Establishing Reference Ranges for Ambulatory Electrocardiography: A Meta-Analysis

Supplementary Material

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Williams CB, *et al. Heart* 2020; 106:1732–1739. doi: 10.1136/heartjnl-2020-316925

eTable 1: MOOSE checklist for meta-analyses of observational studies

Item No	Recommendation	Reported on Page No
Reporting of background should include		
1	Problem definition	5
2	Hypothesis statement	-
3	Description of study outcome(s)	6
4	Type of exposure or intervention used	6
5	Type of study designs used	6
6	Study population	6
Reporting of search strategy should include		
7	Qualifications of searchers (eg, librarians and investigators)	6
8	Search strategy, including time period included in the synthesis and key words	Table e2
9	Effort to include all available studies, including contact with authors	6
10	Databases and registries searched	6
11	Search software used, name and version, including special features used (eg, explosion)	6, Table e2
12	Use of hand searching (eg, reference lists of obtained articles)	6
13	List of citations located and those excluded, including justification	Figure e1
14	Method of addressing articles published in languages other than English	6
15	Method of handling abstracts and unpublished studies	6
16	Description of any contact with authors	6
Reporting of methods should include		
17	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	8, Table 1
18	Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	7
19	Documentation of how data were classified and coded (eg, multiple raters, blinding and interrater reliability)	7
20	Assessment of confounding (eg, comparability of cases and controls in studies where appropriate)	N/A
21	Assessment of study quality, including blinding of quality assessors, stratification or regression on possible predictors of study results	7
22	Assessment of heterogeneity	8
23	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	8
24	Provision of appropriate tables and graphics	Table 2, Figures

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Reporting of results should include		
25	Graphic summarizing individual study estimates and overall estimate	Figures and eFigures
26	Table giving descriptive information for each study included	Table 1
27	Results of sensitivity testing (eg, subgroup analysis)	N/A
28	Indication of statistical uncertainty of findings	9-11

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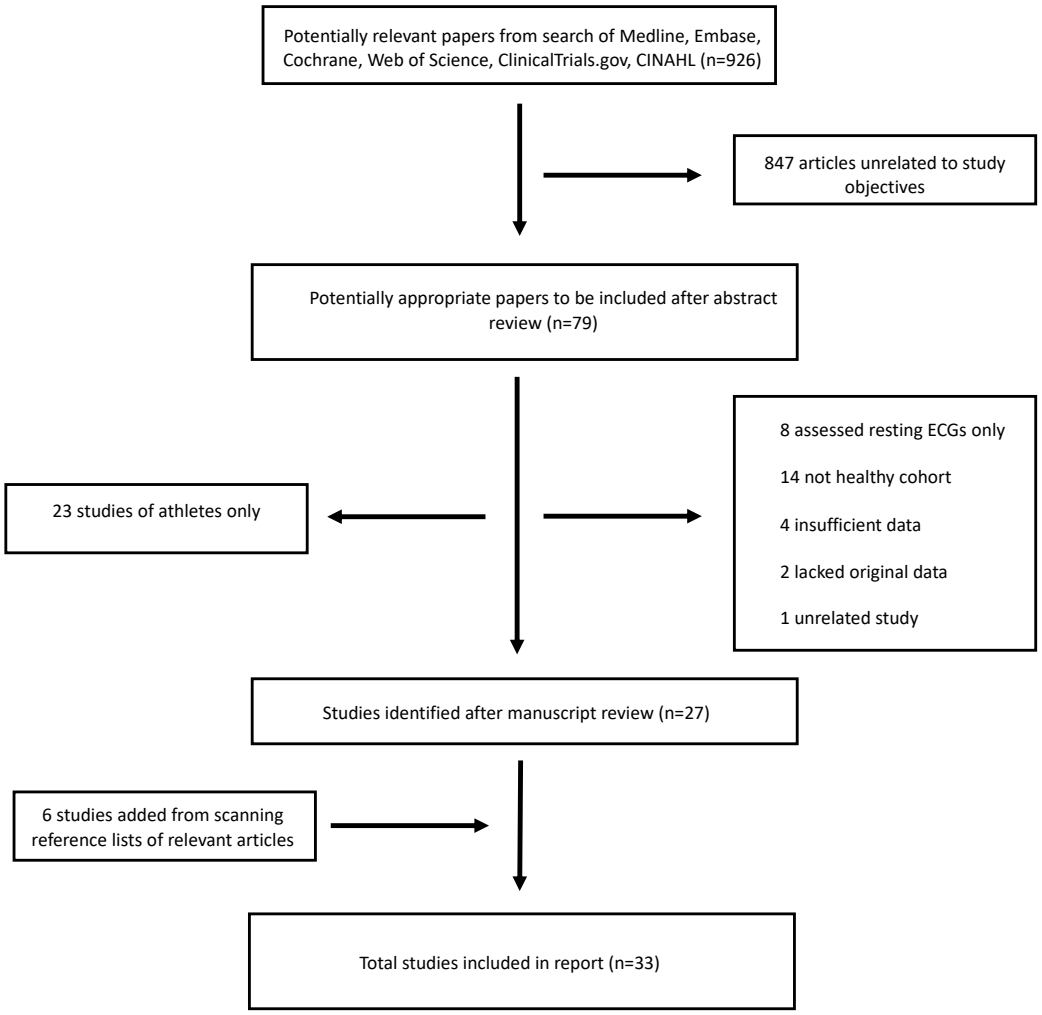
eTable 2: Detailed search strategy:

