**Evidence Table G1. Quality assessment of observational studies**

| **Author, Year** | **Nonbiased selection?** | **High overall loss to followup or differential loss to followup?** | **Outcomes prespecified and defined?** | **Ascertainment techniques adequately****described?** |
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| Ashe, 2006(Please refer to Vodicka,2013 systematic review) |  |  |  |  |
| Bjerrum, 2004 | Unclear | Overall: Unclear\*Differential: Unclear\* | Yes | Yes |
| Bjerrum, 2006 | Unclear: All 52 participatingproviders were invited and agreed to participate, but method for allocating to intervention vs. control group NR. | Unclear whether all GPs enrolledcompleted study. Data collected for control providers only in secondtime period. | Yes: antibiotics identified byWHO classification code | Yes: treatment given reported byprovider using published Audit Project Odense method, citation given |
| Bjerrum, 2011 | Unclear: providers invited toparticipate, selection criteria NR; results presented only for providers completing both registrations | Unclear: results presented only forproviders participating in both registration periods, participation rates could be different before and after intervention (i.e. for comparison groups) | No: unclear how antibioticprescribing and classification were defined | Yes: self-registry by GP duringconsultation, APO citation given |
| Blaschke, 2014 | No: comparison groupsdefined based on whether or not RIDT was used and influenza diagnosed in the ED visit, and not clear that analysis adjusted for other factors that could affect outcomes | No (NA): cross-sectional | Yes, though no classificationreported for antibiotics | Yes: used data from NationalHospital Ambulatory Medical Care Survey (NHAMCS), an annual survey of US ED visits conducted by the National Center for Health Statistics and the CDC |

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| **Author, Year** | **Nonbiased and****adequate ascertainment methods?** | **Statistical analysis of potential confounders?** | **Adequate duration of followup?** | **Overall quality rating** | **Comments** |
| Ashe, 2006(Please refer to Vodicka,2013 systematic review) |  |  |  |  |  |
| Bjerrum, 2004 | Unclear | Yes | NA | Fair | \* Number of clinicians enrolledor possibly lost to followup in the prospective registration of patients is not clearly reported |
| Bjerrum, 2006 | Unclear: outcomes recorded byproviders with no blinding | Yes: "we used 95% confidenceintervals (CI) adjusted for clustering of data according to practices." Antibiotic prescribing outcomes also reported stratified by site of infection. | Yes: data collected over3-week periods in two consecutive winter seasons | Fair |  |
| Bjerrum, 2011 | Unclear: outcomes recorded byproviders with no blinding | Yes: "we used 95% confidenceintervals (CI) adjusted for clustering to GPs." Antibiotic prescribing outcomes also reported stratified by country | Yes: data collected over3-week periods in two consecutive winter seasons | Fair | Happy Audit study |
| Blaschke, 2014 | Unclear: used data from anindependent national survey database, hospital staff collect data with training from Census Bureau, ICD-9 codes used for diagnoses, data "reviewed for completeness and accuracy and validated by representativesfrom the NCHS." However, methods for extracting studydata from database and whether study personnel were blinded is not reported. | Unclear: Outcomes comparedas percent differences across3 groups defined by RIDT use and flu diagnosis; paper does not report any adjustment of these percent differences for factors likely affecting outcomes, though weights based on sampling design (including geographic region, hospital, ED) appear to be used in calculating CIs | NA: cross-sectionaldesign | Fair | ICD-9 codes for influenza lackspecificity. I suspect the PPV of such codes is poor |

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| **Author, Year** | **Nonbiased selection?** | **High overall loss to followup or differential loss to followup?** | **Outcomes prespecified and defined?** | **Ascertainment techniques adequately****described?** |
| Bush 1979(Please refer to Boonacker,2010 systematic review) |  |  |  |  |
| Chowdhury, 2007 | Yes | No: antibiotic prescribing outcomereported for all 24 THCs | Unclear | No for outcomes: only that"prescribing data was collected from THCs records."Yes for exposure |
| Francis, 2006(Please refer to Vodicka,2013 systematic review) |  |  |  |  |
| Gonzales, 1999Gonzales, 2001 | Yes | No | Yes | Yes |
| Gonzales, 2004Gonzales, 2005 | Yes | No | Yes | Yes |
| Gonzales, 2008 | Yes | No | Yes | Yes |
| Harris, 2003 | Unclear | No | Yes | No |
| Hemo, 2009 | Yes | No | Yes | Yes |
| Herman, 2009(Please refer to Andrews,2012 systematic review) |  |  |  |  |
| Holloway, 2009 | Yes: four districts studied (of75 total in Nepal), 2/4 districts randomly assigned to intervention (method NR); sites within districts, villages within sites, and households within villages randomly selected for data collection | No: four districts studied before andafter intervention, loss to FU NR. Individual patients not followed longitudinally. | Yes: treatment informationcollected through household interviews | Yes for both exposures andoutcomes. Diagnoses/ARI severity from survey responses validated against health workers' diagnoses in baseline study. |

