the pooled relative risk by sequentially excluding the non-randomized study and the unpublished study from the analysis. We also performed

在文章的**方法(Methods)**章節，可以找到詳細搜尋策略的說明，包括使用的名詞

步驟 2：系統性文獻回顧的品質如何？

F - 研究是否找到 (Find) 所有的相關證據？

Figures

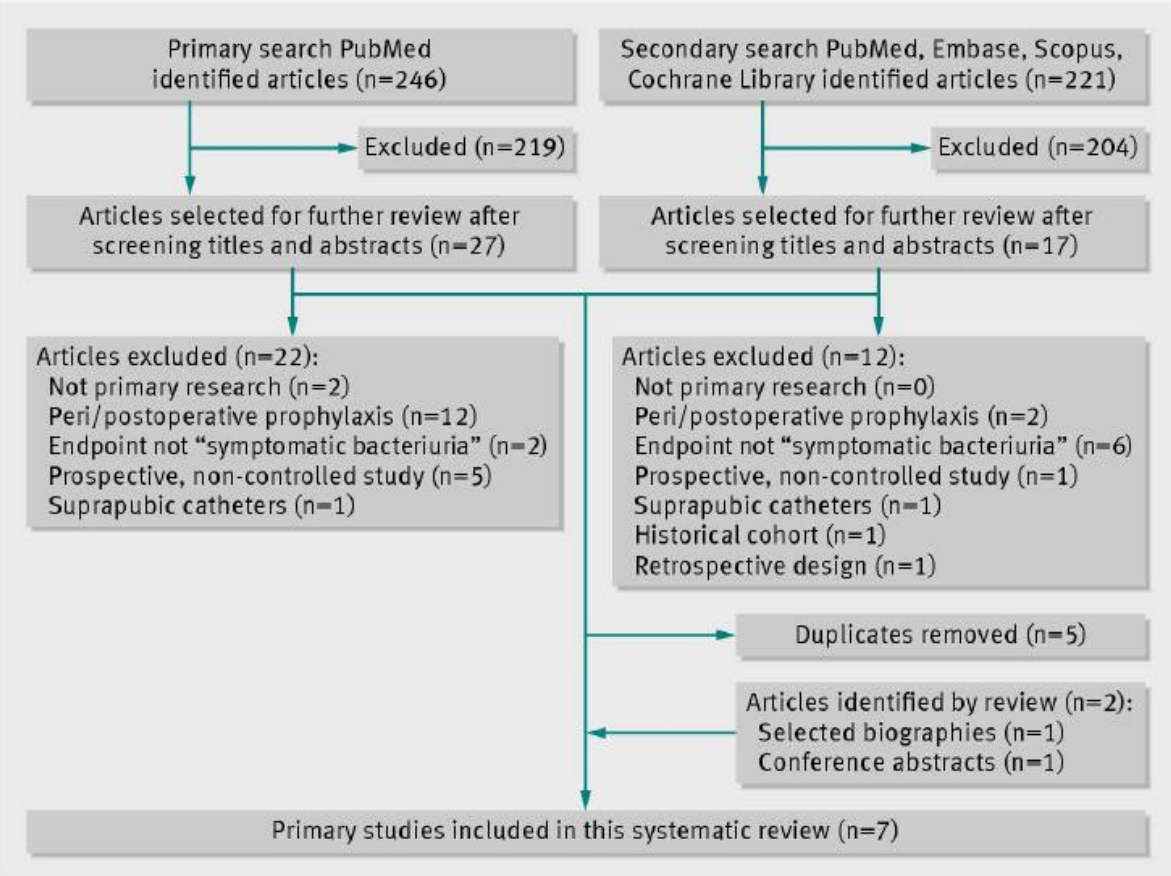


Fig 1 Selection of studies for meta-analysis of trials investigating antibiotic prophylaxis for urinary tract infections after removal of urinary catheter

以PRISMA流程圖呈現

結果(Results)章節中可以找到本篇系統性文獻回顧評估的摘要及全文文獻數目、文獻納入與排除的數量及原因。

評讀結果：V 是 □否 □不清楚

步驟 2：系統性文獻回顧的品質如何？

A - 文獻是否經過嚴格評讀 (Appraisal)？

Data extraction and meta-analysis

We extracted information about the study design, inclusion criteria for patients, sample size, antimicrobial agents used for prophylaxis, and the duration of administration. We also noted the duration of catheterization until removal in intervention and control groups. Finally, we extracted the number of endpoints in intervention and control groups in relation to the patients assigned to each of the groups.