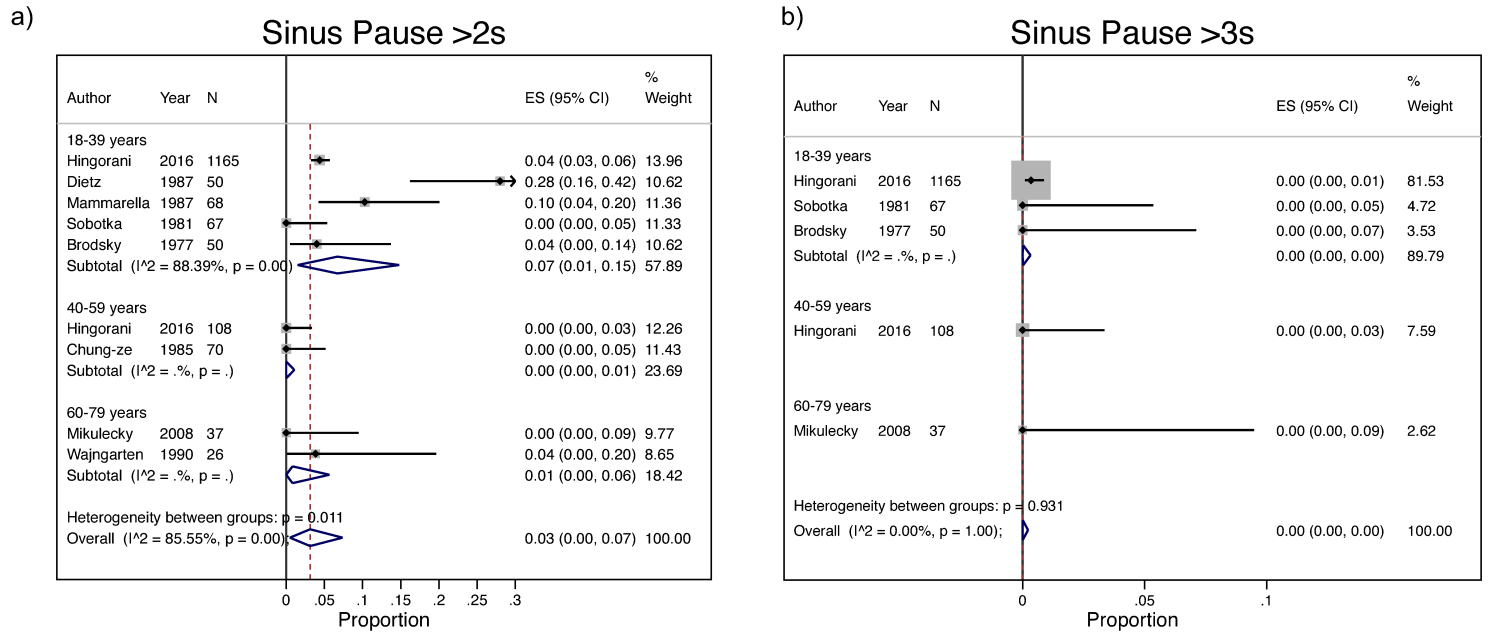
#	Searches
1	(healthy adult* or normal adult* or asymptomatic adult* or healthy participant* or asymptomatic participant* or normal participant* or healthy subject* or normal subject* or asymptomatic subject* or healthy population* or normal population* or asymptomatic population or free of heart disease or without apparent heart disease or active elderly or normal human or house officers or runner* or athlete* or healthy elderly).ti,ab.
2	exp electrocardiography/ or holter.mp. or ambulatory ECG.mp.
3	exp Arrhythmias, Cardiac/ or monitoring, physiologic.mp. or heart arrhythmia*.mp.
4	1 and 2 and 3
5	4 not (case report* or letter* or comment* or editorial* or review* or notes* or "conference abstract").pt.
6	5 not (exp infant/ or exp child/ or exp cells/)
7	limit 6 to humans
8	7 not (exp vascular diseases/ or exp cardiovascular infections/ or exp cardiovascular abnormalities/ or exp Carcinoid Heart Disease/ or exp Cardiac Output, High/ or exp Cardiac Output, Low/ or exp Cardiac Tamponade/ or exp Cardiomegaly/ or exp Cardiomyopathies/ or exp Endocarditis/ or exp Heart Aneurysm/ or exp Heart Arrest/ or exp Heart Defects, Congenital/ or exp Heart Failure/ or exp Heart Neoplasms/ or exp Heart Rupture/ or exp Heart Valve Diseases/ or exp Myocardial Ischemia/ or exp Myocardial Stunning/ or exp Pericardial Effusion/ or exp Pericarditis/ or exp Pneumopericardium/ or exp Postpericardiotomy Syndrome/ or exp Pulmonary Heart Disease/ or exp Rheumatic Heart Disease/ or exp Ventricular Dysfunction/ or exp Ventricular Outflow Obstruction/)
9	8 not (exp syncope/ or exp diving/ or exp physical exertion/ or exp Wolff-Parkinson-White/ or exp stroke/ or exp transient ischemic attack/ or exp cerebrovascular accident/ or exp sudden death/ or exp cardiac pathology/ or exp wandering pacemaker/ or exp metaraminol/ or exp ajmaline/ or exp quinidine/ or exp glycinexylidide/ or exp atropine/ or exp methscopolamine/ or exp hyperlipidemia/ or exp sinus node dysfunction/ or exp vasoregulatory abnormality/ or exp procainamide/ or exp propafenone/ or exp mexilitine/)

eFigure 1: Study selection



Abbreviations: CINAHL, Cumulative Index to Nursing and Allied Health Literature; ECG, electrocardiogram.

eFigure 2: Forest plots for the prevalence of sinus pauses of >2 and >3 seconds



ES (effect size) denotes prevalence of sinus pauses >2 seconds (panel a) and >3 seconds (panel b) for each study and the weighted mean prevalence by age group and overall. Note within age-group heterogeneity could not be tested for some groups due to the small number of studies and/or no events in some studies.