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| **Author, Year** | **Nonbiased and****adequate ascertainment methods?** | **Statistical analysis of potential confounders?** | **Adequate duration of followup?** | **Overall quality rating** | **Comments** |
| Bush 1979(Please refer to Boonacker,2010 systematic review) |  |  |  |  |  |
| Chowdhury, 2007 | Unclear | Yes: study restricted to clinicswith high baseline use, with further matching of intervention and control groups by baseline use, methods for matching NR | Unclear | Fair |  |
| Francis, 2006(Please refer to Vodicka,2013 systematic review) |  |  |  |  |  |
| Gonzales, 1999Gonzales, 2001 | Unclear | Yes | Yes | Fair |  |
| Gonzales, 2004Gonzales, 2005 | Yes | Yes | Yes | Fair |  |
| Gonzales, 2008 | Yes | Yes | Yes | Good | Would have liked a commentabout any "epidemics" like influenza which occurred in the comparison and control group areas |
| Harris, 2003 | Unclear | Yes | Yes | Fair |  |
| Hemo, 2009 | Yes | Yes | Yes | Good |  |
| Herman, 2009(Please refer to Andrews,2012 systematic review) |  |  |  |  |  |
| Holloway, 2009 | Unclear: trained research staffused survey instrument validated for diagnosis, though no validation reported for treatments and blinding NR. | Yes: analysis includes ARIseverity, time (pre/post), and intervention status | Yes: treatment outcomes,with winter season after intervention compared to winter season before. | Fair |  |

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| Isaacman, 1992(Please refer to Andrews,2012 systematic review) |  |  |  |  |
| Little, 2014 | Yes; simple clinical proformaused to create a large generalizable prospective cohort; negligible barriers to recruitment | No (overall); No (differential) | Yes: all studies within the mainDESCARTE study had same outcome measures; complications was main outcome measure | Yes: review of patient notes witha standardized proforma (separated into terms showing possible consultation diagnosis or symptom presentation) |
| Litvin, 2013 | No: intervention clinicsvolunteered to participate | No: one of 9 practices (11%) closedand withdrew (data included through 7/1/11) | Yes, with algorithmsincorporating text strings and ICD-9 codes to define diagnoses, and CDC guidelines to define appropriate treatment by diagnosis | Yes for both exposures andoutcomes. |
| Llor, 2011 | Unclear: intervention andcontrol providers were from different communities, not further described | Unclear: results presented only forproviders participating in both registration periods (intervention groups), and control providers participated in second registration period only. | No: unclear how antibioticprescribing and classification were defined | Yes: self-registry by GP duringconsultation, APO citation given |
| Llor, 2012 | Unclear: not described in thispaper but in other HappyAudit studies intervention and control providers were from different communities, not further described | Unclear whether results forintervention groups presented only for providers participating in both registration periods, but this was true in other Happy Audit studies. Control providers participated in second registration period only. | No: unclear how antibioticprescribing defined | Yes: self-registry by GP duringconsultation, APO citation given |
| Llor, 2012 | Unclear: intervention andcontrol providers were from different communities, not further described | Unclear whether results forintervention groups presented only for providers participating in both registration periods, but this was true in other Happy Audit studies. Control providers participated in second registration period only. | No: unclear how antibioticprescribing defined | Yes: self-registry by GP duringconsultation, APO citation given |

