

Supplementary materials to: **Sudden death in individuals with obstructive sleep apnea: a systematic review and meta-analysis**

	Topic	Page number
<b>Title</b>	Identify the study as a meta-analysis (or systematic review)	1
<b>Abstract</b>	Use the journal's structured format	2
<b>Introduction</b>	<b>Present:</b>	
	The clinical problem	5
	The hypothesis	6
	A statement of objectives that includes the study population, the condition of interest, the exposure or intervention, and the outcome(s) considered	5-6
<b>Sources</b>	<b>Describe:</b>	
	Qualifications of searchers (eg, librarians and investigators)	6
	Search strategy, including time period included in the synthesis and keywords	6
	Effort to include all available studies, including contact with authors	6-7
	Databases and registries searched	6
	Search software used, name and version, including special features used (e.g. explosion)	6
	Use of hand searching (e.g. reference lists of obtained articles)	6
	List of citations located and those excluded, including justification	6
	Method of addressing articles published in languages other than English	6
	Method of handling abstracts and unpublished studies	6
	Description of any contact with authors	6
<b>Study Selection</b>	<b>Describe</b>	
	Types of study designs considered	7
	Relevance or appropriateness of studies gathered for assessing the hypothesis to be tested	7
	Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	7
	Documentation of how data were classified and coded (eg, multiple raters, blinding, and inter-rater reliability)	7
	Assessment of confounding (e.g. comparability of cases and controls in studies where appropriate)	7
	Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results	7-8
	Assessment of heterogeneity	8-9

	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	8-9
<b>Results</b>	<b>Present</b>	
	A graph summarizing individual study estimates and the overall estimate	Figure 2
	A table giving descriptive information for each included study	Table 1
	Results of sensitivity testing (eg, subgroup analysis)	11-12
	Indication of statistical uncertainty of findings	11-12
<b>Discussion</b>	<b>Discuss</b>	
	Strengths and weaknesses	15
	Potential biases in the review process (eg, publication bias)	15

**Supplemental Table 1:** Meta-Analyses and Systematic Reviews of Observational Studies (MOOSE)

Database	Search period	Search terms
MEDLINE	1946 to January 1, 2020	<ol style="list-style-type: none"> <li>1. Sleep</li> <li>2. Obstructive</li> <li>3. Apnoea</li> <li>4. Sudden death</li> <li>5. Cardiac death</li> <li>6. 1 AND 2 AND 3</li> <li>7. 4 OR 5</li> <li>8. 6 AND 7</li> </ol>

**Supplemental Table 2:** MEDLINE Search strategy for studies assessing the association of obstructive sleep apnea and sudden death.

