

Supplementary Table 1. the PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
<b>TITLE</b>			
Title	1	Identify the report as a systematic review.	Page 1
<b>ABSTRACT</b>			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Page 3
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	Page 5
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	Page 5
<b>METHODS</b>			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Page 6
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Page 6
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Page 6
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Page 7
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Page 7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Page 7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Page 8
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Page 8
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	Page 8
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Page 8
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Page 8
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Page 8
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Page 8
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	None
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	Page 8
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Page 8
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	Page 8

Section and Topic	Item #	Checklist item	Location where item is reported
<b>RESULTS</b>			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Page 9
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Page 9
Study characteristics	17	Cite each included study and present its characteristics.	Page 9
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Page 9
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Page 10
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	Page 10
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Page 10
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Page 11
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	Page 11
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Page 11
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	Page 11
<b>DISCUSSION</b>			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Page 12
	23b	Discuss any limitations of the evidence included in the review.	Page 15
	23c	Discuss any limitations of the review processes used.	Page 15
	23d	Discuss implications of the results for practice, policy, and future research.	Page 14
<b>OTHER INFORMATION</b>			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	None
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	None
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	None
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	Page 16
Competing interests	26	Declare any competing interests of review authors.	Page 16
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	Page 17-22

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: <http://www.prisma-statement.org>

Supplementary Table 2. Search strategies determined on November 13, 2021

Databases	Queries	Number of studies
<b>Pubmed</b>		
#1	atrial fibrillation[Title/Abstract]	80,422
#2	non-vitamin K antagonist oral anticoagulants[Title/Abstract] OR NOACs[Title/Abstract] OR direct oral anticoagulants[Title/Abstract] OR DOACs[Title/Abstract] OR new oral anticoagulants[Title/Abstract] OR novel oral anticoagulants[Title/Abstract] OR oral thrombin inhibitors[Title/Abstract] OR oral factor Xa inhibitors[Title/Abstract] OR dabigatran[Title/Abstract] OR rivaroxaban[Title/Abstract] OR apixaban[Title/Abstract] OR edoxaban[Title/Abstract]	15,263
#3	vitamin K antagonists[Title/Abstract] OR warfarin[Title/Abstract]	29,549
#4	falling[Title/Abstract] OR fall[Title/Abstract]	145,680
#5	#1 AND #2 and #3 AND #4	33
<b>Embase</b>		
#1	'atrial fibrillation':ab,ti	140,364
#2	'non-vitamin k antagonist oral anticoagulants':ab,ti OR noacs:ab,ti OR 'direct oral anticoagulants':ab,ti OR doacs:ab,ti OR 'new oral anticoagulants':ab,ti OR 'novel oral anticoagulants':ab,ti OR 'oral thrombin inhibitors':ab,ti OR 'oral factor xa inhibitors':ab,ti OR dabigatran:ab,ti OR rivaroxaban:ab,ti OR apixaban:ab,ti OR edoxaban:ab,ti	30,641
#3	'vitamin k antagonists':ab,ti OR warfarin:ab,ti	48771
#4	falling:ab,ti OR fall:ab,ti	191,497
#5	#1 AND #2 AND #3 AND #4	78

**Supplementary Table 3. Quality assessment of the included studies based on the NOS scale**

Author	Selection			Comparability (maximum of two points)		Outcome			Total scores
	Representativeness of the exposed cohort	Selection of the non-exposed cohort	Ascertainment of exposure	Demonstration that outcome of interest was not present at start of study	Comparability of cohorts on the basis of the design or analysis	Assessment of outcome	Was follow-up long enough for outcomes to occur	Adequacy of follow-up of cohorts	
Rao, M. P 2018	1	1	1	1	1	1	1	1	NOS=8
Steffel, J 2016	1	1	1	1	1	1	1	1	NOS=8
Miao, B 2019	1	1	1	1	0	1	1	1	NOS=7

