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Figure 3.1: Stroke; **Figure 3.2:** All-cause mortality.

Supplementary Figure 4 Funnel plot for visual inspection of publication bias.

Supplementary Table 1 PRISMA checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and	4

		interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	4
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	---
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	5
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	5
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	5
Study selection	9	State the process for selecting studies (i.e., screening,	5

		eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	5
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I ²) for each meta-analysis.	6

Section/topic	#	Checklist item	Reported on page #
Risk of bias across	1	Specify any assessment of risk of bias that may affect	--

studies	5	the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	1 6	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	5
RESULTS			
Study selection	1 7	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	6
Study characteristics	1 8	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	7
Risk of bias within studies	1 9	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	5
Results of individual studies	2 0	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	7
Synthesis of results	2 1	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	7
Risk of bias across studies	2 2	Present results of any assessment of risk of bias across studies (see Item 15).	8
Additional analysis	2 3	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression)	8
DISCUSSION			
Summary of evidence	2 4	Summarize the main findings including the strength of evidence for each main outcome; consider their	9

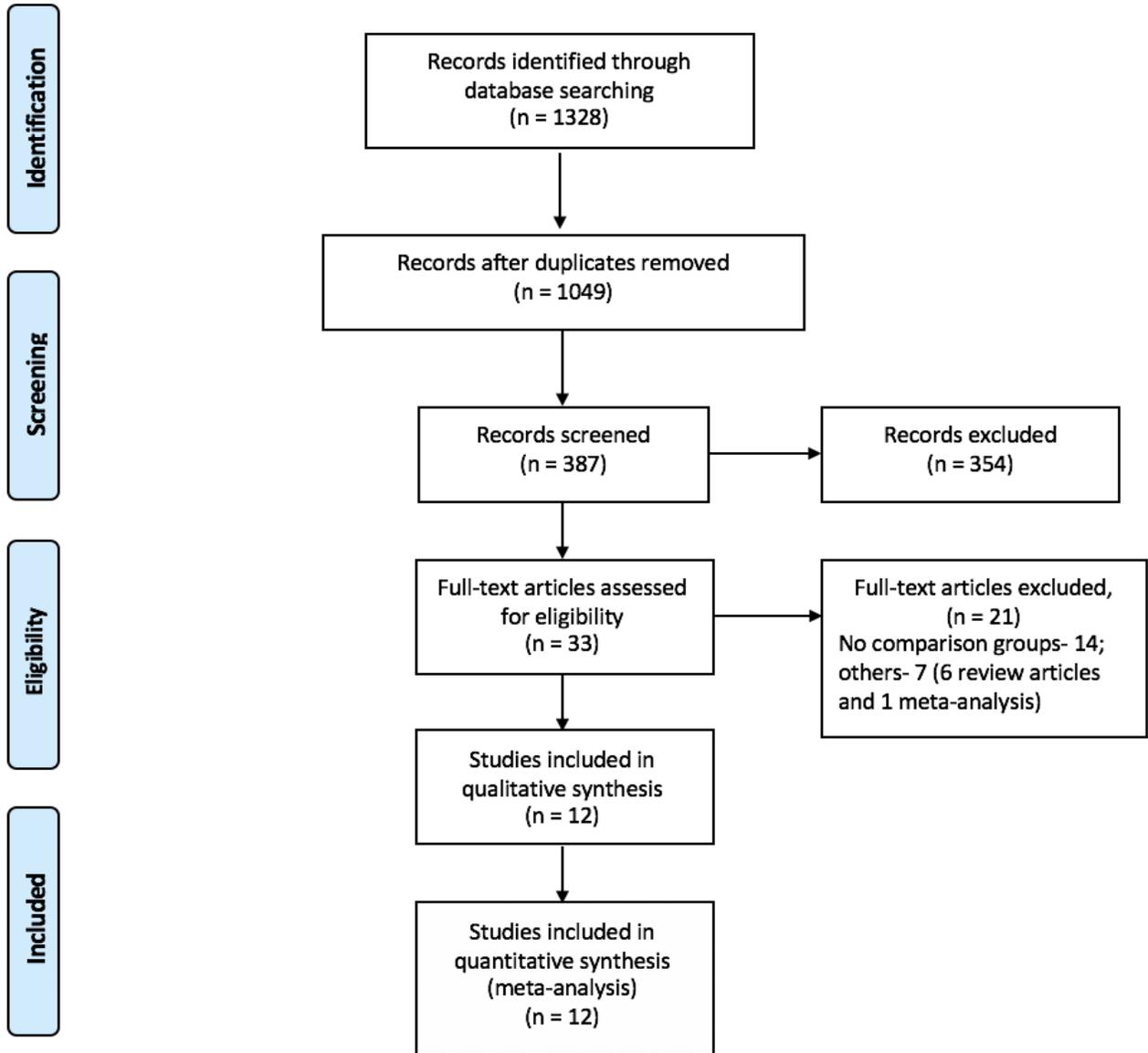
		relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	2 5	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	12
Conclusions	2 6	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	12
FUNDING			
Funding	2 7	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	13

Supplementary Table 2 Newcastle-Ottawa scale for appraisal of quality of observational studies

Study ID	Selection	Comparability	Outcome
Garcia-Fernandez, 2003	☆☆☆	☆☆	☆
Zapolanski, 2013	☆☆☆☆	☆☆	☆☆
Kim, 2013	☆☆☆☆	☆☆	☆☆
Lee, 2014	☆☆☆	☆☆	☆
Melduni, 2017	☆☆☆☆	☆☆	☆☆
Elbadawi, 2017	☆☆☆	☆☆	☆☆
Elbadawi, 2017	☆☆☆	☆☆	☆☆
Friedman, 2018	☆☆☆☆	☆☆	☆☆
Yao, 2018	☆☆☆☆	☆☆	☆☆