We assessed the internal validity of individual trials using a modification of the Cochrane Handbook quality assessment recommendations.[13] Two investigators (JM, CRC) independently rated each trial across four domains of bias: selection, performance, attrition, and detection. A priori, both investigators agreed to evaluate selection bias based on adequacy of randomization and allocation concealment for each study, while performance bias was judged on the probability for systematic differences in care after randomization. Investigators judged attrition bias based on any systematic difference in withdrawals between intervention and control groups. Detection bias was assessed on the timing and methods used to ascertain the primary outcome for each study. The reliability of quality assessment between raters was evaluated with Cohen's κ,[14] with the statistical package SPSS version 20 (IBM Corporation, Armonk, NY). Discrepancies between raters were resolved by consensus.

有列出文獻品質評讀標準的描述，
而結果章節則列出每篇研究品質
的評讀結果

agreed to evaluate selection bias based on adequacy of randomization and allocation concealment for each study, while performance bias was judged on the probability for systematic differences in care after randomization. Investigators judged attrition bias based on any systematic difference in withdrawals between intervention and control groups. Detection bias was assessed on the timing and methods used to ascertain the primary outcome for each study. The reliability of quality assessment between raters was evaluated with Cohen's κ,[14] with the statistical package SPSS version 20 (IBM Corporation, Armonk, NY). Discrepancies between raters were resolved by consensus.

All data were entered into the free online analysis tool "Meta-Analyst" (http://tuftscaes.org/meta_analyst/). Heterogeneity among the studies was assessed with χ^2 and I^2 statistics (25%, 50%, and 75% representing low, moderate, and high heterogeneity).[15] We pooled the results of studies using

評讀結果：V 是 □否 □不清楚

步驟 2：系統性文獻回顧的品質如何？

I - 是否只納入 (included) 具良好效度的文章？

Table 2| **Assessment of quality in studies on effect of antibiotic prophylaxis for urinary tract infections after removal of urinary catheter included in this meta-analysis**

Domain:	Selection bias	Performance bias	Attrition bias	Detection bias
Van Hees[8]	0	0	0	0
Pinochet[29]	1	1	1	1/0
Pfefferkorn[7]	0	0	0/1	0
Brandenburg[28]	1	1	1	0
Wazait[27]	0	0	0	0
Harding[26]	1	0	1	0
Grabe[25]	1	0	1	0
Rating agreement (κ)	1.0	1.0	0.7	NA

NA=not applicable; 0=low risk; 1=high risk or uncertain.

Table 2 呈現每篇文章的 quality assessment 結果

評讀結果：□是 □否 V不清楚

步驟 2：系統性文獻回顧的品質如何？

T - 作者是否以表格和圖表「總結」(total up) 試驗結果？

Table 1| **Summary of studies on effect of antibiotic prophylaxis for urinary tract infections after removal of urinary catheter included in this meta-analysis**

Author	Year published	Design	Patients analyzed	Median duration of catheterization (days)		Antibiotic used	No of cases*		Observation period
				Antibiotics	Control		Antibiotics	Control	
Van Hees[8]	2011	Randomized, placebo	91 general surgery	5/6	4.5	Ciprofloxacin (n=31) or TMP/SMX (n=24) x1 dose before removal	1/55	1/36	2 weeks
Pinochet[29]	2010	Prospective, comparative (patients of surgeon A vs. surgeon B)	713 radical prostatectomy	11	7	Ciprofloxacin (3 day course starting day before removal)	8/261	33/452	6 weeks
Pfefferkorn[7]	2009	Randomized, no placebo	205 abdominal surgery	7	6.5	TMP/SMX (3 doses, first before removal) or ciprofloxacin	5/103	22/102	4 ±2 days after catheter removal
Brandenburg[28]	2006	Randomized, placebo	288 general surgical	3	33	Nitrofurantoin (2 doses, first before removal)	12/137	18/151	4 weeks
Wazait[27]	2004	Randomized, placebo	48 on medical and surgical wards, excluding genitourinary surgery	3.8	3.6	Ciprofloxacin (4 doses, two daily, first before removal)	2/25	1/23	2 weeks
Harding[26]	1991	Randomized, no placebo	79 women on medical and surgical wards with bacteriuria	2.	2	TMP/SMX (single dose)	0/37	7/42	4 weeks (prophylaxis) *v* 2 weeks (no prophylaxis)
Grabe[25]	1984	Randomized, no placebo	96 transurethral prostatectomy	1.9	1.8	Cefotaxime (3 doses, two daily, first before removal)	3/47	8/49	1 week