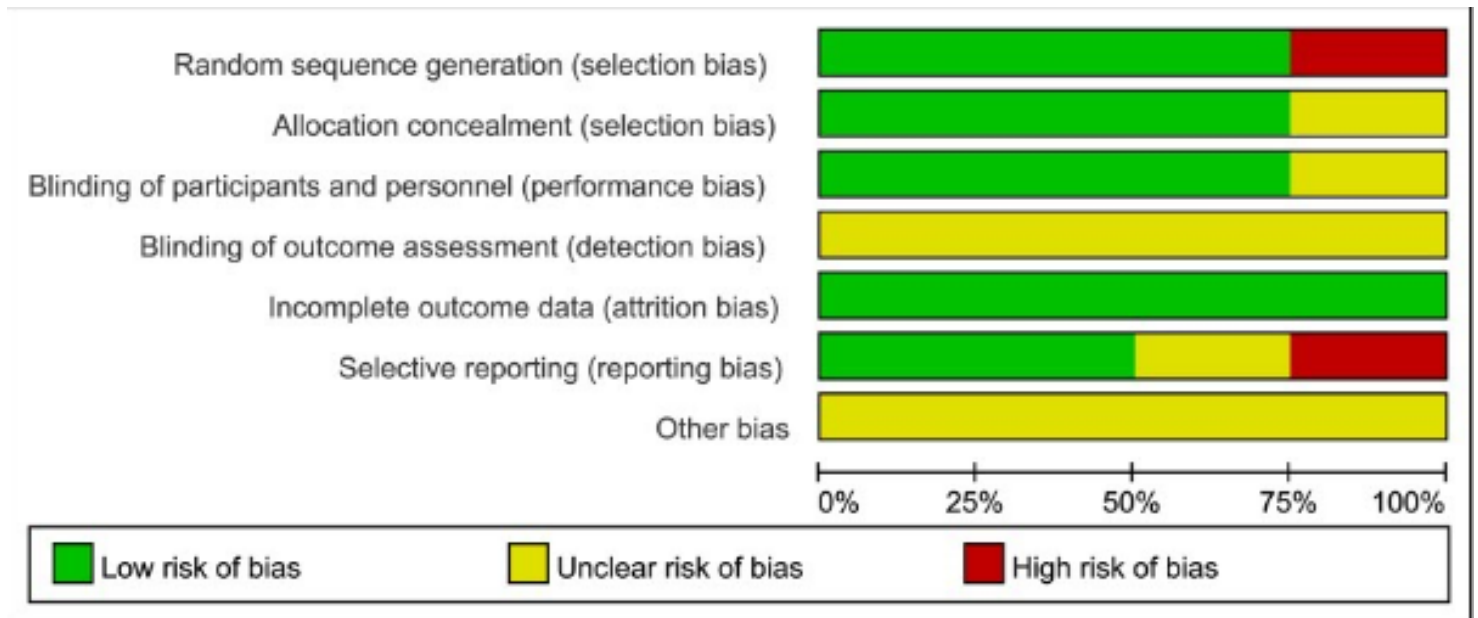
**Supplemental Table 4. Details of the included studies**

