CANADIAN STROKE BEST PRACTICE RECOMMENDATIONS

Rehabilitation, Recovery and Community Participation Following Stroke

Part Three: *Optimizing Activity and Community Participation following Stroke*

Evidence Tables

Post-Stroke Sleep Disorders-Sleep Apnea

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Stroke Rehabilitation and Recovery Writing Group

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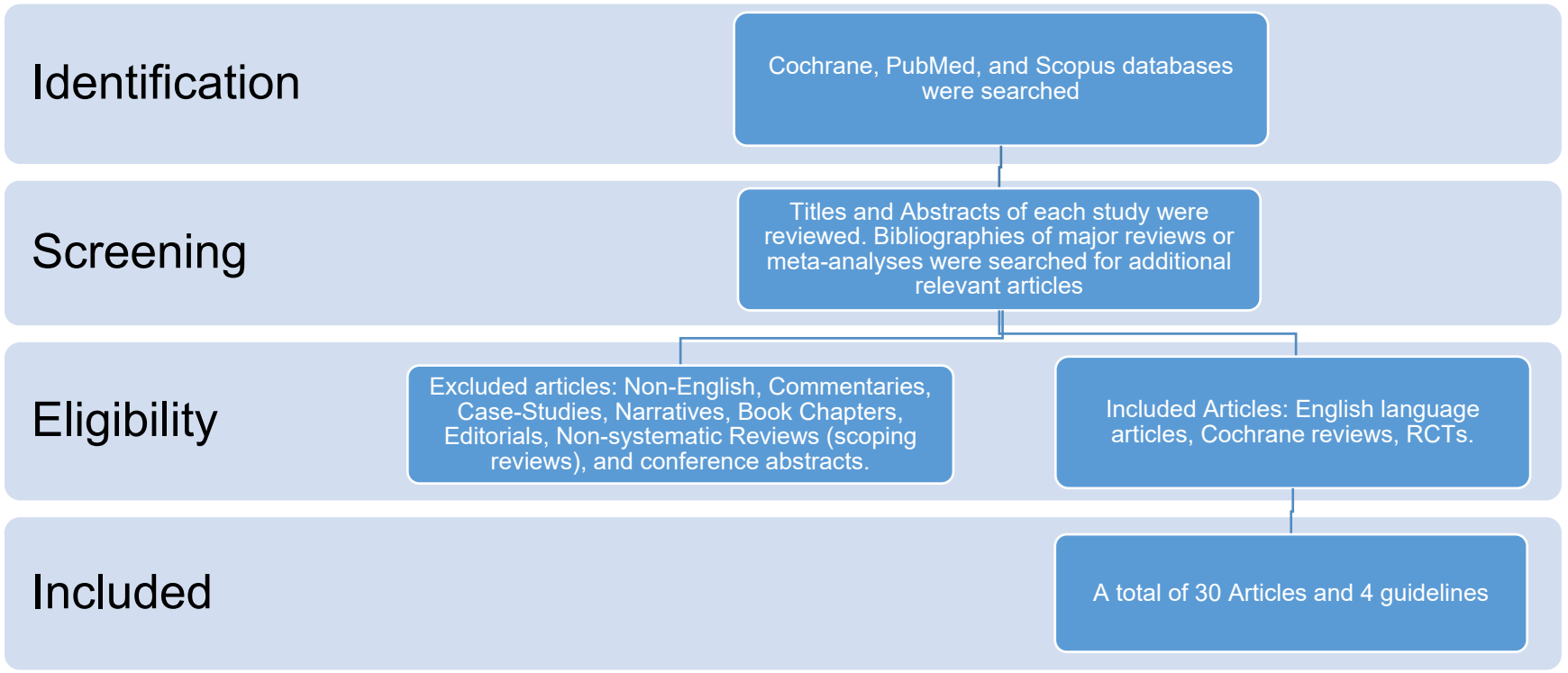
Search Strategy



Cochrane, PubMed and Scopus databases were searched using the terms “stroke” and “sleep apnea” OR “sleep apnoea” OR “insomnia”. The title and abstract of each article was reviewed for relevance. Bibliographies were reviewed to find additional relevant articles. Articles were excluded if they were: non-English, commentaries, case-studies, narrative, book chapters, editorials, non-systematic review, or conference abstracts. Additional searches for relevant best practice guidelines were completed and included in a separate section of the review. A total of 30 articles and 4 guidelines were included and were separated into categories designed to answer specific questions.

