**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 participating  providers were invited and agreed to participate, but method for allocating to intervention vs. control group NR. | Unclear whether all GPs enrolled  completed study. Data collected for control providers only in second  time period. | Yes: antibiotics identified by  WHO classification code | Yes: treatment given reported by  provider using published Audit Project Odense method, citation given |
| Bjerrum, 2011 | Unclear: providers invited to  participate, selection criteria NR; results presented only for providers completing both registrations | Unclear: results presented only for  providers participating in both registration periods, participation rates could be different before and after intervention (i.e. for comparison groups) | No: unclear how antibiotic  prescribing and classification were defined | Yes: self-registry by GP during  consultation, APO citation given |
| Blaschke, 2014 | No: comparison groups  defined 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 classification  reported for antibiotics | Yes: used data from National  Hospital 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 enrolled  or possibly lost to followup in the prospective registration of patients is not clearly reported |
| Bjerrum, 2006 | Unclear: outcomes recorded by  providers with no blinding | Yes: "we used 95% confidence  intervals (CI) adjusted for clustering of data according to practices." Antibiotic prescribing outcomes also reported stratified by site of infection. | Yes: data collected over  3-week periods in two consecutive winter seasons | Fair |  |
| Bjerrum, 2011 | Unclear: outcomes recorded by  providers with no blinding | Yes: "we used 95% confidence  intervals (CI) adjusted for clustering to GPs." Antibiotic prescribing outcomes also reported stratified by country | Yes: data collected over  3-week periods in two consecutive winter seasons | Fair | Happy Audit study |
| Blaschke, 2014 | Unclear: used data from an  independent 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 representatives  from the NCHS." However, methods for extracting study  data from database and whether study personnel were blinded is not reported. | Unclear: Outcomes compared  as percent differences across  3 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-sectional  design | Fair | ICD-9 codes for influenza lack  specificity. 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 outcome  reported 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, 1999  Gonzales, 2001 | Yes | No | Yes | Yes |
| Gonzales, 2004  Gonzales, 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 (of  75 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 and  after intervention, loss to FU NR. Individual patients not followed longitudinally. | Yes: treatment information  collected through household interviews | Yes for both exposures and  outcomes. 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 clinics  with 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, 1999  Gonzales, 2001 | Unclear | Yes | Yes | Fair |  |
| Gonzales, 2004  Gonzales, 2005 | Yes | Yes | Yes | Fair |  |
| Gonzales, 2008 | Yes | Yes | Yes | Good | Would have liked a comment  about 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 staff  used survey instrument validated for diagnosis, though no validation reported for treatments and blinding NR. | Yes: analysis includes ARI  severity, time (pre/post), and intervention status | Yes: treatment outcomes,  with winter season after intervention compared to winter season before. | 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?** |
| Isaacman, 1992  (Please refer to Andrews,  2012 systematic review) |  |  |  |  |
| Little, 2014 | Yes; simple clinical proforma  used to create a large generalizable prospective cohort; negligible barriers to recruitment | No (overall); No (differential) | Yes: all studies within the main  DESCARTE study had same outcome measures; complications was main outcome measure | Yes: review of patient notes with  a standardized proforma (separated into terms showing possible consultation diagnosis or symptom presentation) |
| Litvin, 2013 | No: intervention clinics  volunteered to participate | No: one of 9 practices (11%) closed  and withdrew (data included through 7/1/11) | Yes, with algorithms  incorporating text strings and ICD-9 codes to define diagnoses, and CDC guidelines to define appropriate treatment by diagnosis | Yes for both exposures and  outcomes. |
| Llor, 2011 | Unclear: intervention and  control providers were from different communities, not further described | Unclear: results presented only for  providers participating in both registration periods (intervention groups), and control providers participated in second registration period only. | No: unclear how antibiotic  prescribing and classification were defined | Yes: self-registry by GP during  consultation, APO citation given |
| Llor, 2012 | Unclear: not described in this  paper but in other Happy  Audit studies intervention and control providers were from different communities, not further described | Unclear whether results for  intervention 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 antibiotic  prescribing defined | Yes: self-registry by GP during  consultation, APO citation given |
| Llor, 2012 | Unclear: intervention and  control providers were from different communities, not further described | Unclear whether results for  intervention 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 antibiotic  prescribing defined | Yes: self-registry by GP during  consultation, 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 for  clustering by GP, controlling for case report form variables | Yes: duration of followup  4 weeks | Good |  |
| Litvin, 2013 | Unclear: blinding and database  validation NR | Yes: longitudinal models  included time and "random practice effects". Practice- level observations weighted by "practices' numbers of ARI  encounters during the quarter." | Yes: intervention  conducted in two phases over 27 months, with ARI treatment outcomes | Fair |  |
| Llor, 2011 | Unclear: outcomes recorded by  providers with no blinding | Yes: regression model  adjusted for use of RADTs, age, gender, presenting signs, diagnosis, and patient demand for antibiotics. | Yes: data collected over  3-week periods in two consecutive winter seasons | Fair | Happy Audit study |
| Llor, 2012 | Unclear: outcomes recorded by  providers with no blinding | Yes: regression model  adjusted for use/results of CRP, age, gender, presenting symptoms/ signs, diagnosis, radiography, and patient demand for antibiotics | Yes: data collected in  two consecutive winter seasons | Fair | Happy Audit study |
| Llor, 2012 | Unclear: outcomes recorded by  providers with no blinding | Yes: regression model  adjusted for use/results of CRP, age, gender, comorbidity, presenting signs, duration of symptoms, diagnosis, radiography, and patient demand for antibiotics | Yes: data collected over  3-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 groups  were 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 template  shown with specific antibiotics listed | Yes: self-registry by GP during  consultation, APO citation given, template shown |