Included study		Steffel, J 2016	Rao, M. P 2018	Miao, B 2019
study design		Cohort study	Cohort study	Cohort study
sample size		900	753	25144
Age, median (25th, 75th), years		77 (72, 82)	75 (67, 79)	83 (47,87)
Age $\geq$ 75 years, No. (%)		590 (65.6)	379 (50.3)	-
Male Sex, No. (%)		455 (50.6)	396 (52.6)	14847 (59.0)
Female Sex, No. (%)		445 (49.4)	357 (47.4)	10297 (41.0)
Type of AF, No. (%)	Paroxysmal	271 (30.1)	153 (20.3)	-
	Persistent	178 (19.8)	600 (79.7)	-
	Permanent	451 (50.1)	-	-
CHA2DS2VASc score		5.1 $\pm$ 1.5	4.19 $\pm$ 1.65	-
HAS-BLED score		2.9 $\pm$ 1.0	2.40 $\pm$ 1.07	-
History of hypertension, No. (%)		828 (92.0)	638 (86.6)	21498(85.5)
History of CHF, No. (%)		453 (50.3)	166(22.5)	9191(36.6)
History of diabetes, No. (%)		355 (39.4)	272 (36.1)	8198(32.6)
Depression, No. (%)		-	163 (21.6)	4639(18.4)
Prior MI, No. (%)		-	126 (16.7)	2679(10.7)
Medication at randomization, No (%)	ACE inhibitors/ARBs	-	515 (68.6)	14055(55.9)
	Beta-blockers	-	503 (67.0)	15088(60.0)
	Amiodarone, No. (%)	-	71 (9.5)	1547(6.2)
	Digoxin	-	178 (23.7)	1835(7.3)
	Statins	-	399 (53.1)	14207(56.5)
Follow-up Time (y)	2.8	1.8 (1.4 - 2.3)	1.4 (0.6, 2.6)	Follow-up Time (y)

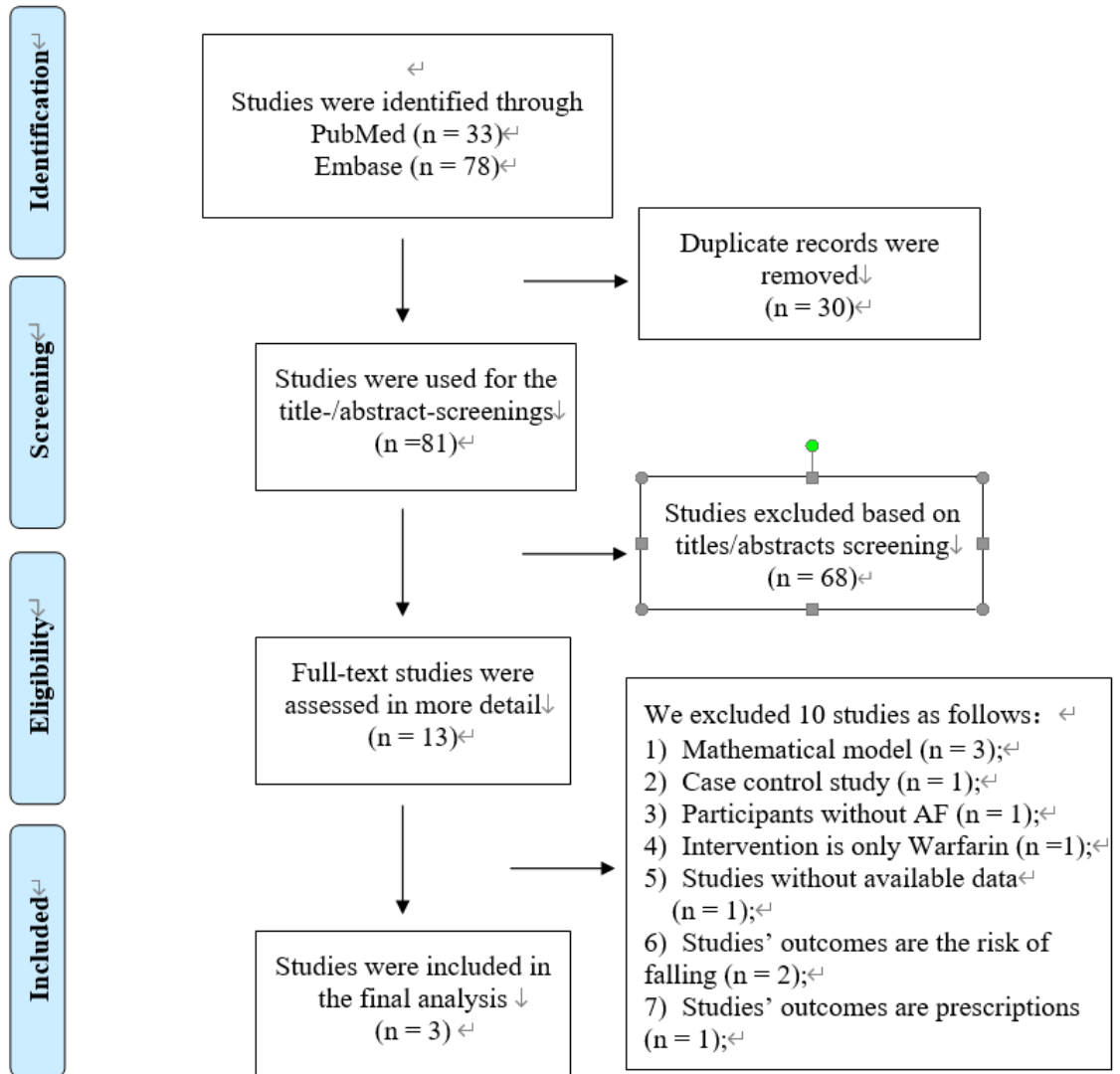
**Supplementary Table 5. GRADE table observational studies.**