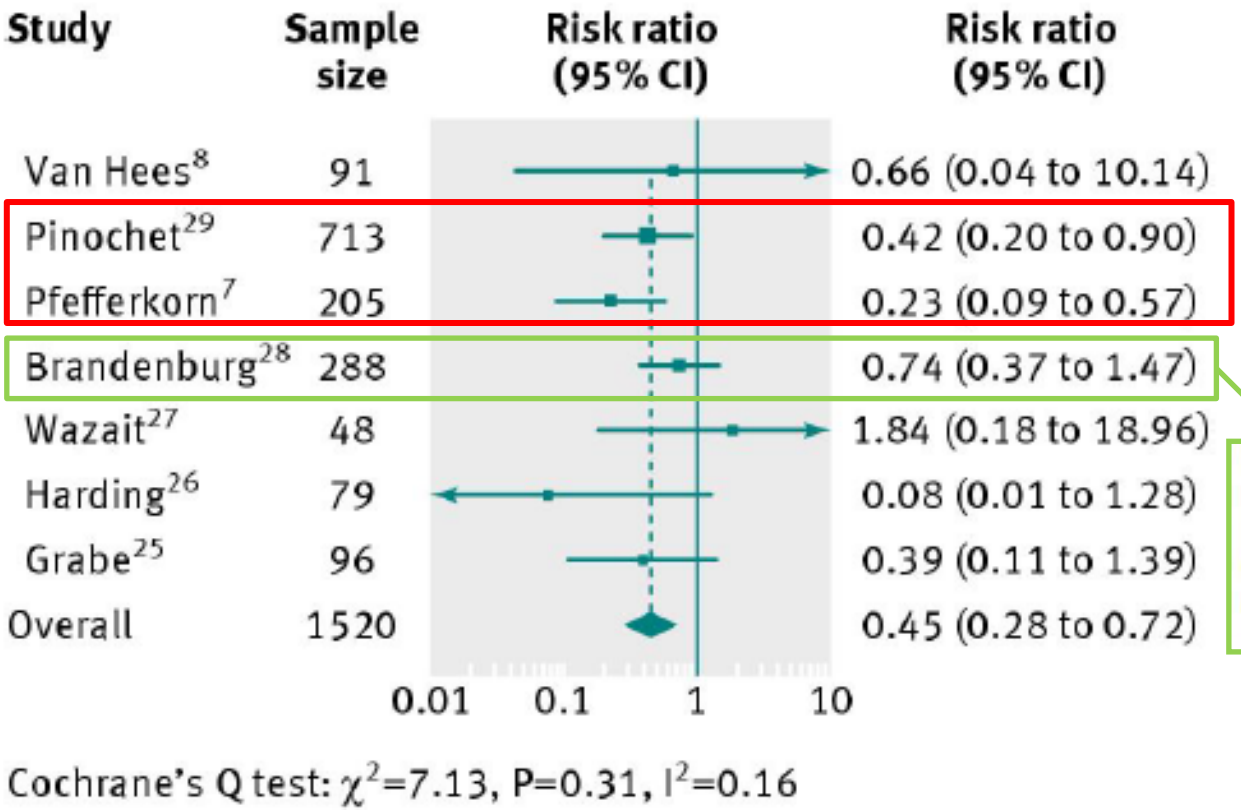
TMP/SMX=trimethoprim/sulfamethoxazole.

*Total was 31/665 (4.7%) in antibiotic group and 90/855 (10.5%) in control group.

