**Supplemental Table 1. Strength of Evidence for Outpatient Antimicrobial Stewardship Studies, Antimicrobial Prescribing**

| **Study, year** | **Study design** | **Purpose of intervention** | **Risk of bias** | **Outcome** | **Finding versus control or prior to implementation (or as noted)** | **Strength of evidence, by outcome** |
| --- | --- | --- | --- | --- | --- | --- |
| ***A. Provider and/or Patient Education Studies (k=16)*** |
| Gerber 201218 | CRCT | Reduce inappropriate antimicrobials for pediatric acute RTIs | Medium | Proportion of broad-spectrum antimicrobials | Intervention: 12.5% decreaseControl: 5.8% decreaseTreatment by time interaction: p=0.01 | LowFor Antimicrobial Prescribing |
| Vinnard 201319 | CBA | Reduce antimicrobials for upper respiratory infection | High | Antimicrobial use | Intervention: 4.7% decreaseControl: 1.2% increase; p=0.133 |
| Butler 201238  | RCT | Reduce antimicrobials for all causes | Medium | Oral antimicrobial dispensing | % reduction: 4.9 [95%CI 0.5, 7.7]; p=0.02 |
| Llor 201239,40 | CBA | Reduce antimicrobials for lower RTIs | Medium | Antimicrobial prescription rate  | LRTI: OR 0.42 [95%CI 0.22, 0.82]; p=0.01\*ARS: OR 0.65 [95%CI 0.21, 1.06]; p=0.06 |
| Regev-Yochay 201165  | CRCT | Reduce prescription rates (pediatric) | High | Antimicrobial prescription rate | RR 0.76 [95%CI 0.75, 0.78] |
| Esmaily 201066 | CRCT | Decrease use of antimicrobials | High | % of prescriptions with antimicrobial | NS |
| Smeets 200941 | CBA | Reduce antimicrobials for acute RTIs | High | Number of antimicrobial prescriptions | NS |
| Finkelstein 200820 | CRCT | Reduce unnecessary antimicrobial use (pediatric) | Medium | Adjusted % change in prescribing | Change between intervention and control communitiesAge 3 to <24 mos: -0.5%; p=0.69Age 24 to <48 mos: -4.2%; p<0.01Age 48 to <72 mos: -6.7%; p<0.0001 |
| Chazan 200767 | RCT | Increase appropriate use of antimicrobials | High | Total antimicrobial use  | Continuous intervention group: 20.0% reductionSeasonal intervention group: 16.5% reductionp<0.0001 |
| Metlay 200721 | CRCT | Reduce antimicrobial use for acute RTIs in the emergency department | Medium | Antimicrobials for URTIs and acute bronchitis | Adjusted differences (intervention year – baseline year)Intervention sites: -10%[95%CI -18%, -2%]Control sites: 0.5% [95%CI -3%, 5%] |
| van Driel 200742 | CRCT | Increase rational use of antimicrobials for acute rhinosinusitis | High | Antimicrobial prescriptions | ORadj 0.63 [95%CI 0.29, 1.37] |
| Little 200544 | RCT | Effectiveness of 3 prescribing strategies and an information leaflet (see delayed prescribing) | Medium | Self-reported use of antimicrobials | Leaflet: 55%No leaflet: 57%; p=0.58† |
| Pagaiya 200568 | RCT | Improve quality of care | Medium | Antimicrobial prescribing | ARTIIntervention: mean change -14.6%Control: mean change 2.8%; p=0.022DiarrheaIntervention: mean change -1.8%Control: mean change -2.1%; p=0.308 |
| Gonzales 200422 | CCT | Improve antimicrobial use for acute RTIs (elderly) | High | Prescription rate for ARTIs | NS |
| Stewart 200023 | CBA | Improve antimicrobial use | High | Total antimicrobial claims | Analysis of before and after data: 9.4% decrease in claims; p=NR |
| ***B. Provider Feedback (k=5)*** |
| Gjelstad 201345 | CRCT | Reduce antimicrobial prescribing for acute RTIs and reduce use of broad-spectrum antimicrobials | High | ARTI episodes with antimicrobial prescription | OR 0.72 [95%CI 0.61, 0.84] | LowFor Antimicrobial Prescribing |
| Vinnard 201319 | CBA | Reduce antimicrobial prescribing for URTIs | High | Antimicrobial prescribing | Change in prescribing relative to controlIntensive intervention: ROR 2.60 [95%CI 1.23, 5.45]Mild intervention: ROR 1.67 [95%CI 0.74, 3.79] |
| Linder 201024 | CRCT | Reduce inappropriate prescribing for acute respiratory infections | High | Oral antimicrobial within 3 days of ARI visit | OR 0.97 [95%CI 0.7, 1.4]; p=0.87 |