Certainty assessment							No. of patients		Effect	Certainty	Importance
No. of studies	Study design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	No. of events	No. of individuals	Relative(95% CI)		
SSE											
3	observational studies	not serious	not serious	not serious	not serious <sup>c</sup>	strong association	268/14006(1.91%)	313/13098(2.39%)	RR 0.87(0.70 to 1.08)	⊕⊕⊕○ MODERATE	
Hemorrhagic stroke											
2	observational studies	not serious	very serious <sup>a</sup>	serious <sup>b</sup>	not serious <sup>c</sup>	strong association	5/979(0.51%)	19/981(1.94%)	RR 0.28 (0.10 to 0.75)	⊕⊕⊕○ MODERATE	
Cardiovascular death											
2	observational studies	not serious	not serious	not serious	not serious <sup>c</sup>	strong association	92/979(9.40%)	98/981(9.99%)	RR 0.97 (0.73 to 1.29)	⊕⊕⊕○ MODERATE	
All-cause death											
2	observational studies	not serious	not serious	not serious	not serious <sup>c</sup>	strong association	151/979(15.42%)	173/981(17.64%)	RR 0.90 (0.72 to 1.11)	⊕⊕⊕○ MODERATE	
Major bleeding											
2	observational studies	not serious	not serious	not serious	not serious <sup>c</sup>	strong association	74/979(7.56%)	99/981(10.09%)	RR 0.78 (0.58 to 1.06)	⊕⊕⊕○ MODERATE	
Major or CRNM bleeding											
2	observational studies	not serious	not serious	not serious	not serious <sup>c</sup>	strong association	229/979(23.39%)	305/981(31.09%)	RR 0.77 (0.61 to 0.98)	⊕⊕⊕○ MODERATE	
Intracranial bleeding											
3	observational studies	not serious	not serious	not serious	not serious <sup>c</sup>	strong association	56/14006(0.40%)	117/13098(0.89%)	RR 0.26 (0.11 to 0.66)	⊕⊕⊕○ MODERATE	