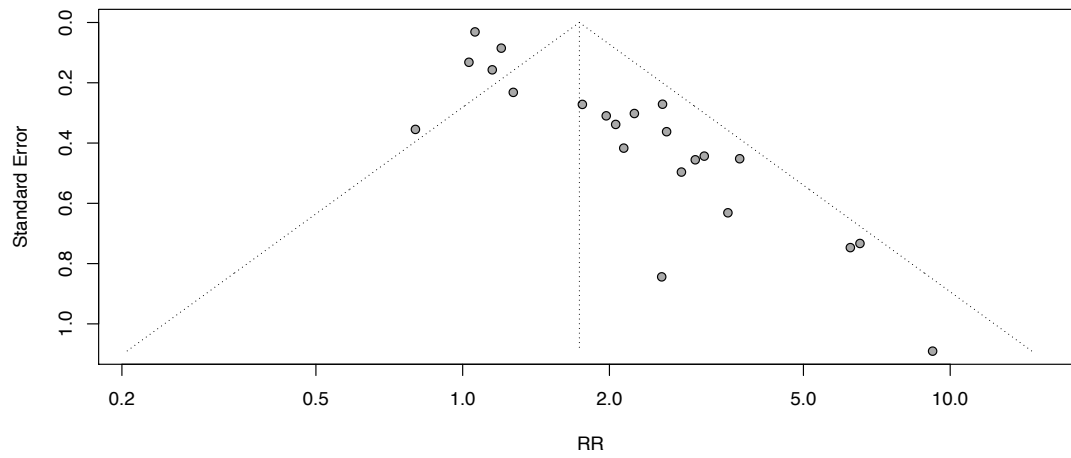
Author	Year	Country	Sample size (n)	Study type	Average follow-up	Mean age	Male (%)	Covariates adjusted for	Study quality score
Kerns et al	2018	USA	558	Cohort	2 y	56	56	Age, gender, ethnicity, obstructive sleep apnea, Charlson comorbidity index, BMI. History of atrial fibrillation, left ventricular mass index, Kt/V, IDW chance, IDW change/body weight, weight-to-hip ratio	9
Gami et al	2013	USA	10,701	Cohort	5.3 y	53	68	Age, hypertension, coronary artery disease, cardiomyopathy or heart failure, ventricular ectopy or NSVT, apnea-hypopnea index (per 10), mean nocturnal O <sub>2</sub> saturation (per 10%), lowest nocturnal O <sub>2</sub> saturation (per 10%)	7
Szentkiralyi et al	2011	Hungary	823	Cohort	66 mo	49	59	Age sex, number of comorbidities, hypertension (presence of antihypertensive medication), duration of renal failure, eGFR, BMI, serum albumin, hemoglobin, cold ischaemic time, delayed graft function, acute rejection, HLA mismatch	9
Shah et al	2009	USA	1,436	Cohort	2.9 y	59	49	Age, race, gender, diabetes, hypertension, atrial fibrillation, hyperlipidemia, body mass index (per 1 unit), tobacco use, alcohol use, obstructive sleep apnea (AHI $\geq$ 5)	8
Sahlin et al	2008	Sweden	132	Cohort	10 y	63	82	Obstructive sleep apnea, central sleep apnea, sex, smoking status, hypertension, diabetes mellitus, atrial fibrillation, age increase in 8 y, body mass index increase in 4, Mini-Mental State Examination score increase in 8 U, Barthel index of activities of daily living increase in 7 U	9
Yaggi et al	2005	USA	1,022	Cohort	3.4 y	-	-	Age, male sex, race, body-mass index, current smoker, current consumption of alcohol, diabetes mellitus, atrial fibrillation, hyperlipidemia, hypertension, obstructive sleep apnea syndrome	8
Gami et al	2005	USA	112	Observational	-	-	-	Time of day (midnight-5:59AM, 6AM-11:59AM, noon-5:59PM, 6PM-11:59PM)	9
Tiwari et al	2019	USA	4,014	Cohort	6.1 y	63	48	Age, gender, race, cause ESRD, living vs. deceased donor, prior transplant, year of transplant, induction immunosuppressant, HLA mismatch, duration of pre-Tx OSA diagnosis, donor age, PR,	9

								duration of pre-Tx dialysis, BMI at transplant, diabetes,	
Butler et al	2019	USA	5,712	Cohort	11 y	-	-	Age, gender, body mass index, race, smoking status, AHI, hypertension, diabetes, coronary heart disease, stroke, heart failure	9
Fan et al	2019	China	804	Cohort	1 y	58	83	Age, sex, body mass index, hypertension, diabetes mellitus, clinical presentation (acute myocardial infarction vs unstable angina), PCI procedure, minimum SaO <sub>2</sub> , MACCE (ischemia-driven revascularization, hospitalization for unstable angina), all repeat vascularization, composite of all events,	8
Shantha et al	2018	USA	548	Cohort	77 mo	65	61	Age, sex, obesity, atrial fibrillation diagnosis, OSA severity, presence of typical LBBB, QRS complex duration >150 ms, BiV pacing >90%, CSA diagnosis	9
Lee et al	2013	South Korea	2,240	Cohort	61.4 mo	-	-	Age, sex, body mass index, diabetes, hypertension, cardiovascular diseases, and previous history of stroke, treatment	9
Yeboah et al	2011	USA	5,338	Cohort	7.5 y	-	-	age, gender, race/ethnicity, BMI, smoking, diabetes mellitus, total cholesterol, HDL, triglycerides, systolic BP, current alcohol use, benzodiazepine use, BP medications and statin use	9
Anandam et al	2013	USA	669	Cohort	79 mo	-	-	Hypertension, current smoking, previous heart disease, CPAP-treated OSA, MAD-treated OSA, untreated OSA	9
Marshall et al	2008	Australia	380	Cohort	13.4 y	-	-	Gender, age, mean arterial pressure, high density lipoprotein cholesterol, total cholesterol, diabetes, angina, smoking categories, body mass categories, sleep apnea	9
Choi et al	2017	South Korea	4,225	Cohort	18 years	49	71	Age, gender, BMI, hypertension, diabetes	9
Korostovtseva et al	2011	Russia	234	Cohort	46 mo	52	61	AHI 5-14.9 per hour, AHR 12-29.9 per house, AHI ≥30 per hour, sex, age, BMI, coronary heart disease, duration of hypertension, glucose metabolism impairment, family history, alcohol use, smoking, physical activity	9
Wang et al	2007	Canada	218	Cohort	2.9 ± 2.2 years	-	-	Untreated OSA, LVEF, NYHA functional class, age	9
Young et al	2008	USA	1,522	Cohort	18 y	48	55	Age, sex, hypertension (BP ≥ 140 systolic or ≥ 90 diastolic or use of antihypertensive	9