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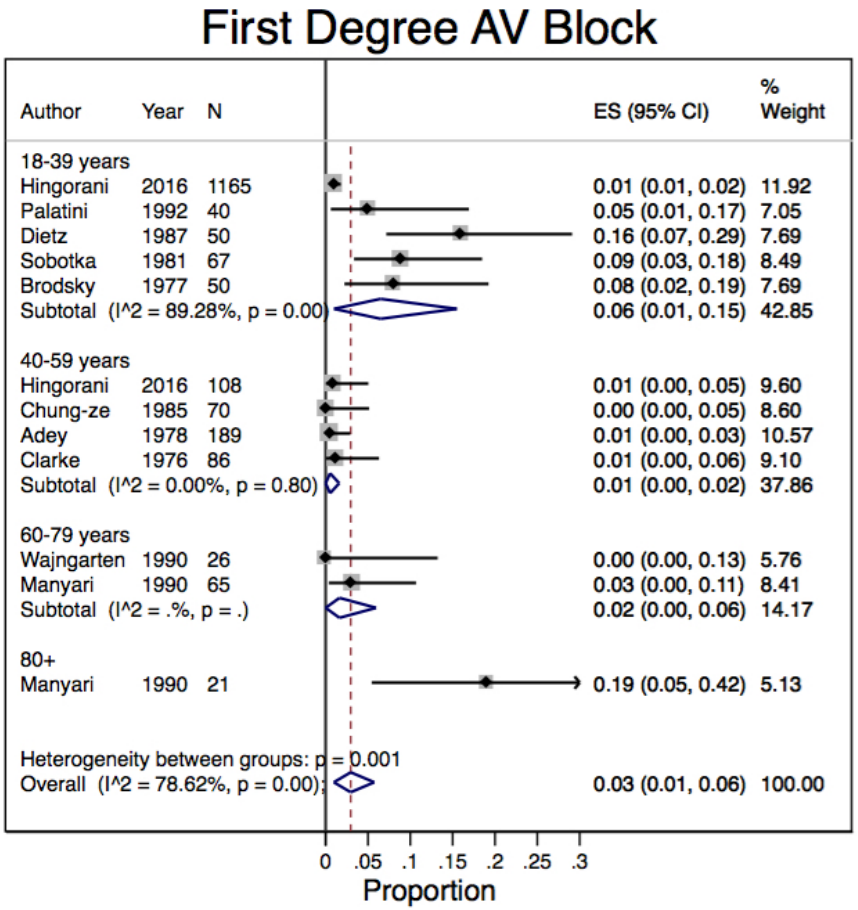
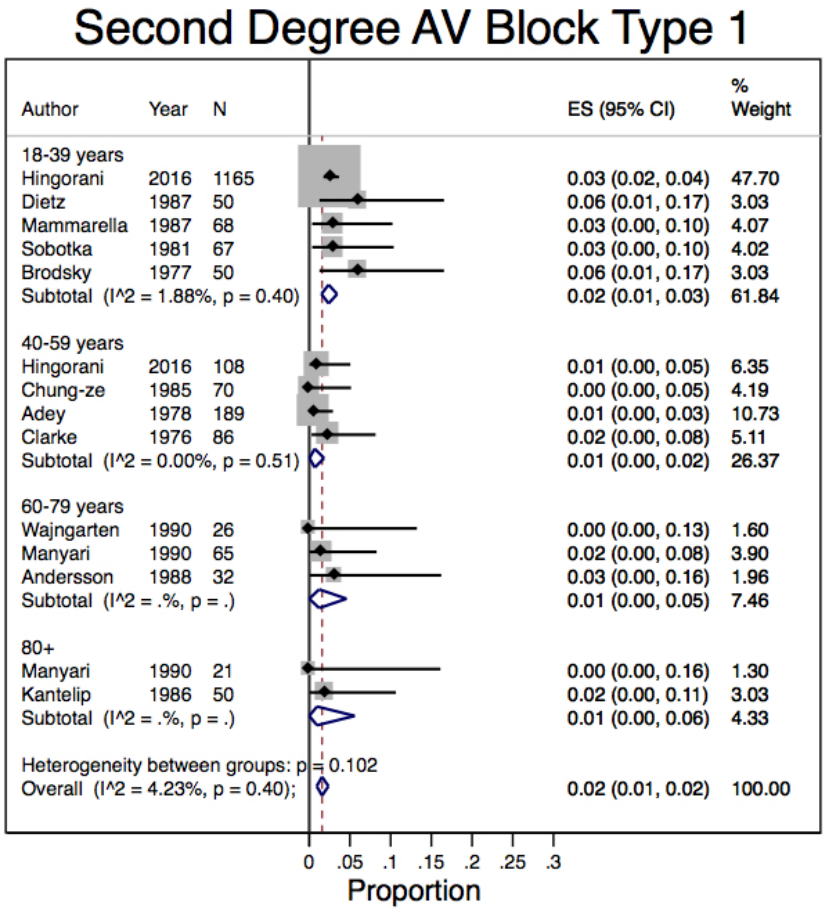
eFigure 3: Forest plot for the prevalence of first degree atrioventricular block