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| **Author, Year** | **Nonbiased and****adequate ascertainment methods?** | **Statistical analysis of potential confounders?** | **Adequate duration of followup?** | **Overall quality rating** | **Comments** |
| Isaacman, 1992(Please refer to Andrews,2012 systematic review) |  |  |  |  |  |
| Little, 2014 | Yes: outcome assessors(reviewers) blinded to aim of study (assessing affect of antibiotic prescription strategies) | Yes: log reg accounting forclustering by GP, controlling for case report form variables | Yes: duration of followup4 weeks | Good |  |
| Litvin, 2013 | Unclear: blinding and databasevalidation NR | Yes: longitudinal modelsincluded time and "random practice effects". Practice- level observations weighted by "practices' numbers of ARIencounters during the quarter." | Yes: interventionconducted in two phases over 27 months, with ARI treatment outcomes | Fair |  |
| Llor, 2011 | Unclear: outcomes recorded byproviders with no blinding | Yes: regression modeladjusted for use of RADTs, age, gender, presenting signs, diagnosis, and patient demand for antibiotics. | Yes: data collected over3-week periods in two consecutive winter seasons | Fair | Happy Audit study |
| Llor, 2012 | Unclear: outcomes recorded byproviders with no blinding | Yes: regression modeladjusted for use/results of CRP, age, gender, presenting symptoms/ signs, diagnosis, radiography, and patient demand for antibiotics | Yes: data collected intwo consecutive winter seasons | Fair | Happy Audit study |
| Llor, 2012 | Unclear: outcomes recorded byproviders with no blinding | Yes: regression modeladjusted for use/results of CRP, age, gender, comorbidity, presenting signs, duration of symptoms, diagnosis, radiography, and patient demand for antibiotics | Yes: data collected over3-week periods in two consecutive winter seasons | Fair | Happy Audit study |

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| **Author, Year** | **Nonbiased selection?** | **High overall loss to followup or differential loss to followup?** | **Outcomes prespecified and defined?** | **Ascertainment techniques adequately****described?** |
| Llor, 2014 | No: two intervention groupswere from different communities, not further described; before/after results presented only for providers completing both registrations | No overall: 9.6% loss to followup.Yes for differential: 6.3% withdrew from one intervention group, 18% from the other | Yes: registration templateshown with specific antibiotics listed | Yes: self-registry by GP duringconsultation, APO citation given, template shown |
| Mainous, 2013 | No: intervention clinicsvolunteered to participate in response to email to Practice Partner Research Network members; other PPRNet practices used as controls.No inclusion/exclusion criteria or excluded practices reported. | No: Loss to FU NR, but bothintervention and control clinics belonged to an existing research network (PPRNet) with common EHR and quarterly data pooling | Yes, with algorithmsincorporating text strings and ICD-9 codes to define diagnoses, and CDC guidelines to define appropriate treatment by diagnosis | Yes for both exposures andoutcomes |
| Maor, 2011(Please refer to Andrews,2012 systematic review) |  |  |  |  |
| McKay, 2011 | Unclear | No | No | No |
| McNulty, 2010 | Yes | No | Yes | Yes |
| Perz, 2002 | Unclear: intervention in oneurban county, and the 3 other major urban counties in the state were controls. However, there were large baseline demographic differences(27% black in intervention county, range 54 to 90% in 3 control counties). | No: data reported for all 3 controlcounties (combined) | Yes, though antibioticprescriptions not linked with individual visits and diagnoses: "prescriptions included were those filled for antimicrobial drugs administered orally and typically used for treatment of respiratory infections in pediatric outpatients." Outpatient visits for a diagnosed respiratory illness were a separate, secondary outcome (ICD-9 codes used). | Yes |

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| **Author, Year** | **Nonbiased and****adequate ascertainment methods?** | **Statistical analysis of potential confounders?** | **Adequate duration of followup?** | **Overall quality rating** | **Comments** |
| Llor, 2014 | Unclear: outcomes recorded byproviders with no blinding | Yes: regression modeladjusted for age, gender, signs and symptoms, referral, antibiotic demand, and "burden of GPs." | Yes: data collected inwinter 2008 and early2009 | Fair | Happy Audit study |
| Mainous, 2013 | Unclear: blinding and databasevalidation NR | Yes: Control clinics matched tointervention clinics for number of providers and baselineARIs. Statistical adjustment for time, practice size and specialty, region, and baseline ARIs. | Yes: 15 months afterintervention, with ARItreatment outcomes | Fair |  |
| Maor, 2011(Please refer to Andrews,2012 systematic review) |  |  |  |  |  |
| McKay, 2011 | Unclear | Time trends for use ofantibiotics only | Yes | Fair |  |
| McNulty, 2010 | unclear | Yes | Yes | Fair |  |
| Perz, 2002 | Unclear: validation of TennCaredatabase and blinding NR | Yes: regression models forprescription rates adjusted for county, age, race, study year; antibiotic resistance stratified by study year and antibiotic category | Yes: 12 months afterintervention, prescribing and resistance outcomes | Fair |  |