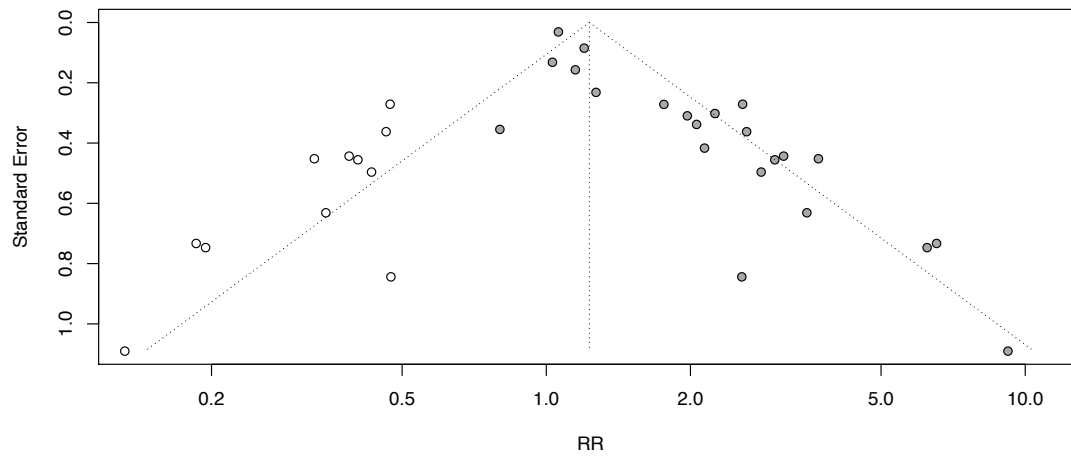
								medication), self-reported diagnosis of diabetes, coronary artery disease, cardiovascular disease, heart failure, myocardial infarction, cardiac surgery, stroke	
Martinez-garcia et al	2012	Spain	939	Cohort	69 mo	-	-	OSA group, age, sex, type of sleep study, sleep clinic, BMI, diabetes mellitus, smoking habit, ESS, dyslipidemia, CVEs, AHT	9
Murajo-murro et al	2013	Finland	405	Cohort	15 y mo	-	-	Age, BMI, smoking	9
Uchôa et al	2015	Brazil	67	Cohort	4.5 y	57	75	Age, male sex, waist circumference, statins, ACEI/ARB, LV ejection fraction, OSA	9

### Supplemental Table 3: Characteristics of studies included in the meta-analysis

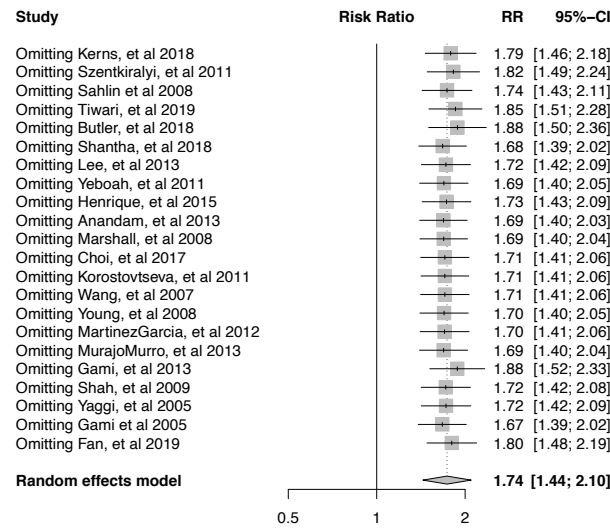
Abbreviations: USA: United States of America; AHI: Apnea-Hypoxia Index; OSA: Obstructive Sleep Apnea; BMI: Body Mass Index; ACEI/ARB: Angiotensin Converting Enzyme/Angiotensin Receptor Blocker; eGFR: Estimated Glomerular Filtration Rate; BP: Blood Pressure; LV: Left Ventricular.



**Supplemental Figure 1: Funnel plot for the 22 studies included in the meta-analysis**



**Supplemental Figure 2: Funnel plot after trim and fill methods**



**Supplemental Figure 3:** Influence sensitivity analyses (leave-One-Out method)