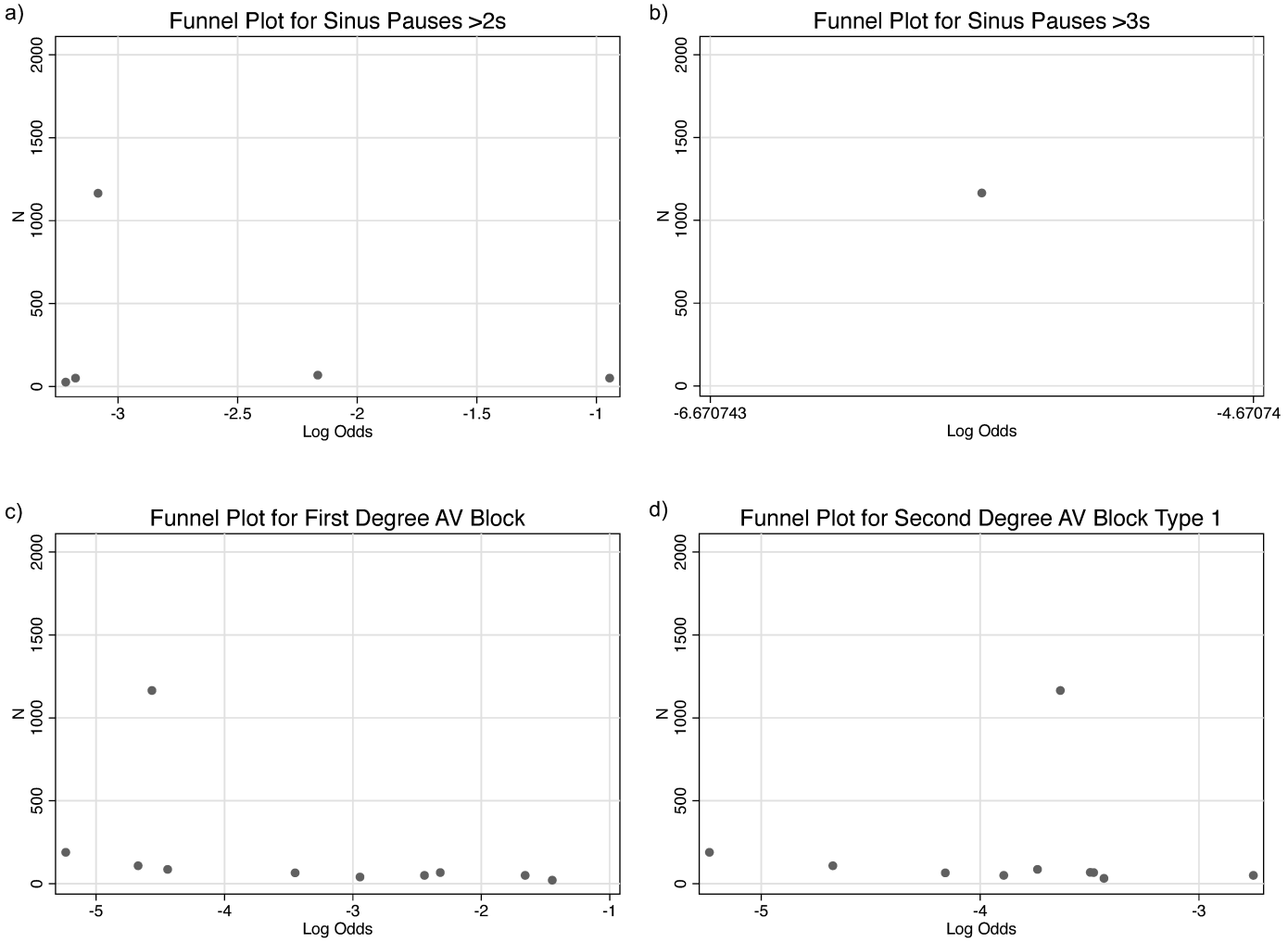
ES (effect size) denotes prevalence of first degree atrioventricular block for each study and the weighted mean prevalence by age group and overall. Note within age-group heterogeneity could not be tested for some groups due to the small number of studies and/or no events in some studies.