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| **Author, Year** | **Nonbiased selection?** | **High overall loss to followup or differential loss to followup?** | **Outcomes prespecified and defined?** | **Ascertainment techniques adequately****described?** |
| Rattinger, 2012 | Unclear: process for selectingthe two VA health centers not described, and they were in different states (Maryland and Utah). There were large baseline differences in race and marital status, but outcomes were adjusted for these variables. For individual visits, exclusion criteria and numbers excluded were reported. | No: one intervention and onecontrol site studied before and after intervention. Individual patients not followed longitudinally. | Yes, with algorithmsincorporating text strings to define diagnoses, and CDC guidelines to define appropriate treatment by diagnosis | Yes: visits identified byautomated case-finding algorithm and data for these visits then manually abstracted. |
| Razon, 2005(Please refer to Vodicka,2013 systematic review) |  |  |  |  |
| Reyes-Morales, 2009 | Unclear: process for selectingclinics not described, though intervention and control clinics reported to be similar. Both intervention and control physicians "agreed to participate." Average three patients per physician analyzed at each stage, but how they were selected NR (all gave consent to participate). | No: outcomes reported for all 106participating physicians | Yes | Yes |

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| **Author, Year** | **Nonbiased and****adequate ascertainment methods?** | **Statistical analysis of potential confounders?** | **Adequate duration of followup?** | **Overall quality rating** | **Comments** |
| Rattinger, 2012 | Unclear: cases identified byautomated algorithm, but data from these visits manually abstracted and blinding NR | Yes: regression modelsadjusted for age, marital status, sex, and race/ethnicity | Yes: 4 years from start ofintervention, prescribing outcomes | Fair |  |
| Razon, 2005(Please refer to Vodicka,2013 systematic review) |  |  |  |  |  |
| Reyes-Morales, 2009 | Yes: some patient and physiciandata by self-report, but corroborated by record and prescription review and "Data were collected by previously trained nurses who were blinded to the hypothesis of the study and unaware of theintervention." | Unclear: intervention andcontrol clinics similar in locations, number of physicians, infrastructure, and population served, but not clear if this resulted from a matching procedure. In addition, "the intervention effect was calculated by using the differences-in-differences model, adjusting for clustersampling of physicians," but no further explanation of this adjustment or discussion of adjustment for other confounders. | Unclear: 7 monthsincluding 3-month intervention, baseline,and followup evaluations;season NR | Fair |  |

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| **Author, Year** | **Nonbiased selection?** | **High overall loss to followup or differential loss to followup?** | **Outcomes prespecified and defined?** | **Ascertainment techniques adequately****described?** |
| Rubin, 2005 | No: community selectedbecause of baseline high frequency of cephalosporin use in children. For Medicaid data, "the rest of rural Utah" used as comparator, and there were baseline differences in antibiotic usebetween community and state (e.g. proportion of nonstrep pharyngitis treated with antibiotics: 95% vs. 65%).One of the few providers in Community A also declined to participate in study. | No: FU not specifically reported, butMedicaid claims data used for both baseline and intervention period, and manual chart review was done for URTI episodes in each period with comparable N's to Medicaid data. | Yes, with ICD-9 codes used toidentify URTI episodes from charts and Medicaid claims | Yes |
| Siegel, 2006 | No: 17 of 30 practitioners in apediatric Practice-Based Research Network compared with 30 "randomly selected community pediatricians," of whom 12 (40%) did not respond. Selection method NR for PBRN providers. | No: data on prescribing practicescollected retrospectively using questionnaires mailed to providers, so no loss to FU | Yes (antibiotic prescribing,SNAP use) | Yes: provider questionnairereproduced in publication |
| Smabrekke, 2002(Please refer to Boonacker,2010 and Vodicka, 2013 systematic reviews) |  |  |  |  |
| Smeets, 2009 | No: 25 groups of GPs agreedto participate (out of 84 invited groups) | No: enrolled groups N= 141, atanalysis, Intervention N=131, C=127 | Yes, RX claims data obtainedfrom a regional health insurance company database | Yes |

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| **Author, Year** | **Nonbiased and****adequate ascertainment methods?** | **Statistical analysis of potential confounders?** | **Adequate duration of followup?** | **Overall quality rating** | **Comments** |
| Rubin, 2005 | Unclear: two data sources forpatient-level data, Medicaid claims and chart review (no linking of these data sources reported), but blinding NR. | Yes: models for patient-leveldata included community, time, diagnosis and antimicrobial class, but not baselineantibiotic use which differed between groups | Unclear: followup datacollected during the same period intervention was conducted, which was from January through June when URTI season likely ending | Poor |  |
| Siegel, 2006 | No: questionnaire askedproviders to retrospectively estimate antibiotic prescribing and SNAP use at several timepoints before and after Otitis Media Study. Recall bias likely, as only PBRN providers participated in study. | Yes: outcomes for the twoprovider groups were compared before and after the SNAP intervention (i.e. minimal adjustment for time) | Yes: questionnairecovers 4-year period | Poor |  |
| Smabrekke, 2002(Please refer to Boonacker,2010 and Vodicka, 2013 systematic reviews) |  |  |  |  |  |
| Smeets, 2009 | Yes | Unclear | Yes | Fair |  |