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Published Guidelines

Guideline	Recommendations
National Clinical Guideline for Stroke for the UK and Ireland. London: Intercollegiate Stroke Working Party; 2023 May 4. **Available at:** www.strokeguideline.org. **(selected)**	5.15 Recommendation People with stroke or TIA should be screened for obstructive sleep apnoea with a valid clinical screening tool. People who screen positive who are suspected of having sleep apnoea should be referred for specialist respiratory/sleep medicine assessment. [2016] (Consensus recommendation)
Clinical Guidelines for Stroke Management 2022. Melbourne (Australia): National Stroke Foundation. Section 6. Managing complications	Consensus-based recommendations • Therapy for stroke survivors with fatigue should be organised for periods of the day when they are most alert. • Stroke survivors and their families/carers should be provided with information, education and strategies to assist in managing fatigue. • Potential modifying factors for fatigue should be considered, including avoiding sedating drugs and alcohol, and screening for sleep-related breathing disorders and depression. • While there is insufficient evidence to guide practice, possible interventions could include cognitive behavioural therapy (focusing on fatigue and sleep with advice on regular exercise), exercise and improving sleep hygiene.
Kleindorfer DO, Towfighi A, Chaturvedi S, Cockroft KM, Gutierrez J, Lombardi-Hill D et al. **2021 Guideline for the Prevention of Stroke in Patients with Stroke and Transient Ischemic Attack: A Guideline from the American Heart Association/American Stroke Association.** ***Stroke* 2021; 52: e364-e467.**	1. In patients with an ischemic stroke or TIA and OSA, treatment with positive airway pressure (eg, continuous positive airway pressure [CPAP]) can be beneficial for improved sleep apnea, BP, sleepiness, and other apnea related outcomes. 2. In patients with an ischemic stroke or TIA, an evaluation for OSA may be considered for diagnosing sleep apnea
Winstein CJ, Stein J, Arena R, Bates B, Cherney LR, Cramer SC et al; on behalf of the American Heart Association Stroke Council, Council on Cardiovascular and Stroke Nursing, Council on Clinical	None

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Guideline	Recommendations
Cardiology, and C ouncil on Quality of Care and Outcomes Research. **Guidelines for adult stroke rehabilitation and recovery: a guideline for healthcare professionals from the American Heart Association/American Stroke Association.** ***Stroke* 2016;47:e98–e169**	

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Evidence Tables

Association between Risk of Stroke and Sleep Apnea

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Risk of Incident Stroke					
Li et al. 2014 **China** **Systematic review & meta-analysis**	NA	10 prospective cohort studies including community-dwelling, population-based participants without a history of stroke. Sample sizes ranged from 408-5,338.	The independent association between obstructive sleep apnea (OBA) and stroke was explored. Sleep apnea was assessed using polysomnography (n=8) and self-report (n=2)	**Primary outcome:** Incident stroke	Follow-up periods ranged from 3.4-10 years. OSA was a significant, independent predictor of fatal/non-fatal stroke (RR=2.10, 95% CI 1.50-2.93)
Marshall et al. 2014 **Australia** **Prospective study**	NA	400 participants, aged 40-65 years, included in the Busselton Health Study who had responded to a mailed sleep disorder questionnaire and subsequently undergone home-monitoring in 1990 to identify the presence of obstructive sleep apnea (OSA).	Associations between mortality and CVDs and mild and moderate/severe sleep apnea, quantified by the respiratory disturbance index (RDI) were explored, controlling for other known risk factors (age, BMI smoking status, ETOH use, diabetes, blood pressure, medical history). RDIs were defined as oxygen desaturations ≥ 3% from the preceding baseline level that were accompanied by either (a) an increased heart rate ≥ 10 beats/min and/or (b) a burst of snoring associated with commencement and termination of the desaturation event (i.e., an audible apnea).	**Primary outcome:** Incidence of cancer, incident stroke, all-cause mortality and CVD	Follow-up data were available for 393 participants without history of stroke. Mild and moderate/severe sleep apnea was present in 4.6% and 20.6% of participants, respectively. There were 77 deaths, 31 strokes (7.9%) and 103 CVD events (26.2%), representing 7358 person years of observation. In fully adjusted analysis, mild sleep apnea was not an independent predictor of incident stroke (HR=1.0, 95% CI 0.39-2.7), although moderate/severe sleep apnea was associated with significantly increased risk (HR=3.7, 95% CI 1.2-11.8). Moderate/severe sleep apnea was also an independent predictor of all-cause mortality (HR=4.2, 95% CI 1.9-9.2), cancer mortality (HR=3.4, 95% 1.1-10.2), cancer incidence (HR=2.5, 95% CI 1.2-5.0) and non-skin cancer incidence (HR=2.9, 95% CI 1.4-6.1)

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Redline et al. 2010 **US** **Prospective study**	N/A	5,422 participants (45% men) from the Sleep Heart Health Study (SHHS), ≥40 years, without history of stroke who were not being treated for sleep apnea and resided in the community.	Participants completed polysomnography at baseline and a survey regarding sleep apnea diagnosis and treatment at 3 and 5 year follow-ups. Sleep apnea was defined as using the obstructive apneas/-hypopnea index (OAHI). The independent contribution of sleep apnea and incident stroke was explored. Covariates included age, BMI, smoking status, medications, diabetes, and race.	**Primary outcome:** Incident stroke	Participants were followed for a median of 8.7 years. During the study period, there were 193 incident ischemic strokes. The unadjusted odds of stroke were reported to be significantly increased for men (OR= 2.26, 95% CI 1.45-3.52) and women (OR= 1.65, 95% CI 1.45-3.52) with sleep apnea (OAHI>15), compared to those without. For participants in the most severe sleep apnea quartile IV (OAHI >19) the adjusted hazard ratio for developing incident ischemic stroke was 2.86 (95% CI 1.1 to 7.4, p=0.016) for men and 1.21 (95% CI 0.7 to 2.2, p>0.05) for women. For men with scores of 5-25, each one-unit increase in OAHI increased the risk of stroke by 6%. The risk was increased in women with OAHI scores >25.
Valham et al. 2008 **Sweden** **Prospective Study**	N/A	392 patients (67% men) with coronary artery disease referred for coronary angiography. Patients over the age of 70 were excluded. 92% of those screened were eligible for inclusion.	The association between cardiovascular events and sleep apnea was explored. All participants underwent a baseline sleep study. Sleep apnea was identified when ≥5 apneas/ hypopneas per hour of sleep were recorded based on polysomnography.	**Primary outcome:** Occurrence of stroke, myocardial infarction, and death.	Participants were followed for 10 years. Sleep apnea was recorded in 211 (54%) of the patients at baseline. Stroke occurred in 47 (12%) of patients during follow-up. Participants with sleep apnea were significantly more likely to experience a stroke during the 10-year study period (38% vs 9%, p<0.001) but not myocardial infarction (44% vs 34%, p>0.05) or death (46% vs 34%, p>0.05). For patients with sleep apnea, the risk of stroke was significantly increased (HR=

