

### Supplementary table 1: MOOSE checklist

See separate supplementary table

#### Moose checklist

Recommendation	Reported on page no
<b>Reporting of background should include</b>	
Problem definition	3,4
Hypothesis statement	3,4
Description of study outcome(s)	4
Type of exposure or intervention used	4
Type of study designs used	4,5
Study population	4,5
<b>Reporting of search strategy should include</b>	
Qualifications of searchers (eg, librarians and investigators)	26
Search strategy, including time period included in the synthesis and keywords	4,5
Effort to include all available studies, including contact with authors	5
Databases and registries searched	4,5
Search software used, name and version, including special features used (eg, explosion)	NA
Use of hand searching (eg, reference lists of obtained articles)	5
List of citations located and those excluded, including justification	Flow diagram
Method of addressing articles published in languages other than English	NA
Method of handling abstracts and unpublished studies	5
Description of any contact with authors	5,8
<b>Reporting of methods should include</b>	
Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	5,6
Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	NA
Documentation of how data were classified and coded (eg, multiple raters, blinding, and interrater reliability)	6
Assessment of confounding (eg, comparability of cases and controls in studies where appropriate)	6
Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results	6

Assessment of heterogeneity	7
Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated	6,7
Provision of appropriate tables and graphics	8-15
<b>Reporting of results should include</b>	
Graphic summarizing individual study estimates and overall estimate	8-15
Table giving descriptive information for each study included	Table 1
Results of sensitivity testing (eg, subgroup analysis)	15; supplementary table 5
Indication of statistical uncertainty of findings	Yes, presented as CIs in all results and figures
<b>Reporting of discussion should include</b>	
Quantitative assessment of bias (eg, publication bias)	14
Justification for exclusion (eg, exclusion of non-English-language citations)	NA
Assessment of quality of included studies	17,18
<b>Reporting of conclusions should include</b>	
Consideration of alternative explanations for observed results	19,20
Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature review)	23-25
Guidelines for future research	25
Disclosure of funding source	25

From: Stroup DF, Berlin JA, Morton SC, et al. (2000) Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. JAMA 283: 2008-2012.

**Supplementary table 2: Risk of pneumonia with individual antipsychotic drugs compared to no exposure**

Antipsychotic	No of studies	RR (95% Confidence Intervals)	Weight (%)	I <sup>2</sup> (%)
Amisulpride	1	1.14 (0.79 to 1.65)	5.6	NA
Chlorpromazine	1	1.10 (0.68 to 1.78)	4.8	NA
Clozapine	2	3.12 (2.59 to 3.74)	11	0
Haloperidol	2	2.75 (1.48 to 5.12)	10.7	78
Olanzapine	3	2.16 (1.51 to 3.09)	13.5	45.1
Pipamperone	1	1.55 (0.99 to 2.42)	5.07	NA
Quetiapine	2	1.79 (1.40 to 2.29)	12.3	33.2
Risperidone	3	1.86 (1.17 to 2.96)	16.6	81.3
Sulpiride	1	1.29 (0.94 to 1.77)	6	NA
Zotepine	2	1.50 (1.20 to 1.90)	11.5	0
Zuclopenthixol	1	2.25 (1.00 to 5.07)	2.9	NA
Overall	3	1.88 (1.57 to 2.25)	100	81.2

**Supplementary information table 3: Consensus Newcastle-Ottawa Scale (NOS) Case controlled studies**

		Selection			Comparability		Exposure			
Case controlled studies	Case definition	Representativeness	Selection of controls	Definition of controls	Comparability (a)	Comparability (b)	Ascertainment	Method	Non-response rate	Total
Kuo et al (2013)	0	1	1	0	1	1	0	1	1	6
Yang et al (2013)	0	1	1	0	1	1	0	1	1	6
Gau et al (2010)	1	1	1	1	1	1	0	1	1	8
Trifiro et al (2010)	1	1	1	1	1	1	0	1	1	8
Knol et al (2008)	0	1	1	1	1	1	0	1	1	7
Wada et al (2001)	1	1	0	0	1	0	0	0	0	3
Liao et al 2013	0	1	1	1	1	1	0	1	1	7
Barnett et al (2006)	0	1	1	1	1	1	0	1	1	7
Pratt et al (2011))	0	1	1	1	1	1	0	1	1	7

### Definitions of cases and controls

#### Is the case definition adequate?

- a) yes, with independent validation (i.e. using more than 1 database to verify cases)
- b) yes, e.g. record linkage or based on self-reports
- c) no description

#### Comparability of cases and controls on the basis of the design or analysis

- a) study controls for 'Age' (selected by authors as the most important factor)
- b) study controls for any additional factor: Smoking, gender, chronic respiratory diseases (asthma and/or COPD), or psychiatric diagnosis. Two points if propensity score matching or adjustment for multiple variables. Chalon & Elixhauser comorbidity indices were used by some studies and covered some comorbidities.

