

**ABSTRACT**

**Objective**

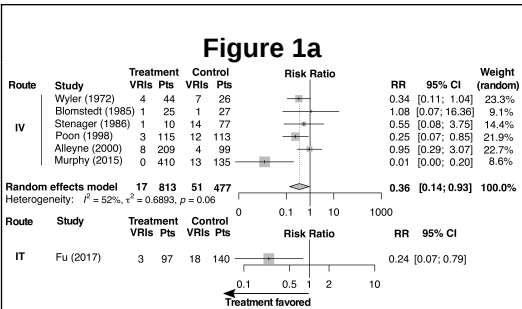
To analyze published evidence on the efficacy of extended systemic antimicrobial therapy and antibiotic-coated external ventricular drain (ac-EVD) use in reducing VRI incidence.

**Methods**

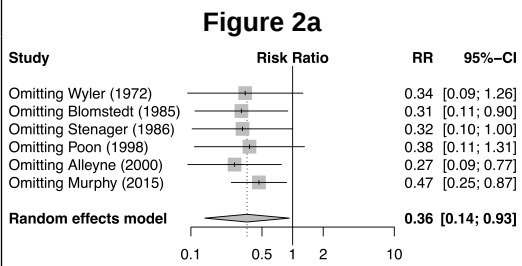
We searched PubMed for studies related to VRIs and antimicrobial prophylaxis. Eligible articles reported VRI incidence in control and treatment cohorts evaluating prophylaxis with either extended systemic antibiotics (>24 hrs) or ac-EVD. Risk ratios and VRI incidence were aggregated by prophylactic strategy and pooled estimates were determined via random or mixed effects models. Study heterogeneity was quantified using I2 and Cochran’s Q statistics. Rigorous assessment of study bias was performed, and PRISMA guidelines were followed throughout.

**Results**

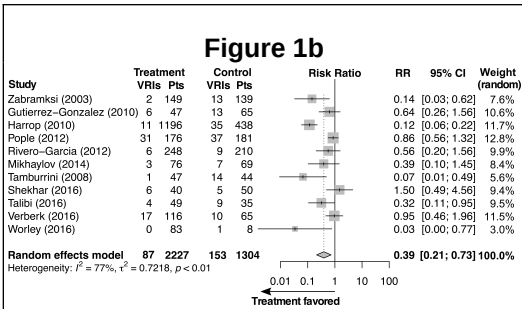
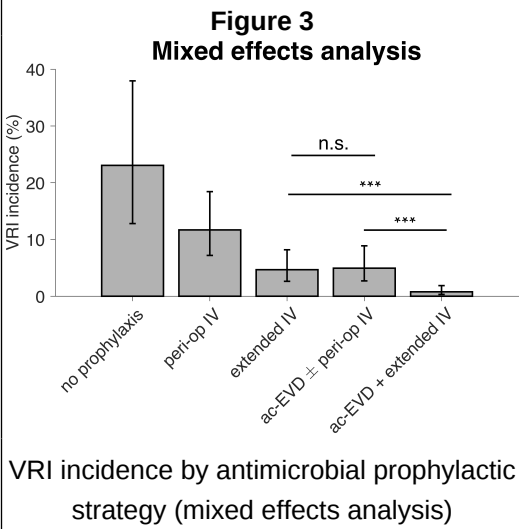
Across 604 articles, 19 studies (3%) met eligibility criteria, reporting 5,242 ventriculostomy outcomes. Extended IV and ac-EVD prophylaxis were associated with risk ratios of 0.36 [0.14, 0.93] and 0.39 [0.21, 0.73], respectively. Mixed effects analysis yielded expected VRI incidence of 13-38% with no prophylaxis, 7-18% with perioperative IV prophylaxis, 3-9% with either extended IV or ac-EVD prophylaxis as monotherapies, and as low as 0.8-2% with extended IV and ac-EVD dual prophylaxis.



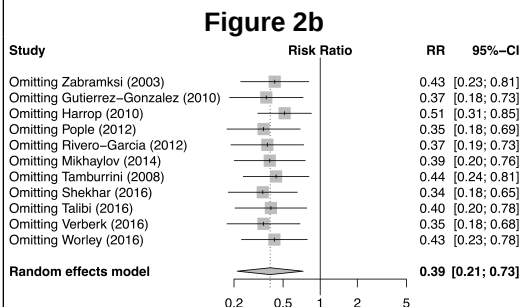
VRI risk ratios with extended systemic antimicrobial therapy



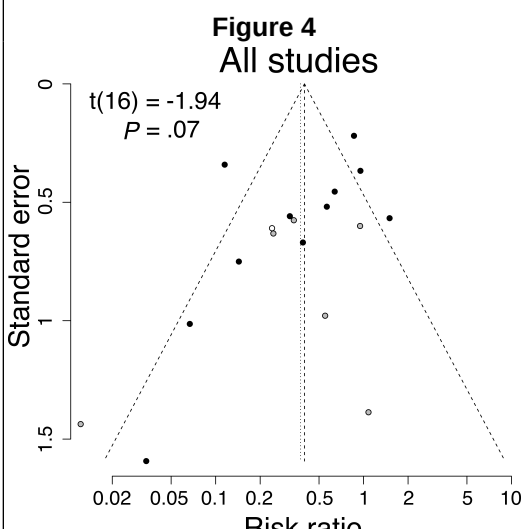
Sensitivity analysis for pooled VRI risk ratios with extended IV prophylaxis



VRI risk ratios with ac-EVD



Sensitivity analysis for pooled VRI risk ratios with ac-EVD



Funnel plot assessing potential publication bias across all studies

**Key Points**

- Strong evidence for the efficacy of both extended IV prophylaxis and ac-EVD monotherapies in lowering VRI incidence
- Pooled VRI rates of 4-5% with extended IV or ac-EVD monotherapies vs. 1-2% with dual therapy
- NNT of 17 and 16 for extended IV or ac-EVD monotherapy vs. baseline incidence, respectively.
- NNT of 26 and 24 for dual therapy vs. extended IV or ac-EVD monotherapy, respectively.
- Estimated cost savings per patient of \$5,100 for extended IV, \$5,000 for ac-EVD + peri-procedural IV prophylaxis, and \$5,900 for dual therapy

**Limitations**

- Heterogeneity in reported baseline VRI rates likely reflects multifactorial risk factors such as EVD indication, procedural setting, patient population, hospital protocols, and antimicrobial regimens.
- Efficacy of antimicrobial interventions in a specific practice setting ultimately depends on baseline VRI incidence achieved in clinical practice.
- Other important clinical outcomes such as mortality, adverse events, LOS not considered.

**Conclusions**

Extended IV and ac-EVD prophylaxis both have a strong evidence base as effective interventions for lowering VRI risk and may provide further benefit as dual prophylactic therapy, but further research is needed to better predict their utility in specific practice environments.