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					2.89, 95% CI 1.4 to 6.1, *p*<0.01), adjusting for age, body mass index, gender, left ventricular function, coronary artery intervention, diabetes mellitus, hypertension, previous stroke/TIA, atrial fibrillation, and smoking status.
Arzt et al. 2005 **Canada** **Prospective study**	N/A	1475 participants from the Wisconsin Sleep Cohort Study (55% men), aged 30-60 years, recruited from the general population without a history of stroke. Of these, 1136 completed the follow-up assessment. Participants with a history of stroke were excluded from this analysis. **Exclusion criteria:** pregnancy, unstable cardio-pulmonary disease, airway cancer, recent upper airway surgery involving, and those with unusable sleep study physiologic measurements, inadequate sleep periods, and no REM sleep.	Participants completed overnight protocols at baseline and after 4, 8, and 12 years. Protocols included assessment of polysomnography, measurement of blood pressure, serum cholesterol, history of stroke, and history of risk factors for stroke (age, sex, BMI, diabetes, smoking, and alcohol intake). The association between incident stroke and sleep disordered breathing were explored.	**Primary outcome:** Incidence of stroke	Of the 1475 individuals included in the cross-sectional analyses, 22 had a history of stroke. Compared to those with no/mild apnea (<5 events/hour), those with severe apnea (≥20 events/hour) had higher odds of stroke, controlling for age, sex, BMI, alcohol use, and smoking status (OR= 4.33; 95% CI 1.32 to 14.24, p=0.02). The results remained significant after additionally controlling for hypertension and diabetes. In the longitudinal analyses, the incidence of stroke was 1.33 per 1000 person years. Compared to those with no/mild apnea (<5 events/hour), those with severe apnea (≥20 events/hour) had a higher odd of stroke, controlling for age, sex (OR= 4.48; 95% CI 1.31 to 15.33, p=0.02). Results were not significant after additionally controlling for BMI (OR= 3.08, 95% CI 0.74 to 12.81).
Yaggi et al. 2005 **USA** **Prospective study**	NA	1,022 patients ≥50 years referred to a sleep clinic for investigation of sleep-disordered breathing, with no prior history of stroke.	Obstructive sleep apnea (OSA) was diagnosed on the basis of overnight polysomnography. Patients with apnea-hypoxia index (AHI) scores of ≥5 were classified as having OSA. Associations OSA and risk of stroke were explored, controlling for age, sex, race, smoking status, alcohol	**Primary outcome:** Composite outcome of incident stroke (including TIA) and all-cause mortality.	697 patients (68%) had OSA. The mean AHI scores for patients with and without OSA were 35 vs. 2, (p<0.001). The median duration of follow-up was 3.4 years for patients with OSA (3.3 for patients without OSA).

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
			use, BMI, and the presence or absence of diabetes mellitus, hyperlipidemia, atrial fibrillation, and hypertension		Outcome data was available for 842 patients (82%). Records were used to establish vital status of those who were not contacted. There were 88 patients (9%) who died or suffered a stroke during follow-up (22 strokes, 50 deaths). The risk of stroke or death was significantly higher among patients with OSA (adj HR=1.97, 95% CI 1.12-3.48, p<0.01). Increasing AHI scores were associated with increased risk of stroke/death (eg. AHI>36, HR=3.30, 95% CI 1.74-6.26).
Risk of Recurrent Stroke					
Xie et al. 2014 **China** **Systematic review & meta-analysis**	NA	13 hospital-based cohort studies that included patients newly diagnosed with stroke (n=6) or ischemic heart disease (n=7) with a diagnosis of obstructive sleep apnea (OSA), based on the apnea-hypoxia index using results obtained from polysomnography and who were followed for at least 6 months. Sample sizes ranged from 59-392. Mean age ranged from 53-79 years. 33%-98% of patients were male	The relationship between OSA and risk of serious adverse outcomes was explored	**Primary outcome:** Stroke, IHD, all-cause mortality and cardiovascular mortality	The risk of subsequent stroke was increased significantly in patients with OSA with a history of previous stroke (RR=1.80, 95% CI 1.24-2.62). The results of 3 studies included. The risk of subsequent stroke was increased significantly in patients with OSA with a previous history of stroke or IHD (RR=1.94, 95% CI 1.29-2.92). The results of 5 studies included. The risk of all-cause mortality was significantly in patients with OSA and a history of stroke (RR=1.69, 95% CI 1.36-2.12). Results from 6 studies included.
Rola et al. 2008 **Poland**	NA	91 patients with first-ever stroke admitted to a single facility. Mean age was 65 years, 87% male.	All patients underwent 8-hr nocturnal screening for sleep-disordered breathing (SDB) within 7 days of stroke. The Apnea-Hypopnea Index	**Primary outcome:** Recurrent stroke or TIA, case fatality and functional outcome	61 patients (67%) were identified with SDB. There were no significant differences in