eFigure 4: Forest plot for the prevalence of second degree AV Block, type 1

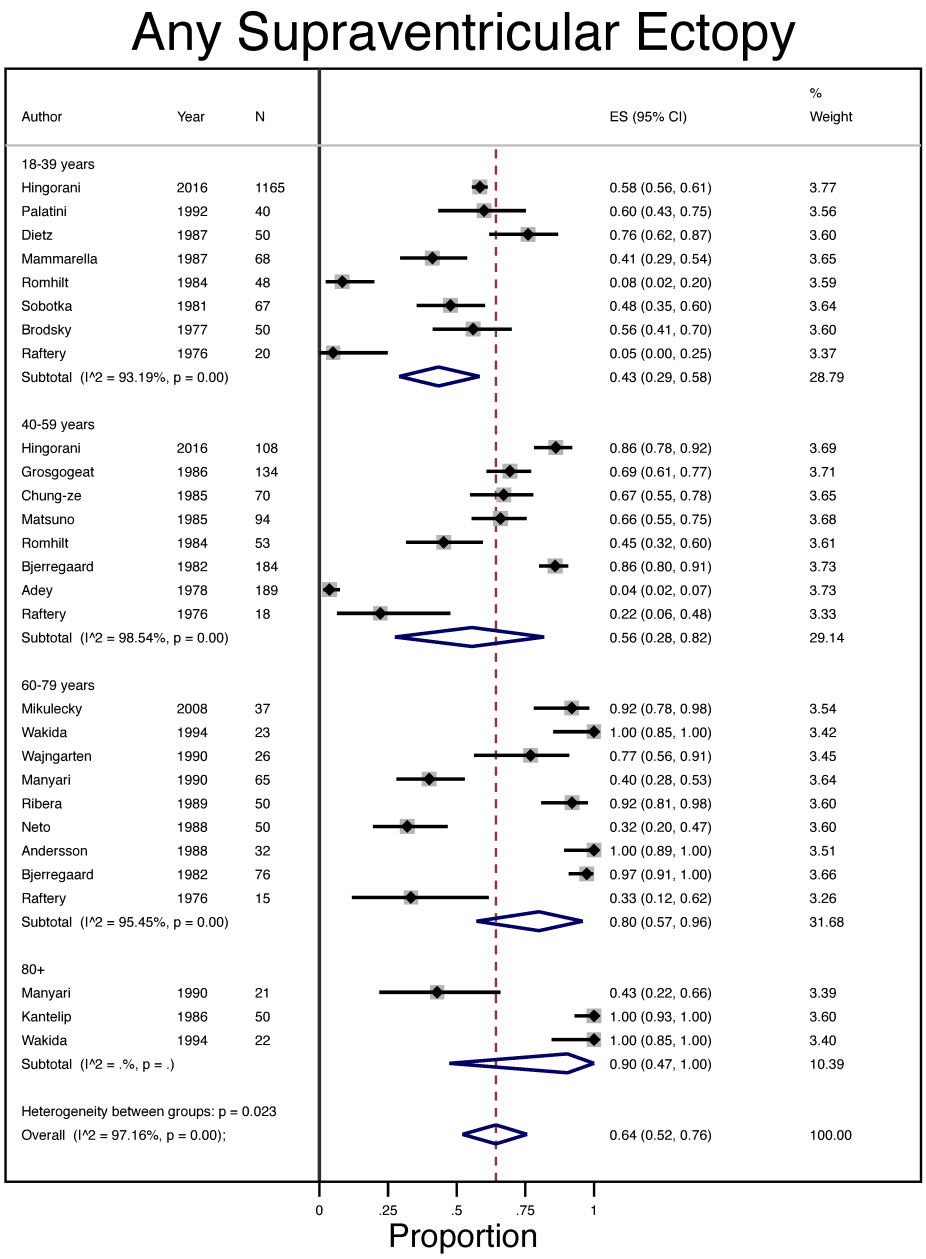


ES (effect size) denotes prevalence of second degree atrioventricular block, type 1, for each study and the weighted mean prevalence by age group and overall. Note within age-group heterogeneity could not be tested for some groups due to the small number of studies and/or no events in some studies.