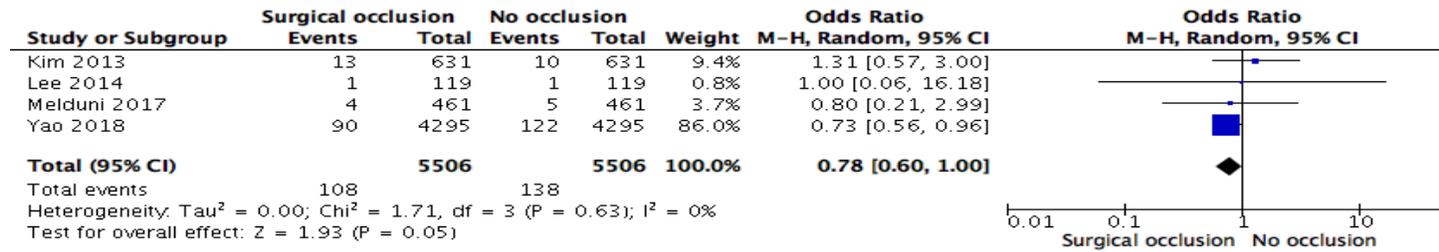
Supplementary Figure 1 PRISMA flow chart for study selection.

Figure 1: PRISMA flow chart for search strategy and selection criteria for included studies

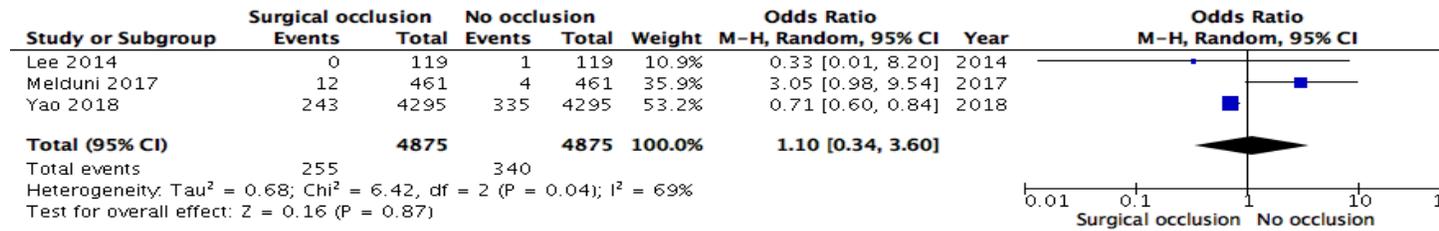


Supplementary Figure 2 Subgroup analysis including propensity match studies.

Supplementary Figure 2.1: Stroke

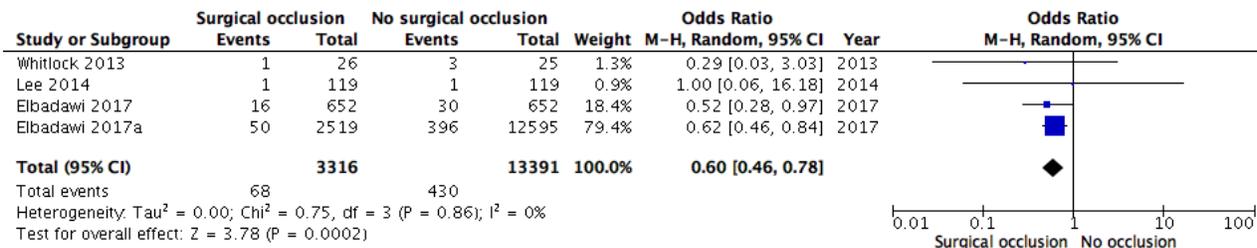


Supplementary Figure 2.2: All-cause mortality



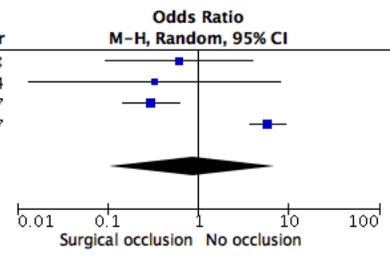
Supplementary Figure 3 Subgroup analysis including studies with AF predominance.

Supplementary Figure 3.1: Stroke



Supplementary Figure 3.2: All-cause mortality

Study or Subgroup	Surgical occlusion		No surgical occlusion		Weight	Odds Ratio M-H, Random, 95% CI	Year
	Events	Total	Events	Total			
Whitlock 2013	2	26	3	25	24.1%	0.61 [0.09, 4.01]	2013
Lee 2014	0	119	1	119	17.6%	0.33 [0.01, 8.20]	2014
Elbadawi 2017	10	652	32	652	28.8%	0.30 [0.15, 0.62]	2017
Elbadawi 2017a	40	2519	35	12595	29.4%	5.79 [3.67, 9.13]	2017
Total (95% CI)		3316		13391	100.0%	0.87 [0.11, 7.12]	
Total events	52		71				
Heterogeneity: Tau ² = 3.87; Chi ² = 52.63, df = 3 (P < 0.00001); I ² = 94%							
Test for overall effect: Z = 0.13 (P = 0.89)							



Supplementary Figure 4 Funnel plot for visual inspection of publication bias.