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| **Author, Year** | **Nonbiased selection?** | **High overall loss to followup or differential loss to followup?** | **Outcomes prespecified and defined?** | **Ascertainment techniques adequately****described?** |
| Strandberg, 2005 | No: all 80 generalpractitioners at 14 public health centers invited to participate in audit; 45 who agreed were intervention group, 35 others were control group. Baseline differences in prescribing patterns between groups. 12 private GPs excluded. | Unclear: 4/45 participants (8.8%)and 5/35 nonparticipants (14%) were missing data at final followup. Considering all 5 time periods, data were missing for 2% of participating providers (4/225) and 19% of nonparticipants (33/175). Authors identify only "dropout of one andtwo GPs, respectively, because they had no registered patients duringone of the periods." | Unclear: broad vs. narrow-spectrum antibiotics and appropriate use not clearly defined | No: unclear how 1998 dataextract on diagnoses and treatments related to 1994/1995 study period data collection, or how diagnoses were defined in and extracted from electronic records. |
| Trepka, 2001 | Unclear: intervention andcontrol groups in different geographical regions of Wisconsin (north vs. central). Within these regions, households randomlyselected for outcome surveys;4.7% refused and 36% had no phone or could not be reached. No statistically significant difference in refusal rates betweenregions, but rates of those not reached NR by intervention group. However, baseline knowledge outcomes similar between regions. | No: 65/430 (15%) of respondentslost to FU overall, 18% in intervention and 13% in control areas. Analyses were restricted to parents completing both surveys. | Yes | Yes |

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| **Author, Year** | **Nonbiased and****adequate ascertainment methods?** | **Statistical analysis of potential confounders?** | **Adequate duration of followup?** | **Overall quality rating** | **Comments** |
| Strandberg, 2005 | Unclear: data extraction methodNR (automated vs. manual), no blinding or database validation reported | No: stratified time seriesanalysis only: results reported for each of five time periods, but no adjustment for other confounders, including baseline prescribing patterns which differed between participants and nonparticipants | Unclear: 3 months afterregistration intervention | Poor |  |
| Trepka, 2001 | Unclear: blinding andquestionnaire validation NR | Yes: cofactors associated withknowledge outcomes in univariate analysis (p<0.1) were entered into multivariate models, though univariate results also reported | Yes: knowledge outcome,follow up survey one year after baseline survey and9 months after intervention began | Fair |  |

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| **Author, Year** | **Nonbiased selection?** | **High overall loss to followup or differential loss to followup?** | **Outcomes prespecified and defined?** | **Ascertainment techniques adequately****described?** |
| Vinnard, 2013 | No: for AD study, interventiongroups defined by high baseline antibiotic use. In PM study, there were large baseline differences in antibiotic use reported. Inboth groups, intervention providers were selected from university faculty (CPUP), and control group were nonfaculty providers (CCA). | No: results reported for all 28providers in AD study; for PM study, results reported for *more* providers than described in methods (70 vs.40) | Yes | Yes: research staff abstractedantibiotic data from medical records using structured abstraction form |
| Weiss, 2011 | Yes, database | No (NA): no patient-level data | Yes | Yes |
| Wheeler, 2001(Please refer to Andrews,2012 systematic review) |  |  |  |  |
| Wutzke, 2007 | Yes | Unclear | Yes | Yes |

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| Vinnard, 2013 | Unclear: no blinding reported foroutcomes assessors | Yes: intervention and controlproviders matched for baseline bronchitis visits. Models of effects of intervention on antibiotic prescribing included provider, time, and a time/intervention interaction term. AD model also adjusted for sex and smoking | Yes: one year for ADstudy, two years for PMstudy | Fair | Two substudies included:academic detailing (AD) and patient mailing (PM)Clinical Practices of the University of Pennsylvania (CPUP) practice providers are university faculty; Clinical Care Associates (CCA) providers are nonfaculty but affiliated with the university |
| Weiss, 2011 | Unclear | Unclear: model variables notprovided; time trends for antibiotic prescriptions filled | Yes | Fair |  |
| Wheeler, 2001(Please refer to Andrews,2012 systematic review) |  |  |  |  |  |
| Wutzke, 2007 | Yes | Unclear: population surveyswere weighted by age and gender, provider surveys not adjusted or weighted, drug utilization data adjusted for seasonality and timing of the initial intervention | Yes | Fair |  |