eFigure 5: Funnel plots for meta-analyses of sinus pauses and conduction block

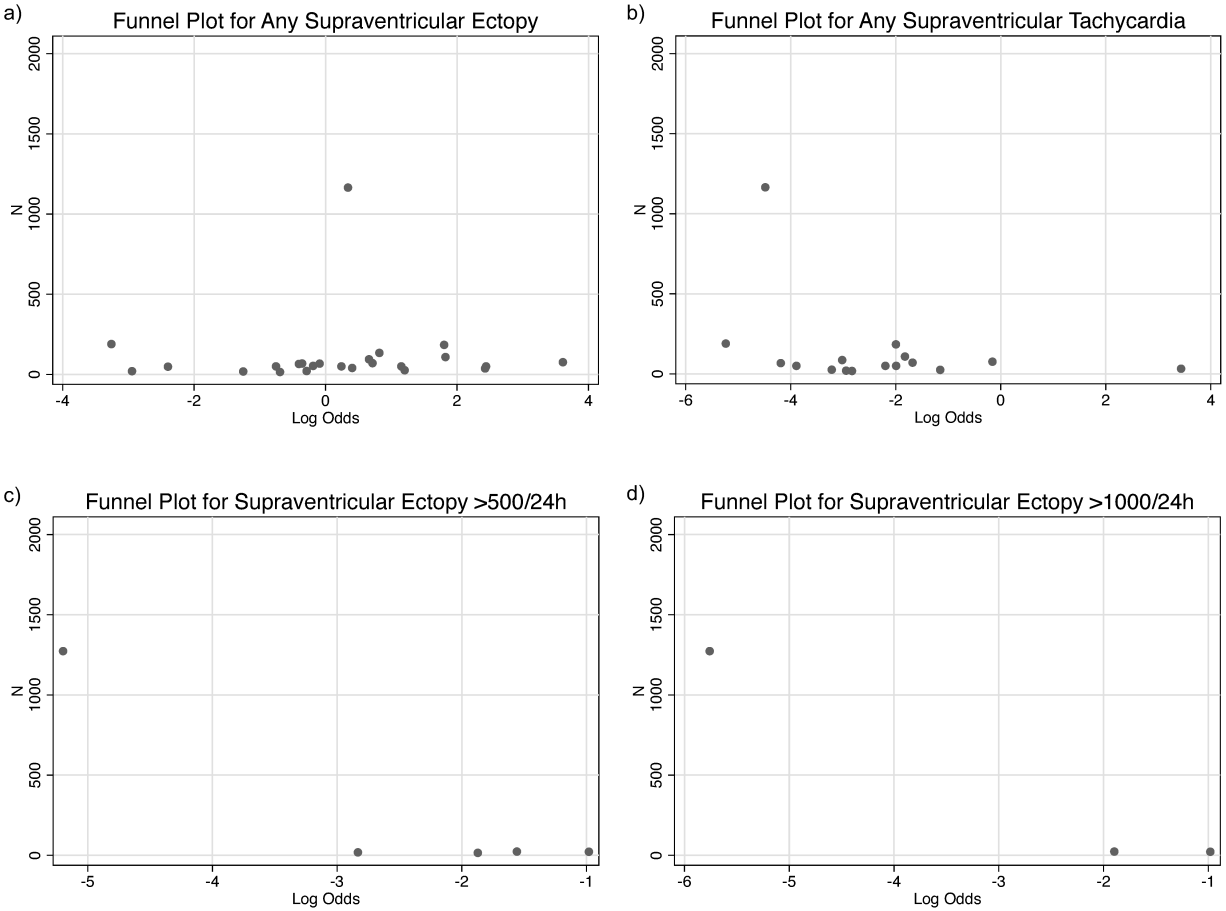


eFigure 6: Forest plot for the prevalence of any supraventricular ectopy

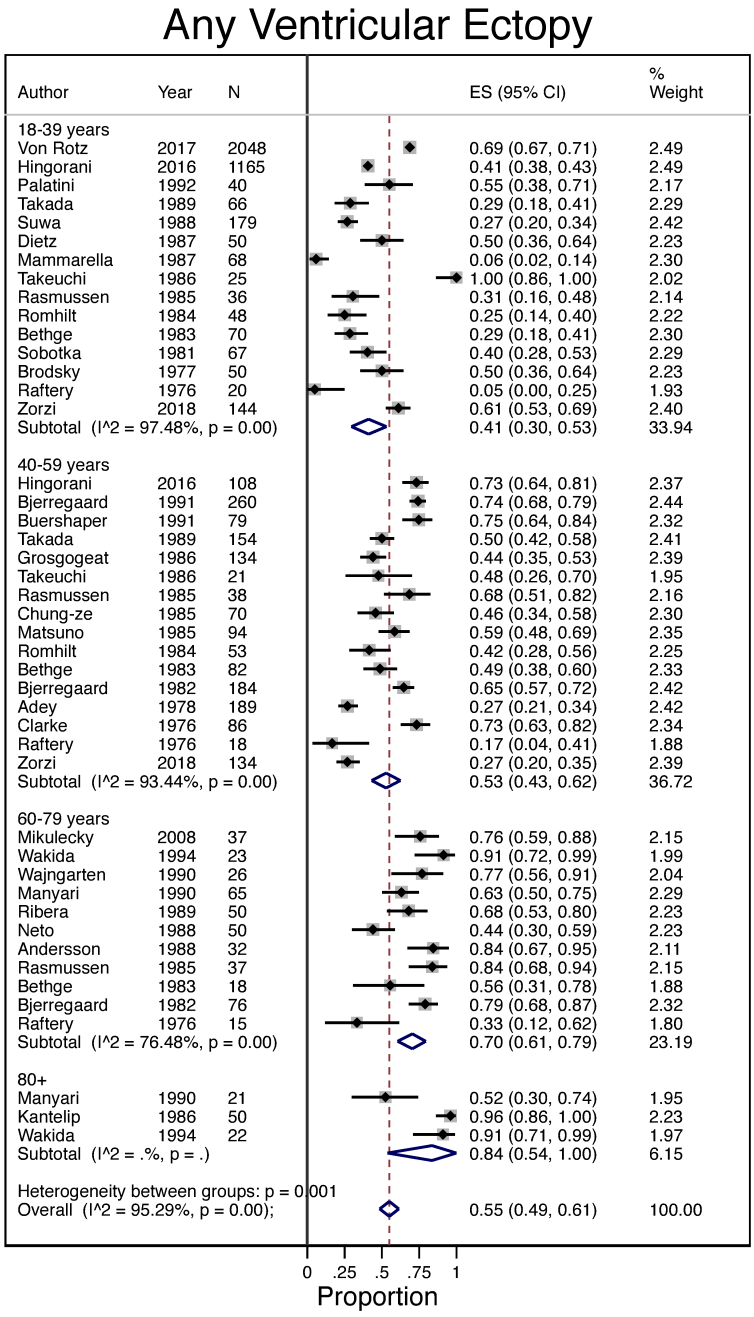


ES (effect size) denotes the weighted mean prevalence of any SVE, by age group and overall. Note within age-group heterogeneity could not be tested for some groups due to the small number of studies and/or no events in some studies.

eFigure 7: Funnel plots for meta-analyses of supraventricular ectopy and tachycardia