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Prospective study		Patients with significant reduction of consciousness, aphasia, history of significant heart failure or dementia were excluded.	(AHI) was used to classify patients with (AHI>5) and without (AHI≥5) SDB. Patients were followed for 24 months.		the proportion of patients with and without SDB in terms of stroke risk factors (hypertension, IHD, diabetes, cardiac arrhythmias, nicotinism, hypercholesterolemia) 37 patients had mild/moderate SDB (AHI<20) and 24 patients had severe SDB (AHI>20). The odds of recurrent stroke were significantly higher among patients with SDB (OR=1.52, 95% CI 1.06-2.14), with no increased risk for case fatality.

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Testing for Post-Stroke Obstructive Sleep Apnea (OSA)

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Boulos et al. 2022 **Canada** **RCT** ***SLEep APnea Screening Using Mobile Ambulatory Recorders After TIA/Stroke (SLEAP SMART)***	CA: ☑ Blinding: Patient ☒ Assessor ☑ ITT: ☑	250 patients who had sustained a stroke or TIA within the past 6 months. Mean age was 67 years, 66% were men. 89% of patients had a stroke as presenting event.	Patients were randomized 1:1 to home sleep apnea testing (HSAT) or standard assessment with in-laboratory polysomnography (iPSG). Patients randomized to HSAT completed their sleep study on average 27.1 days after randomization vs. 94.2 days for patients in the iPSG group.	**Primary outcomes:** Detection of OSA, CPAP prescriptions **Secondary outcomes:** ESS, Functional Outcomes of Sleep Questionnaire (FOSQ), Stroke Impact Scale (SIS), Center for Epidemiological Studies Depression Scale (CES-D), patient experience Assessments were conducted at baseline and 6 months	94 patients completed HSAT and 71 completed iPSG. A significantly greater proportion of patients in the HSAT arm were diagnosed with OSA (48.8% vs 35.2%, risk difference=0.14, 95% CI 0.007–0.265, p=0.04). A significantly greater proportion of patients in the HSAT group were prescribed CPAP 40% vs. 27.2%, risk difference= 0.13, 95% CI 0.004–0.252, p=0.045). There was significantly greater improvement in ESS scores at 6 months in the HSAT group (from 7.0 to 5.4 vs. 7.4 to 6.3, adjusted MD= -1.13, 95% CI −2.17 to −0.09). There were no significant changes from baseline for any of the other secondary outcomes except SIS (activities), whereby there was significantly greater improvement in the HSAT group. A significantly greater proportion of patients in the HSAT group reported a positive experience with their sleep study compared with their usual sleep (89.4% vs. 31.1%, p<0.001). HSAT was less costly and more effective for the detection of OSA.
Saletu et al. 2018 **Austria** **RCT** ***Telemedicine***	NA	33 patients referred to a neurorehabilitation center following stroke occurring within the previous 1-12 months with moderate OSA. Mean age was 63 years,	Patients underwent home sleep apnea testing (HSAT) during their rehabilitation stay. Accuracy was studied by comparing the respiratory event index (REI)/monitoring time (MT) of	**Primary outcome:** Agreement between methods	Data from 25 patients were eligible for comparison of HSAT and PSG. Mean time between the two measurements was 6 days.

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Monitoring of Sleep Apnea in Stroke (HOPES)		58% were men.	HSAT screening with the apnea-hypopnea index (AHI)/total sleep time (TST) obtained during subsequent unattended polysomnography PSG.		The REI detected in the PSG night demonstrated no significant differences to the AHI. The 2 measures were highly correlated (r = .97; p 0< .001) The authors concluded that HSAT, performed during in-hospital services, is a feasible and accurate method to detect OSA.

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Treatment of Post-Stroke Obstructive Sleep Apnea (OSA) for the Prevention of Future Vascular Events