摘要圖表
Table 1
Figure 2

步驟 2：系統性文獻回顧的品質如何？

T - 作者是否以表格和圖表「總結」(total up) 試驗結果？



The conference abstract of an unpublished study described a randomized controlled trial from the Netherlands.[28] In this study, 288 patients were randomized to either nitrofurantoin prophylaxis or placebo at time of catheter removal. Symptomatic urinary tract infections occurred in 18/151 (11.9%) of the intervention group and 12/137 (8.8%) of the control group

Fig 2: Forest plot of seven included studies with 1520 participants on effect of antibiotic prophylaxis on urinary tract infections after removal of urinary catheter

步驟 2：系統性文獻回顧的品質如何？

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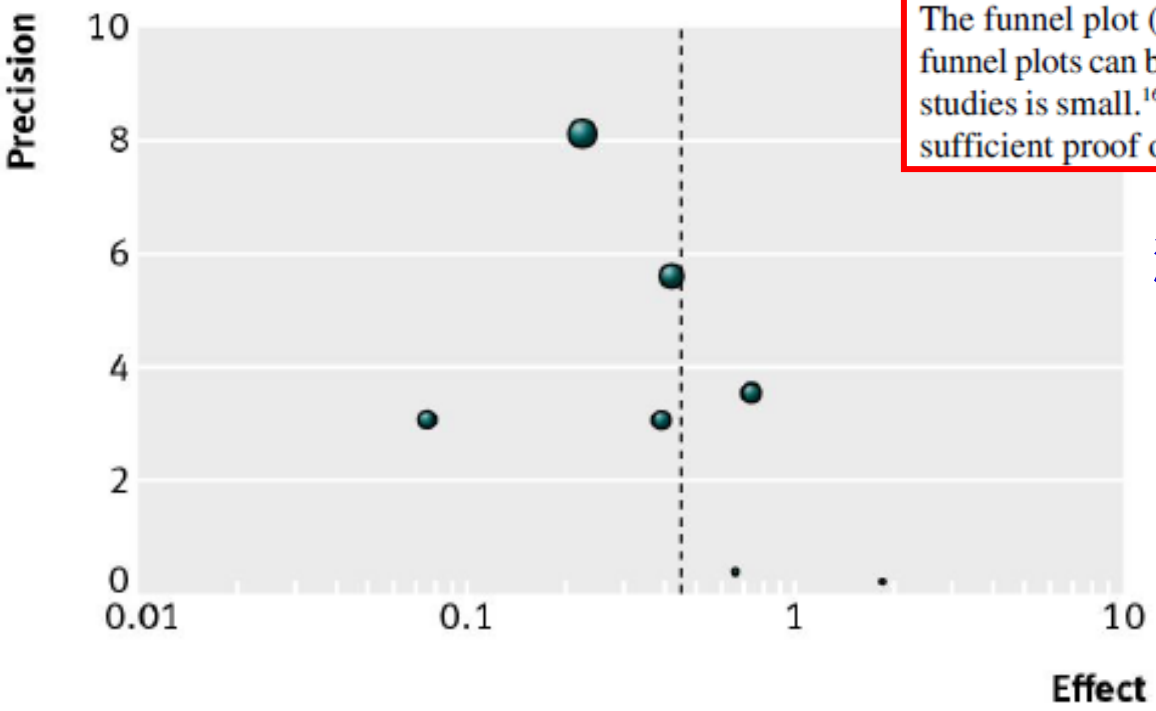


The funnel plot (fig 3⇓) suggests some publication bias, but funnel plots can be difficult to interpret if the number of included studies is small.[16] In addition, asymmetrical funnel plots are not sufficient proof of publication bias. Alternative explanations