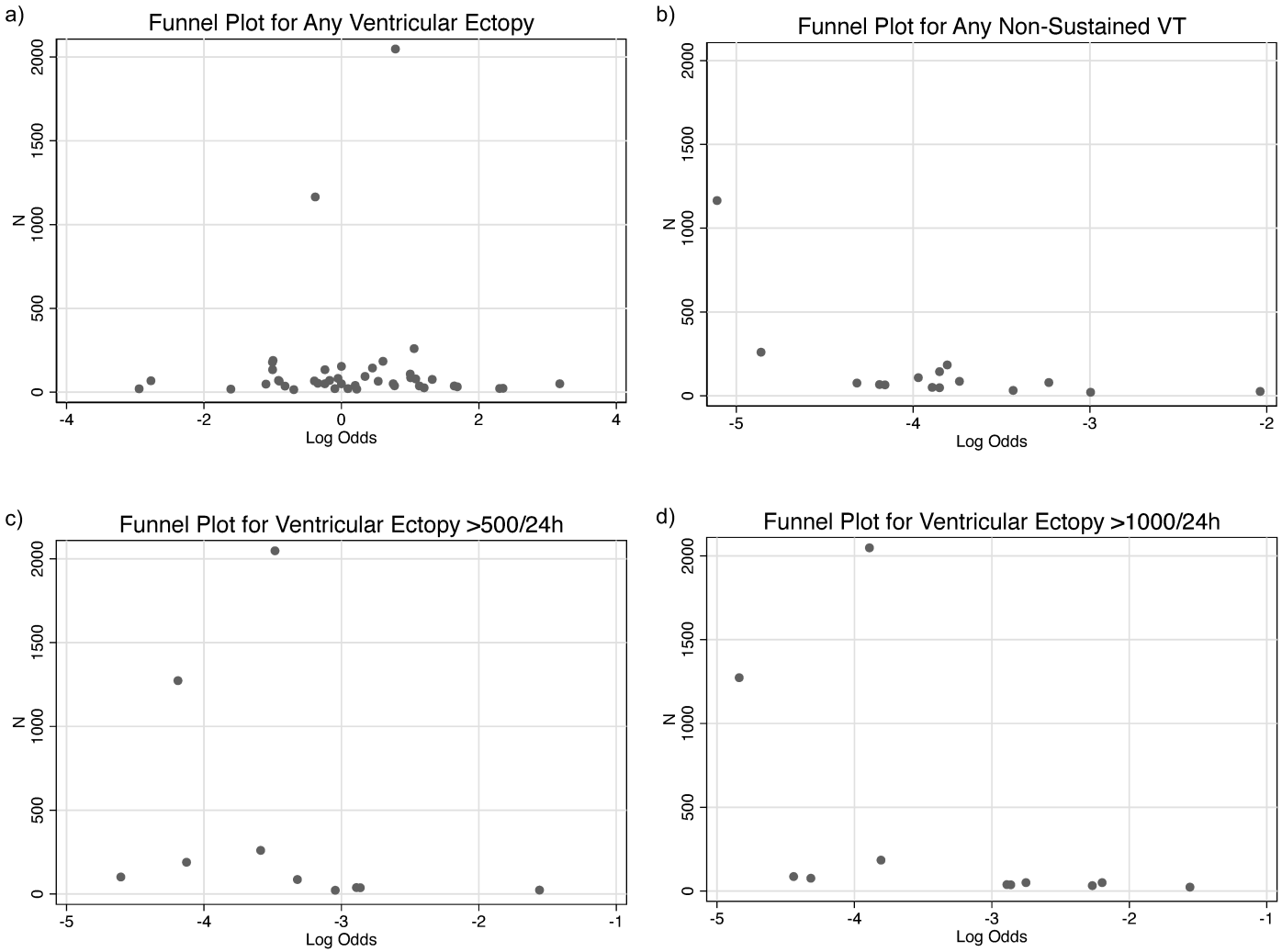


eFigure 8: Forest plot for the prevalence with any ventricular ectopy



ES (effect size) denotes the weighted mean prevalence of any VE, by age group and overall. Note within age-group heterogeneity could not be tested for some groups due to the small number of studies and/or no events in some studies.

eFigure 9: Funnel plots for meta-analyses of ventricular ectopy and non-sustained ventricular tachycardia



Heart Rate Analysis

Nine studies reported mean heart rate (eFigure 10a). There was no data in those ≥ 80 years of age. The overall weighted mean heart rate was 78.1 beats per minute (bpm), with a central 95% range (2.5th to 97.5th percentile) from 61.2 to 95.0 bpm. The mean heart rate and 95% range was similar across all age groups. Similarly, the minimum heart rate (eFigure 10b) was similar across all age groups with overall weighted mean being 56.6 bpm (95% range from 41.2 to 72.0 bpm). However, lower 2.5th percentile for minimum heart rate varied with age and was 41.5 bpm in those 18-39, 43.4 bpm in those 40-59, and 37.4 with those 60-79 years. Maximum heart rate decreased with age (eFigure 10c), with a mean maximum heart rate of 123.5 bpm (95% range 93.2 to 153.8 bpm). One study in those 40-59 years, by Chung-Ze, was an outlier with a mean maximum heart rate of only 90.6 bpm. There was asymmetry in the funnel plots, particularly for minimum and maximum heart rate (eFigure 11) but the number of studies were small.