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Sánchez-de-la-Torre et al. 2023 **Spain** **Patient-level meta-analysis**	Trials were generally at low risk of bias, except that none blinded participants to treatment group.	4,186 participants with previous cardiovascular or cerebrovascular events with confirmed moderate to severe OSA treated with CPAP for at least one year. Participants from the SAVE, ISAACC study and RICCADSA trial were included. Mean age was 61.2 years, 82.1% were men. Median AHI was 27 events/hour. Median ESS score was 6.0. 32.5% of participants had cerebrovascular disease.	In each trial, participants were randomized to receive CPAP (n=2,097) or no CPAP (n=2,089).	**Primary outcome:** Recurrent major adverse cardiac and cerebrovascular events (MACCEs) **Secondary outcome:** Individual components of the primary outcome (death from cardiovascular causes, MI, revascularization procedure, hospital admission for heart failure, hospital admission for unstable angina, or hospital admission for TIA).	There was no significant difference between groups in the frequency of the primary outcome (349 [CPAP group] vs. 342 [no CPAP group]; HR=1.01, 95% CI 0.87-1.17). On-treatment analysis adjusted by time-varying and baseline confounding factors using a marginal structural Cox model revealed a significantly decreased risk of the primary outcome with good CPAP adherence (≥4 hours per day; HR= 0.69, 95% CI 95% CI 0.52- 0.92). The risk of individual components of the primary outcome was not reduced significantly in the CPAP group (e.g, stroke HR=0.97, 95% CI 0.71-1.33; TIA HR=1.79, 95% CI 0.86-3.73). Over the study period, mean CPAP adherence was 3.03 hours/day. 38.5% of patients treated had good CPAP adherence.
Sánchez-de-la-Torre et al. 2020 **Spain** **RCT** ***Impact of Sleep Apnea syndrome in the evolution of Acute Coronary syndrome. Effect of intervention with CPAP (ISAACC study)***	CA: ☑ Blinding: Patient ☒ Assessor ☑ ITT: ☒	2,551 patients with acute coronary syndrome, recruited from 15 hospitals with a hospital stay of 24–72 hours who were found to not have excessive daytime sleepiness or were not sleepy (EES score of ≤10). Patients had not been treated previously with CPAP for sleep apnea. Mean age was 60 years, 85% were men.	All patients underwent respiratory polygraphy during the first 24–72 h after admission. Patients with OSA (AHI ≥15 events/hour), were randomized (1:1) to receive CPAP treatment plus usual care (CPAP group) or usual care alone (UC group) for a minimum of one year. A group of patients with ACS but without OSA was also included as a reference group (n=603).	**Primary outcome:** Composite of cardiovascular events (cardiovascular death or non-fatal events [Acute MI, non-fatal stroke, hospital admission for heart failure, and new hospitalisations for unstable angina or TIA]) **Secondary outcomes:** Individual components of the primary outcome	Median duration of follow-up was 3.35 years. The number of patients who completed 1 year of follow-up in each group was 552 (88%) in the CPAP group, 549 (88%) in the UC group, and 511 (86%) in the reference group. Mean time of adherence to CPAP treatment was 2·78 hours/night. The prevalence of the primary outcome was similar in the CPAP and UC groups during follow-up (98 events [16%] vs.108 events [17%]; HR=0·89, 95% CI 0·68–1·17, p=0·40). In subgroup analysis, the

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					risk of the primary outcome was not significantly lower in patients with good adherence to CPAP (≥4 h/night) The prevalence of the primary outcome was similar between patients in the reference group during follow-up (90 events [15%] vs.102 [17%] events; HR=1·01, 95% CI 0·76–1·35, p=0·93). There were no significant differences between groups in the risk of any of the individual components of the primary outcome.
Labarca et al. 2020 **Chile** **Systematic review & meta-analysis**	All trials were at lost risk of bias across all domains assessed, except for lack of blinding of participants.	8 RCTs including 5,817 participants with OSA and who had sustained a major adverse cardiovascular event. Mean age ranged from 52 to 71 years, 72 to 88% were men. 4 studies included nonsleepy participants, 7 included moderately sleepy patients, and none included severely sleepy OSA patients.	Trials compared CPAP with usual care.	**Primary outcome:** Major adverse cardiovascular events (MACE) **Secondary outcomes:** Individual components of the primary outcome including all-cause mortality, cardiovascular mortality, stroke, unstable angina, new-onset atrial fibrillation, MI and heart failure	Mean duration of follow-up ranged from 6 to 84 months. The use of CPAP was not associated with a significantly reduced risk of the primary outcome (RR=0.87, 95% CI 0.7 to 1.10). GRADE: moderate certainty The use of CPAP was not associated with a significantly reduced risk of stroke (RR=0.94, 95% CI 0.71 to 1.26). GRADE: high certainty The use of CPAP was not associated with a significantly reduced risk of CV mortality (RR=0.94, 95% CI 0.62 to 1.43), heart failure (RR=0.92, 95% CI 0.69 to 1.24) or MI (RR=1.04, 95% CI 0.79 to 1.37). GRADE: moderate certainty The use of CPAP was not associated with a significantly reduced risk of unstable angina (low certainty) or atrial fibrillation (low certainty).
Brill et al. 2018 **Switzerland**	Using the Cochrane tool, risk of bias	10 RCTs including 564 persons with sleep disordered breathing (SDB)	Trials compared CPAP with sham CPAP or usual care	**Primary outcomes:** Adherence to CPAP, neurologic improvement	Mean duration of follow-up ranged from 8 nights to 2 years.

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Systematic review & meta-analysis	was generally low or unclear across 6 domains with a high risk of bias among 9 trials for failure to blind patient and/or outcome assessors.	following stroke or TIA. Mean age ranged from 56 to 78 years. Median age ranged from 45 to 88 years. Mean % of women ranged from 24% to 67%. Mean baseline AHI ranged from 11/h to 38.5/events/hour. In 5 trials, treatment was started within 7 days after stroke; in 5 trials, treatment was started 10 to 28 days post stroke/TIA.		(NIHSS and CNS), adverse events, new vascular events, and death.	Dropouts were greater in the CPAP group with a greater number in the early trials. Mean CPAP use was 4.53 hours a night. CPAP was associated with a significant improvement in neurological function (SMD= 0.541, 95% CI 0.026–1.055). In a single trial, CPAP was associated with a significant increase in cardiovascular survival.
Gupta et al. 2018 **India** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor ☒ ITT: ☒	70 patients with first-ever stroke of onset ≥6 weeks to 6 months with OSA and an AHI of > 15 events/hour. Mean age was 53 years, 81% were men.	Patients were randomized to receive nightly CPAP treatment (n=30) or no CPAP (n=40, best medical treatment)	**Primary outcome:** New vascular events **Secondary outcomes:** Functional outcome (Barthel Index [BI], mRS), Epworth Sleepiness Scale (ESS) Score, MMSE, Memory Scale Scores Assessments were conducted at baseline, 3, 6 and 12 months.	At 12-month follow-up, there was one vascular event (TIA) in the CPAP group and 6 events (2 TIAs, 2 cases of angina, 1 nonsymptomatic change in ECG and 1 death) in the non-CPAP group (p=0.23). The average number of hours of CPAP use in the CPAP group was 4.2 h/night and the average percentage of nights CPAP was used was 76%. The percentage of nights CPAP was used for more than 4 hours was 58.9 %. The CPAP efficacy was good, with a mean AHI of 1.6 ± 0.9 events/h during use. At 3, and 6 months, there was no significant difference between groups in mean ESS score. At 12 months, patients in the CPAP group had significantly lower mean scores (3.00 vs. 6.12, p<0.001). There was no significant difference between groups in mean BI scores, Memory Scale scores or MMSE scores between groups at 3, 6 or 12 months. At 6 and 12 months, a significantly greater proportion of patients in the