Supplementary Figure 1. The risk of bias assessment for each selected study

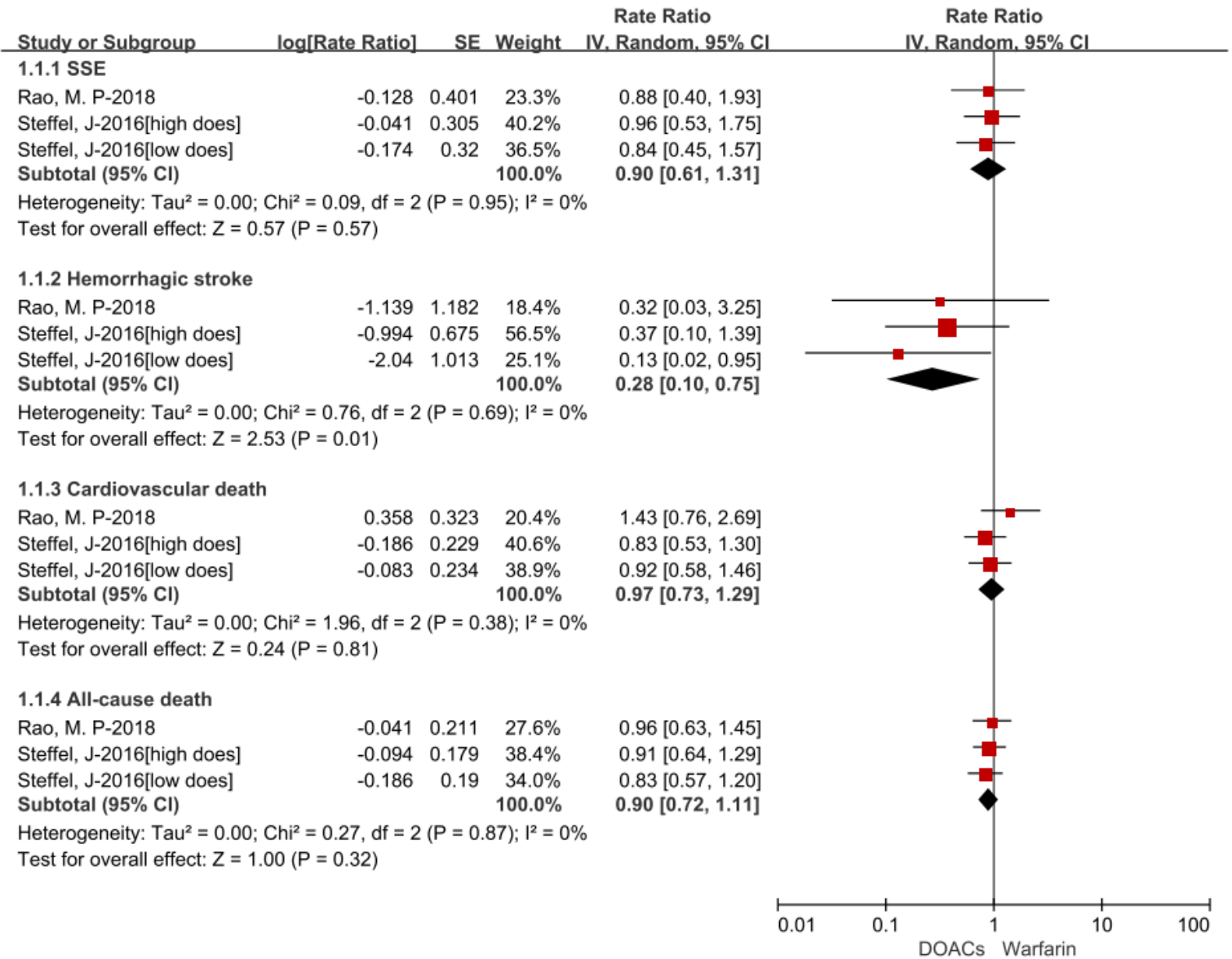


Supplementary Figure 2. The process of literature retrieval of this meta-analysis





**Supplementary Figure 3. Adjusted effectiveness data of direct oral anticoagulants compared with warfarin among atrial fibrillation patients at risk of falling about the study by Rao, M et al and the study by Steffel, J et al.**



**Supplementary Figure 4. Adjusted safety data of direct oral anticoagulants compared with warfarin among atrial fibrillation patients at risk of falling about the study by Rao, M et al and the study by Steffel, J et al.**