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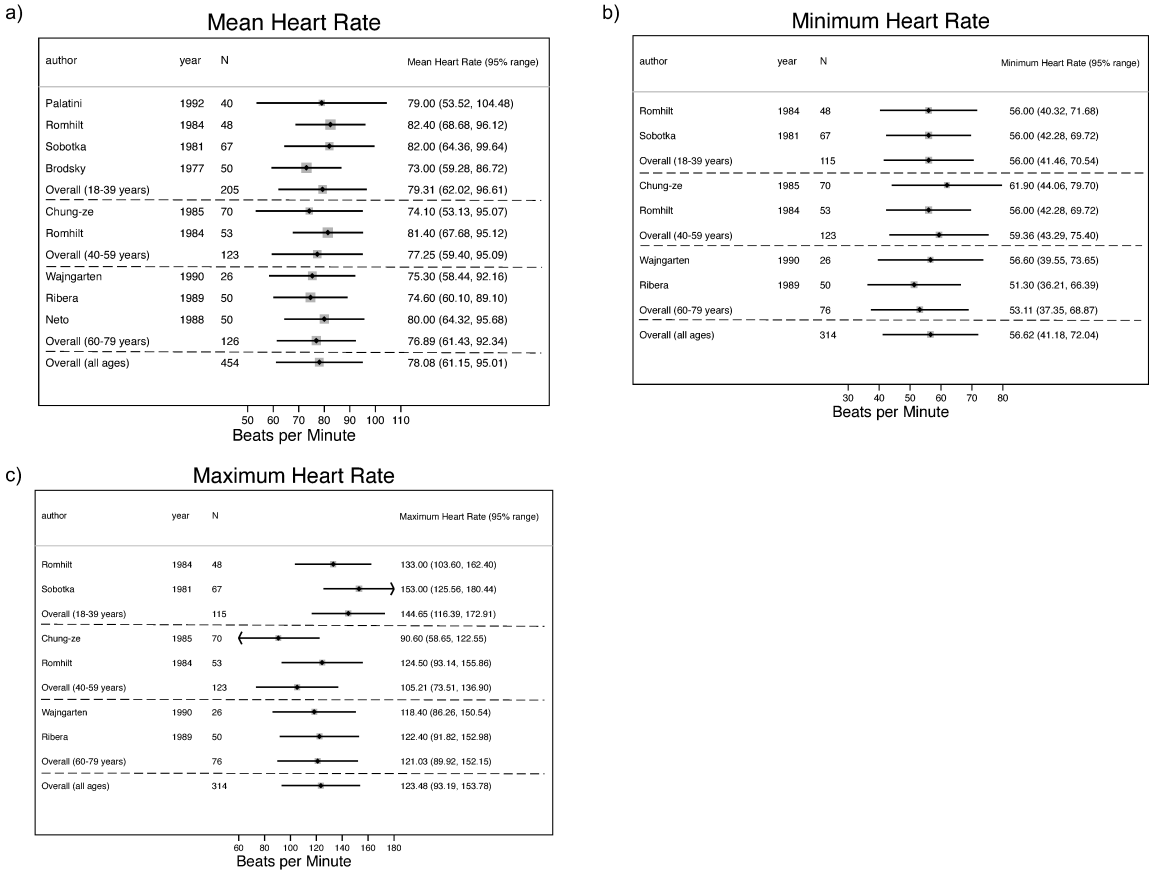
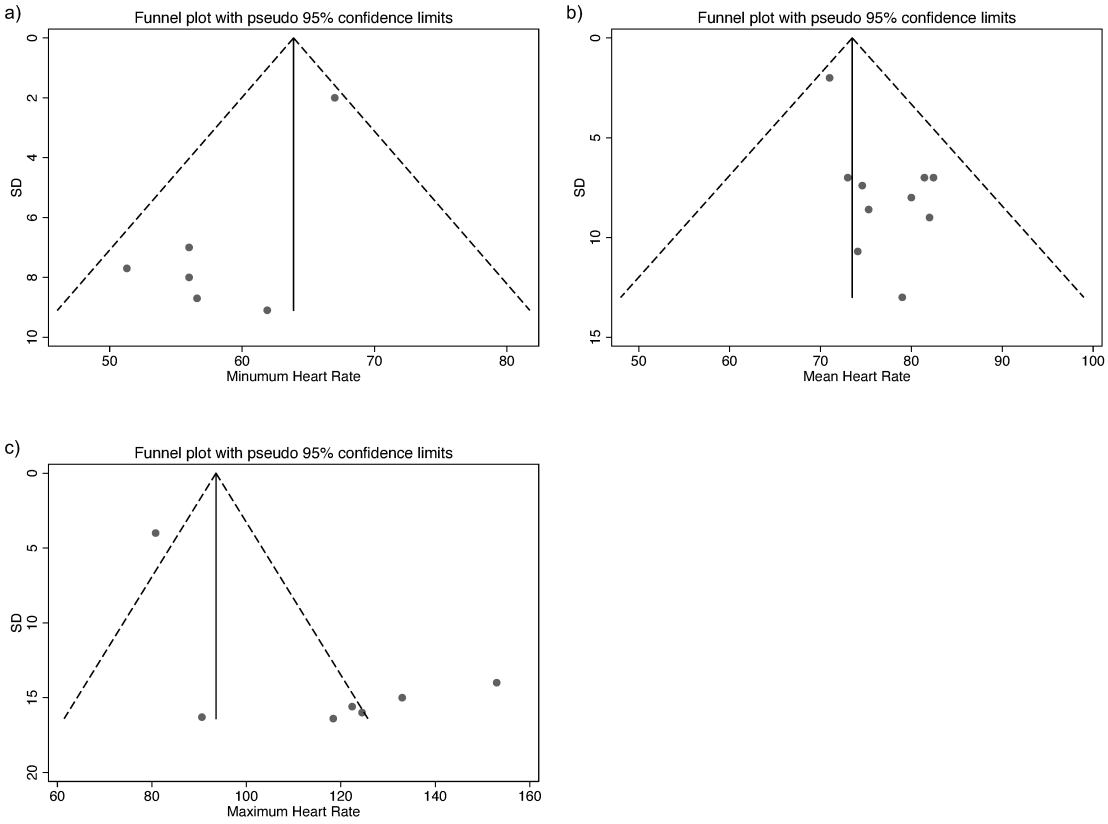
eFigure 10: Forest plots of mean, minimum and maximum Heart Rates



The weighted average mean (panel a), minimum (panel b) and maximum (panel c) heart rate for each study are presented, with central 95% ranges (2.5th to 97.5th percentile). The results are presented by age group and overall.

eFigure 11: Funnel plots for meta-analyses of mean, minimum and maximum heart rates



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