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					CPAP group had improved their mRS scores by ≥1 point (50% vs. 22.5%, p=0.02 and 53.3% vs. 27.5%, p=0.03, respectively).
McEvoy et al. 2016 **Australia** ***Sleep Apnea Cardiovascular Endpoints (SAVE)***	CA: ☑ Blinding: Patient ☒ Assessor☑ ITT: ☒	2,717 patients, aged 45-75 years from 89 clinical centers in 7 countries, with a previous history of coronary artery disease or cerebrovascular disease, with a diagnosis of moderate-to-severe obstructive sleep apnea (OSA)(desaturation index of ≥12). Mean age was 61 years, 81% were male, 44% and 10% of patients had a history of stroke and TIA, respectively.	Patients were randomly assigned to receive either CPAP therapy plus usual care (n=1,346) or usual care alone (n=1,341). Patients in the CPAP group were provided with an automated positive airway pressure machine, the use of which, and adherence to, was monitored by the core sleep laboratory. All patients received management for cardiovascular risk factors reduction and were given advice on healthful sleep habits and lifestyle changes to minimize OSA. Clinic visits were scheduled for all participants at 1, 3, 6, and 12 months and then annually.	**Primary outcome:** A composite of death from any cardiovascular cause, MI, stroke, or hospitalization for heart failure, acute coronary syndrome, or TIA **Secondary outcomes:** Individual components of the primary outcome, other composites of cardiovascular events, revascularization procedures, new-onset atrial fibrillation, new-onset diabetes, and death from any cause. Other outcomes included symptoms of obstructive sleep apnea, health-related quality of life, and mood	Mean duration of follow-up was 3.7 years. Mean adherence to CPAP treatment during follow-up was 3.3 hours/night. For patients in the CPAP group there was a significant decrease in the apnea-hypoxia index from a mean of 29.0 to 3.7 events/hour. The risk of the primary outcome was not reduced significantly for patients in the CPAP group (17.0% vs. 15.4%, HR=1.10, 95% CI 0.91-1.32, p=0.34). There were no significant differences between groups in the frequency of any of the secondary cardiovascular-related outcomes. 5.0% of patients in the CPAP group experienced a stroke vs. 5.1% in the usual care group (HR=0.97, 95% CI 0.69-1.35, p=0.84). There was a significant difference in the mean change of the Epworth Sleepiness Scale scores from baseline to end of study (-3.1 vs. -0.7, adjusted change= -2.5, 95% CI -2.8 to -2.2, p<0.001), favouring the CPAP group. Patients in the CPAP group also had significantly greater improvements in measures of mood and HR-QoL. The frequency of serious adverse events was similar between groups (37% vs.

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					35%, p=0.27). There were 147 drop-out/withdrawals.
Peker et al. 2016 **Sweden** **RCT** ***Continuous Positive Airway Pressure (CPAP) Treatment in Coronary Artery Disease and Sleep Apnea (RICCADSA)***	CA: ☑ Blinding: Patient ☒ Assessor☑ ITT: ☑	244 patients with coronary artery disease who had undergone PCI or CABG in the previous 6 months and had OSA (API ≥15 events/hour) and without daytime sleepiness (ESS score<10). Mean age was 66 years, 84% were men.	Patients were randomized 1:1 to receive nightly CPAP treatment vs. no CPAP	**Primary outcomes:** Composite of need for repeat revascularization, MI, stroke, or cardiovascular mortality	Median duration of follow-up was 57 months. Mean duration of CPAP use was 2.4 hours/night, There was no significant difference between groups in the risk of the primary outcome (18.1% vs. 22.1%; HR=0.80, 95% CI 0.46–1.41; p= 0.449). Independent predictors of the primary outcome were diabetes (HR=2.05; 95% CI 1.06–3.98) and previous revascularization (HR=3.29; 95% CI 1.77–6.10). CPAP use (yes/no) was not an independent predictor of the primary outcome. Mean CPAP use of ≥4 hours/night vs. <4 hours/night was associated with a significantly reduced risk of the primary outcome (6 vs. 43 events; HR=0.29, 95% CI 0.10–0.86).
Martinez-Garcia et al. 2005 **Spain** **Prospective study**	N/A	51 individuals with ischemic stroke or TIA and severe sleep apnea (≥20 apneas/hypopneas per hour of sleep). Patients with previous CPAP treatment were excluded. 37% of consecutive stroke admissions were included in the study.	Participants underwent respiratory polygraphic evaluation at least 2 months following the onset of stroke. Patients were offered a 1-month trial of Continuous Positive Airway Pressure (CPAP) with automatic titration. Treatment was continued for a total of 18 months for those who could tolerate treatment (n=15; 29%).	**Primary outcome:** New vascular events. Assessments were conducted baseline and at the end of the treatment period.	14 vascular events occurred during the study period, with 13 of these events occurring in participants who could not tolerate CPAP and 1 in patients who used CPAP for the full treatment period (p=0.03, based on a log-rank test adjusted for presence of atrial fibrillation). Participants who could not tolerate CPAP had significantly less hypersomnia (p=0.04), a significantly lower mean AHI (p=0.03) and were significantly more dependent (p=0.01).