| Mainous, 2013 | No: intervention clinics  volunteered 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 both  intervention and control clinics belonged to an existing research network (PPRNet) with common EHR and quarterly data pooling | Yes, with algorithms  incorporating text strings and ICD-9 codes to define diagnoses, and CDC guidelines to define appropriate treatment by diagnosis | Yes for both exposures and  outcomes |
| 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 one  urban 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 control  counties (combined) | Yes, though antibiotic  prescriptions 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 by  providers with no blinding | Yes: regression model  adjusted for age, gender, signs and symptoms, referral, antibiotic demand, and "burden of GPs." | Yes: data collected in  winter 2008 and early  2009 | Fair | Happy Audit study |
| Mainous, 2013 | Unclear: blinding and database  validation NR | Yes: Control clinics matched to  intervention clinics for number of providers and baseline  ARIs. Statistical adjustment for time, practice size and specialty, region, and baseline ARIs. | Yes: 15 months after  intervention, with ARI  treatment outcomes | Fair |  |
| Maor, 2011  (Please refer to Andrews,  2012 systematic review) |  |  |  |  |  |
| McKay, 2011 | Unclear | Time trends for use of  antibiotics only | Yes | Fair |  |
| McNulty, 2010 | unclear | Yes | Yes | Fair |  |
| Perz, 2002 | Unclear: validation of TennCare  database and blinding NR | Yes: regression models for  prescription rates adjusted for county, age, race, study year; antibiotic resistance stratified by study year and antibiotic category | Yes: 12 months after  intervention, 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 selecting  the 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 one  control site studied before and after intervention. Individual patients not followed longitudinally. | Yes, with algorithms  incorporating text strings to define diagnoses, and CDC guidelines to define appropriate treatment by diagnosis | Yes: visits identified by  automated 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 selecting  clinics 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 106  participating 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 by  automated algorithm, but data from these visits manually abstracted and blinding NR | Yes: regression models  adjusted for age, marital status, sex, and race/ethnicity | Yes: 4 years from start of  intervention, prescribing outcomes | Fair |  |
| Razon, 2005  (Please refer to Vodicka,  2013 systematic review) |  |  |  |  |  |
| Reyes-Morales, 2009 | Yes: some patient and physician  data 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 the  intervention." | Unclear: intervention and  control 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 cluster  sampling of physicians," but no further explanation of this adjustment or discussion of adjustment for other confounders. | Unclear: 7 months  including 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 selected  because 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 use  between 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, but  Medicaid 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 to  identify URTI episodes from charts and Medicaid claims | Yes |
| Siegel, 2006 | No: 17 of 30 practitioners in a  pediatric 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 practices  collected retrospectively using questionnaires mailed to providers, so no loss to FU | Yes (antibiotic prescribing,  SNAP use) | Yes: provider questionnaire  reproduced in publication |
| Smabrekke, 2002  (Please refer to Boonacker,  2010 and Vodicka, 2013 systematic reviews) |  |  |  |  |
| Smeets, 2009 | No: 25 groups of GPs agreed  to participate (out of 84 invited groups) | No: enrolled groups N= 141, at  analysis, Intervention N=131, C=  127 | Yes, RX claims data obtained  from 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 for  patient-level data, Medicaid claims and chart review (no linking of these data sources reported), but blinding NR. | Yes: models for patient-level  data included community, time, diagnosis and antimicrobial class, but not baseline  antibiotic use which differed between groups | Unclear: followup data  collected during the same period intervention was conducted, which was from January through June when URTI season likely ending | Poor |  |
| Siegel, 2006 | No: questionnaire asked  providers 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 two  provider groups were compared before and after the SNAP intervention (i.e. minimal adjustment for time) | Yes: questionnaire  covers 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 general  practitioners 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 and  two GPs, respectively, because they had no registered patients during  one of the periods." | Unclear: broad vs. narrow-  spectrum antibiotics and appropriate use not clearly defined | No: unclear how 1998 data  extract 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 and  control groups in different geographical regions of Wisconsin (north vs. central). Within these regions, households randomly  selected for outcome surveys;  4.7% refused and 36% had no phone or could not be reached. No statistically significant difference in refusal rates between  regions, but rates of those not reached NR by intervention group. However, baseline knowledge outcomes similar between regions. | No: 65/430 (15%) of respondents  lost 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 method  NR (automated vs. manual), no blinding or database validation reported | No: stratified time series  analysis 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 after  registration intervention | Poor |  |
| Trepka, 2001 | Unclear: blinding and  questionnaire validation NR | Yes: cofactors associated with  knowledge 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 and  9 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, intervention  groups defined by high baseline antibiotic use. In PM study, there were large baseline differences in antibiotic use reported. In  both groups, intervention providers were selected from university faculty (CPUP), and control group were nonfaculty providers (CCA). | No: results reported for all 28  providers in AD study; for PM study, results reported for *more* providers than described in methods (70 vs.  40) | Yes | Yes: research staff abstracted  antibiotic 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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| **Author, Year** | **Nonbiased and**  **adequate ascertainment methods?** | **Statistical analysis of potential confounders?** | **Adequate duration of followup?** | **Overall quality rating** | **Comments** |
| Vinnard, 2013 | Unclear: no blinding reported for  outcomes assessors | Yes: intervention and control  providers 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 AD  study, two years for PM  study | 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 not  provided; time trends for antibiotic prescriptions filled | Yes | Fair |  |
| Wheeler, 2001  (Please refer to Andrews,  2012 systematic review) |  |  |  |  |  |
| Wutzke, 2007 | Yes | Unclear: population surveys  were 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 |  |