**Supplementary information table 4: Consensus Newcastle-Ottawa Scale (NOS) for Cohort studies**

	Selection				Comparability		Outcome			
Cohort studies	Representativeness	Selection of unexposed	Ascertainment of exposure	Outcome not present at start	Comparability (a)	Comparability (b)	Assessment	Length of follow-up	Adequacy of follow-up	Total
Aparasu et al (2013)	1	1	0	0	1	1	1	1	0	6
Huybrechts et al (2012)	1	1	0	0	1	1	1	1	1	7
Wang et al (2007)	1	1	0	0	1	1	1	1	0	6
Huybrechts et al (2011)	1	1	0	0	1	1	1	1	0	6
Dharmarajan et al (2011)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Star et al (2010)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Jackson et al (2015)	1	1	0	0	1	1	1	1	0	6

## Supplementary information table 5: Sensitivity analyses

### A: Sensitivity analysis on variations of the primary analysis

Comparison	No of studies	RR	95% Confidence Interval	I <sup>2</sup> (%)
<i>DerSimonian &amp; Laird CIs in studies of pneumonia</i>				
SGA vs no SGA	6	1.93	1.65 to 2.26	44.7
FGA vs no FGA	5	1.70	1.44 to 2.00	45.8
FGA vs SGA	7	1.07	0.90 to 1.28	50.2
Antipsychotic exposure vs no exposures	2	2.02	1.08 to 3.77	63.2
Individual antipsychotic	11*	1.88	1.57 to 2.25	81.2
<i>Excluding self-control case series</i>				
SGA vs no SGA excluding SCCS	5	2.11	1.54 to 2.88	46.5
<i>DerSimonian &amp; Laird CIs in studies of mortality</i>				
Antipsychotic exposure vs no exposure	4 <sup>s</sup>	1.50	1.05 to 2.14	51.0

\*Number of Individual antipsychotic from 3 studies; <sup>s</sup> Number of comparisons from 2 studies

### B: Sensitivity analysis removing each study in turn in SGA vs no SGA analysis

Study omitted	Estimate	95% Confidence interval	
Kuo et al (2013)	2.10	1.69	2.63
Yang et al (2013)	1.92	1.60	2.31
Gau et al (2010)	1.92	1.63	2.28
Trifiro et al (2010)	1.88	1.61	2.20
Knol et al (2008)	1.79	1.61	1.98
Pratt et al (2011)	2.11	1.69	2.62
<b>Combined</b>	1.93	1.65	2.26

### C: Sensitivity analysis removing each study in turn in FGA vs no FGA analysis

Study omitted	Estimate	95% Confidence interval	
Kuo et al (2013)	1.75	1.45	2.09
Yang et al (2013)	1.57	1.39	1.78
Trifiro et al (2010)	1.68	1.38	2.06
Knol et al (2008)	1.76	1.43	2.16
Pratt et al (2011)	1.72	1.36	2.19
<b>Combined</b>	1.69	1.44	2.00

**D: Sensitivity analysis removing each study in turn in FGA vs SGA analysis**

<b>Study omitted</b>	<b>Estimate</b>	<b>95% Confidence interval</b>	
Aparasu et al (2013)	1.04	0.85	1.28
Huybrechts et al (2012)	1.05	0.86	1.27
Wang et al (2007)	1.14	0.96	1.36
Trifiro et al (2010)	1.11	0.93	1.32
Huybrechts et al (2011)	1.08	0.88	1.32
Dharmarajan et al (2011)	1.08	0.86	1.37
Jackson et al (2015)	1.02	0.87	1.20
<b>Combined</b>	1.07	0.90	1.28

## Supplementary table 6: Database searches

Database: Embase <1974 to 2016 Week 18>

Search Strategy:

- 
- 1 \*pneumonia/ (43195)
  - 2 \*neuroleptic agent/ (28232)
  - 3 1 and 2 (28)
  - 4 exp pneumonia/ (229474)
  - 5 2 and 4 (105)
  - 6 from 5 keep 1,3-6,8,11-13,16,19-20,22,24-25,27-29,33,38,40-41,43,45,47,50,54,57-58,61,67,69 (32)

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Database: Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R)

Daily and Ovid MEDLINE(R) <1946 to Present>

Search Strategy:

- 
- 1 \*Antipsychotic Agents/ (33074)
  - 2 exp Pneumonia/ (80126)
  - 3 1 and 2 (41)
  - 4 from 3 keep 2-5,7-12,15,18-20,24-26,29 (18)

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Pubmed

Recent queries

Search	Add to builder	Query	Items found	Time
#13	Add	Select 19 document(s)	19	06:53:24
#12	Add	Search (#8 or #7)	199	06:52:25
#8	Add	Search antipsychotic and pneumonia	199	06:39:19
#10	Add	Search antipsychotic and pneumonia Schema: all Filters: Observational Study	0	06:39:00
#9	Add	Search antipsychotic and pneumonia Filters: Observational Study	0	06:39:00
#7	Add	Search (#6 or #5)	18	06:36:24



#6	Add	Search ("Pneumonia, Bacterial"[Mesh]) AND "Antipsychotic Agents"[Mesh]
	5	06:35:26
#5	Add	Search ("Antipsychotic Agents"[Mesh]) AND "Pneumonia, Aspiration"[Mesh]
	13	06:33:52