| Naughton 200946 | RCT | Reduce overall antimicrobial prescribing and 2nd-line prescribing | High | Antimicrobial prescribing  | NS |
| Madridejos-Mora 200447 | CCT | Improve quality of prescribing  | Medium | Over prescription of antimicrobials | Change in intervention group pre to post intervention: p=0.006Difference between intervention and control groups post-intervention: p=0.026 |
| ***C. Guidelines (k=6)*** |
| Venekamp 201249 | ITS | Change prescription rates for acute rhinosinusitis | Medium | Prescription rate | Post-intervention slope significantly different from pre-intervention slope (p<0.05) | LowFor Antimicrobial Prescribing |
| Weiss 201126 | ITS | Effect of guidelines on antimicrobial use | Medium | Difference in prescribing | Significant level change after guideline dissemination (p=0.002) |
| Seager 200650 | CRCT | Assess effect of education outreach visits on prescribing for dental pain | Medium | Odds of prescription; odds of inappropriate prescription | Prescription: OR 0.63 [95%CI 0.41, 0.95]; p<0.05Inappropriate prescription: OR 0.33 [95%CI 0.21, 0.54]; p<0.05 |
| Martens 200651 | CCT | Effect of guidelines on volume of prescriptions | High | Total antimicrobial prescriptions per GP per year | NS |
| ***D. Delayed Prescribing (k=4)*** |
| Cals 201064 | RCT | Effect on management of lower RTI and rhinosinusitis | Medium | Filled delayed prescription  | Intervention 23%, Control 72%; p<0.001 | LowFor Antimicrobial Prescribing |
| Little 201052 | RCT | Effect of management strategies for UTI | Medium | Antimicrobial use | Delayed group vs. control: OR 0.12 [95%CI 0.03, 0.59] |
| Worrall 201027 | RCT | Reduce antimicrobial use for ARTIs | High | Prescriptions filled | Usual date 43%, Post date 44%, p=0.924 |
| Little 200544 | RCT | Effectiveness of 3 prescribing strategies and an information leaflet (see education) | Medium | Self-reported use of antimicrobials | No antimicrobials 16%, delayed 20%, immediate 96%; p<0.001 |
| ***E. Communication Skills Training (k=6)*** |
| Little 201353 | CRCT | Effects of internet-based training on antimicrobial prescribing for lower and upper RTIs  | Medium | Antimicrobial use | Communication training vs. no communication training: RRadj 0.69 [95%CI 0.53, 0.87]; p<0.0001 | MEDIUMFor Antimicrobial Prescribing |
| Légaré 201228 | CRCT | Reduce overuse of antimicrobials for acute RTIs | Medium | Patient decision to use antimicrobials after consultation | RRadj 0.50 [95%CI 0.3, 0.7] |
| Légaré 201029 | CRCT | Reduce overuse of antimicrobials for acute RTIs | Medium | Patient decision to use antimicrobials after consultation | Absolute difference 16% [95%CI -31, 1]; p=0.08 |
| Cals 200954 | CRCT | Effect of skills training on prescribing | High | Antimicrobials at index consultation | Communication training 27%, no training 54%; p<0.01 |
| Francis 200957 | CRCT | Reduce use and return clinic visit (pediatric) | Medium | Antimicrobials at index consultation | OR 0.29 [95%CI 0.14, 0.60] |
| Altiner 200758 | CRCT | Reduce unnecessary antimicrobial prescribing for acute cough | High | Antimicrobials prescribed  | At 6-weeks post-interventionORadj 0.38 [95%CI 0.26, 0.56]; p<0.001 |
| ***F. Formulary Restriction (k=2)*** |
| Manns 201230 | ITS | Restrict quinolone use | Medium | Quinolone use | NS (level and slope) | LowFor Antimicrobial Prescribing |
| Marshall 200631 | ITS | Restrict fluoroquinolone reimbursement | Low | Prescriptions per week for fluoroquinolone group (3 of 6 antimicrobials restricted) | p<0.0001 for levelNS for trend |
| ***G. Decision Support (k=6)*** |
| Gonzales 201332 | CRCT | Reduce use of antimicrobials for acute bronchitis | High | Antimicrobial prescriptions | Intervention period vs. baselinePrinted decision support: ORadj 0.57 [95%CI 0.40, 0.82]Computer-assisted decision support: ORadj 0.64 [95%CI 0.45, 0.91]Usual care: NS | LowFor Antimicrobial Prescribing |