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Treatment of Obstructive Sleep Apnea following Stroke to Improve Recovery/Fatigue

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Bravata et al. 2018 **USA** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor ☑ ITT: ☑	252 patients recruited from 5 hospitals within one week of stroke or TIA. Median age was 60 years, 59% were men.	Patients were randomized to receive CPAP (enhanced, n=82 or standard, n=86) or usual care (n=84). The enhanced protocol focused on delivering the patient-tailored behavioral adherence program, and the standard protocol focused on technical issues related to the CPAP equipment. There were 5 in-person contacts and 1 telephone contact over the up to 12-month follow-up in the standard CPAP group and one in-person and 2 telephone contacts during the first week + weekly in-person contacts during the first month + telephone contacts at months 2, 4, 5, 7, 8, 9, 10, and 11, in the enhanced group.	**Primary outcomes:** CPAP adherence, NIHSS and mRS scores and recurrent vascular events	The prevalence of OSA was 74% (standard), 80% (enhanced) and 69% (control). The median duration of follow-up was 360 days (control), 346 days (standard) and 324 days (enhanced). CPAP was used by patients in both CPAP group 50% of nights with an average use per night of 4.3 hours (enhanced) and 3.9 (standard). At the end of follow-up, mean mRS change scores were not significantly difference from baseline between groups. Control: 1.6 to 1.5 (Δ 0.1) Standard CPAP 1.8 to 1.0 (Δ-0.6) Enhanced CPAP 1.9 to 1.4 (Δ-0.3) At the end of follow-up, mean NIHSS change scores were not significantly difference from baseline between groups. Control: 2.4 to 2.0 (Δ -0.5) Standard CPAP 2.2 to 1.6 (Δ-0.8) Enhanced CPAP 2.3 to 1.5 (Δ-0.7) In on treatment analysis, among patients with OSA, increasing CPAP use was associated with greater improvement in NIHSS and mRS scores. There were 11.0 vascular events per 100 person years in the intervention groups (combined) vs. 13.1 in the control group.
Aaronson et al. 2016 **The Netherlands**	CA: ☒ Blinding: Patient ☒ Assessor ☒	36 patients admitted to a neurorehabilitation unit between one- and 16-weeks post stroke with OSA. Mean age was 58	Patients were randomized to receive rehabilitation treatment as usual (control group) or to rehabilitation + CPAP treatment for 4 weeks.	**Primary outcomes:** A battery of neuropsychological tests, assessing vigilance, attention,	3 patients in the CPAP group and 2 in the control group withdrew from the study, and 5 patients were lost to follow-up. Mean CPAP compliance was 2.5 hours

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
RCT	ITT: ☑	years, 61% were men. Mean AHI was 34.2. Mean time since stroke to admission to rehab was 17 days.		memory, working memory, executive functioning, language, visuoperception, psychomotor ability, intelligence, neurological status (CNS, NIHSS), functional status (mobility and self-care components of the Utrecht Scale for Evaluation of Rehabilitation [USER[) **Secondary outcomes:** Sleepiness (Stanford Sleepiness Scale), fatigue (Checklist Individual Strength), anxiety and depression (Hospital Anxiety and Depression Scale), and subjective sleep quality (Sleep Quality Scale) Assessments were conducted at baseline, end of treatment and at 2-month follow-up.	per night. At the end of 4 weeks, there was significantly greater improvement in 2 domains of cognitive outcomes in the CPAP group, executive function ($p<0.01$) and attention ($p=0.05$). At the end of 4 weeks and at the end of follow-up, there were no significant differences between groups in mean change scores for CNS or NIHSS scores. At the end of 4 weeks, there was no significant difference in mean change scores between groups for or USER scores. There were no significant differences between group in the mean change scores from baseline to 4 weeks, or from baseline to follow-up for any of the secondary outcomes.
Khot et al. 2016 **MI** **RCT**	CA: ☑ Blinding: Patient ☑ Assessor☑ ITT: ☑	40 patients admitted to an inpatient rehabilitation unit following stroke. Mean age was 56 years, 55% were men. Patients were not screened for the presence of OSA. Median NIHSS score was 6.5. 71% patients had evidence of sleep apnea.	In addition to rehabilitation therapies, patients were randomized to receive CPAP or no CPAP After discharge, all enrolled patients were referred to a sleep medicine clinic for a comprehensive evaluation, although only 14 patients attended.	**Primary outcome:** FIM change at 28 days	Median duration of CPAP use was 14 days. 10 patients withdrew from the study. Mean time from stroke onset to treatment was 10 days. There was no significant difference between groups in mean total FIM score change (34 vs. 26, $p=0.25$). There was no significant difference