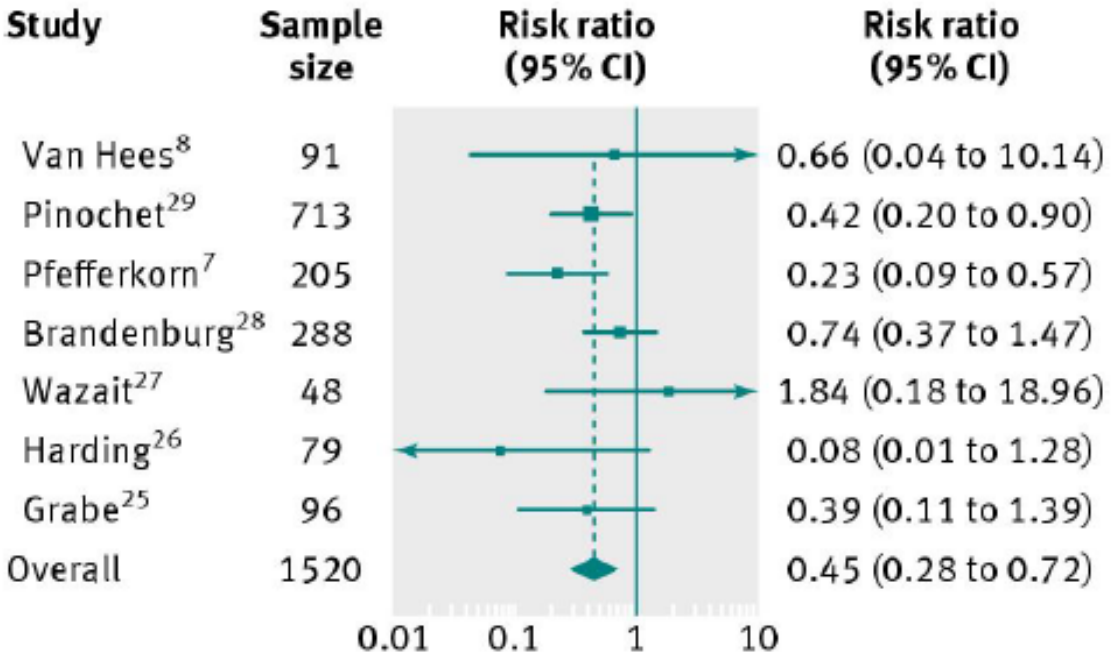
漏斗圖:用以檢驗系統性文獻回顧所納入的文章，是否有出版誤差的工具圖

評讀結果：V 是 □否 □不清楚

Fig 3 Funnel plot of seven included studies with 1520 participants on effect of antibiotic prophylaxis on urinary tract infections after removal of urinary catheter

步驟 2：系統性文獻回顧的品質如何？

H - 試驗的結果是否相近 - 異質性 (Heterogeneity)？



Cochrane's Q test: χ^2=7.13, P=0.31, I^2=0.16

All data were entered into the free online analysis tool "Meta-Analyst" (http://tuftscaes.org/meta_analyst/). Heterogeneity among the studies was assessed with χ^2 and I^2 statistics (25%, 50%, and 75% representing low, moderate, and high heterogeneity).[15]

評讀結果：V 是 □否 □不清楚

Conclusion

- The meta-analysis indicated an overall reduction in symptomatic urinary tract infection when antibiotic prophylaxis was given, with a risk ratio of 0.45 (95% CI 0.28 to 0.72) compared with controls.
- The absolute reduction of symptomatic urinary tract infection was 5.8% (31/665 (4.7%) in the antibiotic prophylaxis group v 90/855 (10.5%) in the control group).
- The number needed to treat to prevent one symptomatic urinary tract infection was 17 (95% CI 12-30), with low heterogeneity (I^2 =16%).

Discussion

Current practice ??

Antibiotics prophylaxis was practiced by 60 % of respondents from various medical specialties, 40 % of urologist used in all patients.

Wazait HD, Antibiotics on urethral catheter withdrawal: a hit and miss affair. *J Hosp Infect* 2004;58:297-302.

Clinical application:
Cost, suitable for nursing home patient ….

Clinical Discussion

- 感控 總醫師:
  - primary outcome 以泌尿道感染症狀為收案條件顯主觀，可能導致定義過廣。
- 護理部 高副：
  - 放置導尿管的過程可能導致黏膜受傷，且本篇文獻之研究結果建議使用預防性抗生素，或許臨床可以考慮預防性投藥。
- 感控 李主任：
  - 因為研究族群多為一般外科年輕人，如發生及診斷確認泌尿道感染再行治療，其成本效益較佳，抗藥效的疑慮也較低。站在感控立場，不建議廣泛投予預防性抗生素。
  - 如欲推行或許高危險因素個案，如攝護腺手術等，投與預防性抗生素以降低困難治療的攝護腺感染情形，可能較有益處。
  - 導尿嚴格執行無菌技術，是降低感染的重要因素。

Methodology Discussion

- 蔡老師:
  - 在納入的七篇文獻中，有一篇非RCT、一篇尚未發表，作者有將此兩篇文獻移除後再行sensitivity analysis，但結果都相同，可更有力的說服讀者，是值得學習的方式。
  - 在Detection bias的評估方面，呈現low risk，且本文的outcome var. 除主觀資料外、尚有客觀資料，此處為研究結果是否可以相信時之評估重點
  - 本文 Selection bias 風險高，建議作者可進一步進行次群體分析(subgroup analysis)，例如將年齡層或危險因素分組，將有助於臨床應用

Thank you!