| Jenkins 201333 | RCT | Decrease prescribing for non-pneumonia acute respiratory infection | Medium | Antimicrobials for ARIs | Significant time trend (p<0.0001); significant difference in trend between intervention and control (p<0.0001) |
| McGinn 201334 | RCT | Effect on management of respiratory tract infections | High | Antimicrobial prescriptions | ARD 0.82, RRadj 0.74 [95%CI 0.60, 0.92]; p=0.008 |
| Rattinger 201235 | CBA | Minimize unnecessary use of antimicrobials | High | Proportion of unwarranted prescriptions | Intervention period vs. baseline Targeted antimicrobials; p<0.0001 at intervention sites, p=ns at control sites |
| Linder 200936 | CRCT | Reduce inappropriate prescribing | High | Prescriptions to patients with ARI diagnosis | OR 0.80 [95%CI 0.6, 1.2]; p=0.30 |
| Martens 200759 | CRCT | Change prescribing behavior | High | Prescriptions | NS  |
| ***H. Financial Incentive (k=1)*** |
| Martens 200760 | CBA | Reduce volume of prescriptions and improve quality of prescribing | High | Prescriptions | NS for Quinolones, nitrofurantoin, amoxicillin, mupriocinp<0.05 for trimethoprim, amoxicillin + clavulanic acid, doxycycline | LowFor Antimicrobial Prescribing |
| ***I. Procalcitonin, Rapid Antigen Detection Tests, Polymerase Chain Reaction Assay, and C-Reactive Protein (k=9)*** |
| Little 201361 | RCT | Effect of rapid streptococcal antigen detection test on prescribing for sore throat | High | Antibiotic use | Compared to delayed prescribing (control)Clinical score + RADT: RR 0.73 [95%CI 0.52, 0.98]; p=0.03Clinical score: RR0.71 [95%CI 0.50, 0.95]; p=0.02  | MEDIUMFor Antimicrobial Prescribing |
| Brittain-Long 201162 | RCT | Effect of rapid test for respiratory virus | Medium | Prescriptions (early result vs. late result) | Early: 4.5%Late: 12.3%; p=0.005 |
| Worrall 200737 | RCT | Compared clinical judgment, rapid antigen detection test, and decision rules for patients with sore throat | High | Prescriptions | p<0.001 for rapid antigen test vs. usual care |
| Diederischsen 200063 | RCT | Effect of CRP testing on prescribing for RTI | Medium | Prescriptions | OR 0.90 [95%CI 0.7, 1.2] |
| Takemura 200569 | RCT | Effect of immediate availability of WBC and CRP results on prescribing for any infection | High | Prescriptions | CRP+WBC: 52%Usual care: 88%; p<0.001 |
| Cals 200954 | CRCT | Effect of CRP and communication skills training for lower RTI | High | Prescriptions | *CRP: 31%**No CRP: 53%; p=0.02* |
| Cals 201064 | RCT | Effect of CRP testing on prescribing for lower RTI and rhinosinusitis | Medium | Prescriptions | CRP vs. No CRP: RR 0.77 [95%CI 0.56, 0.98] |
| Llor 201239,40 | CBA | Effect of CRP testing on prescribing for lower RTI or acute rhinosinusitis | Medium | Prescriptions | Full intervention vs. usual careLRTI: OR 0.22 [95%CI 0.12, 0.38]; p=0.00ARS: OR 0.12 [95%CI 0.01, 0.32]; p=0.01 |
| Little 201353 | CRCT | Effects of internet-based training for CRP for patients with lower or upper RTI | Medium | Prescriptions | CRP training vs. No CRP trainingRRadj 0.54 [95%CI 0.42, 0.69]; p<0.0001 |

RCT = randomized controlled trial; CRCT = cluster randomized controlled trial; ITS = interrupted time series; CCT = controlled clinical trial; CBA = controlled before and after study; RTI = respiratory tract infection; UTI = urinary tract infection; RADT = rapid antigen detection test; CRP = C-reactive protein; WBC = white blood cell count; NS = not statistically significant; OR = odds ratio [95% confidence interval]; RR = rate ratio [95% confidence interval]; IRR = incidence rate ratio [95% confidence interval]; HR = hazard ratio [95% confidence interval]; WMD = weighted mean difference; ROR = ratio of odds ratios

\*Partial intervention (education without CRP) vs. usual care; see Laboratory Test section for full intervention results (including CRP test)

†Education component only (see delayed prescribing)