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					between groups in mean motor FIM score change (26 vs. 23, p=0.24), but there was significantly greater improvement in cognitive FIM (6 vs. 2.5, p=0.04).
Brown et al. 2013 **US** **RCT (feasibility)**	CA: ☒ Blinding: Patient ☑ Assessor☑ ITT: ☒	32 patients with acute ischemic stroke and OSA (defined as ≥5 apneas/ hypopneas per hour of sleep, assessed within 7 days of stroke onset). Median age was 61 years. 63% were male. Patients who had previously used CPAP, and those with a mRS score ≤1, or had an unstable medical condition were also excluded. 4% of patients screened for eligibility were included in the trial.	Participants were randomized to receive active Continuous Positive Airflow Pressure (CPAP; n=15) or sham CPAP (n=17) for 3 months. All participants were called at 1, 2, 4, 6, 8, and 10 weeks following treatment initiation to encourage treatment compliance.	**Primary outcome:** The Epworth Sleepiness Scale (ESS), Patient Health Questionnaire-9 (PHQ-9), Fatigue Severity Scale (FSS), modified Rankin Scale (mRS), Barthel Index (BI), and National Institute of Health Stroke Scale (NIHSS). Assessments were conducted baseline and at a 3-month follow-up.	Median self-reported CPAP usage was similar between those in the active and sham treatment groups: Days with usage = 16 vs. 32 (p>0.05), cumulative usage = 53 vs 74 (p>0.05), and mean usage per day = 4.5 vs. 3.5 (p>0.05). Between-group comparisons were not significant for any of the measured outcomes, except for depression symptom severity, where the median PHQ-9 score was significantly higher in the active treatment group (5 vs. 2, p<0.05). Dropouts: Intervention group=7/15, control group=6/17.
Svatikova et al. 2011 **USA** **RCT**	CA: ☒ Blinding: Patient ☒ Assessor☒ ITT: ☒	18 patients admitted to hospital with acute ischemic stroke or probable ischemic stroke with obstructive sleep apnea. Median age was 58 years, 61% men. .	The first phase of the study involved two consecutive nights with in-hospital sleep studies in which participants were randomized to therapeutic pillow use on the first (n=9) or second night (n=9) and standard positioning on the other night. In the second phase, participants were randomized to use a therapeutic pillow (a SONA pillow®; n=9) or standard positioning (n=9) for 3 months, beginning immediately following phase one.	**Phase one:** Number of apneas/ hypopneas per hour of sleep (Apnea Hypopnea Index; AHI), sleeping time spent supine, oxygen saturation. **Phase two:** modified Rankin Scale (mRS: good outcome=0-1, bad outcome=2-6). **Timing of Assessment:** During each of the 2 in-hospital sleep studies and at a 3-month telephone follow-up.	During the in-hospital sleep study, the therapeutic night was associated with a significant reduction in absolute time spent supine (36%; 95% CI 18% to 55%, p<0.001), a non-significant increase in absolute oxygen saturation (1.2%, p>0.05), and a significant reduction in relative AHI (19.5%; 95% CI 5% to 32%, p=0.01), as compared to the non-therapeutic night (adjusting for period effect). At the 3-month follow-up, 78% (n=7) of participants in the therapeutic group were determined to have a good outcome (mRS=0-1) as compared to 67% (n=6) of those in the standard positioning group.
Parra et al. 2011,	CA: ☒	140 acute ischemic stroke	Participants were randomized to	**Primary outcome**:	No significant between-group differences

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Parra et al. 2015 (5-year follow-up) **Spain** **RCT**	Blinding: Patient ☒ Assessor☒ ITT: ☒	patients <75 years, with predominately obstructive sleep apnea (≥20 apneas/hypopneas per hour of sleep). Mean age was 64 years. Mean BMI was 29. 60% of those who were screened for eligibility and underwent a sleep study were randomized.	receive conservative treatment with nasal continuous positive airway pressure (nCPAP; n=71) or conservative treatment only (n=69) for 2 years. Those who received nCPAP began treatment 3-6 days post stroke onset.	Improvements in Barthel Index (≥1-point increase), the Canadian Scale (increase of ≥0.5 points), the Rankin Scale (≥1-point reduction per category), Short Form 36 (SF-36), mortality, and new cardiovascular events. Assessments were conducted at baseline and at 1, 3, 12, and 24-month post-stroke follow-ups. **5-year outcomes:** Cardiovascular events (stroke, TIA, angina, MI) and mortality	were reported at the 3, 12, or 24 month follow-ups on any of the measured outcomes. At 1 month, participants who received nCPAP were significantly more likely to have improved Rankin Scale (OR=7.8; 95% CI 1.7 to 39.8, p=0.02) and the Canadian Scale (OR=2.8; 95% CI 0.9 to 9.1, p=0.04). The two groups did not differ in terms of cardiovascular mortality rate (0% vs 4.3%, p>0.05) or the 24-month cardiovascular event-free survival rate (87.7% vs 88.4%, p>0.05), although the mean time to cardiovascular event occurrence was significantly longer for patients in the nCPAP group (14.9 vs 7.9 months; p=0.04). **Dropouts:** nCPAP=14/71 (28.2%); control group=0/69 (0%). At 5 years, there were significantly fewer cardiovascular-related deaths in the nCPAP group (0/57 vs. 7/69) and increased cardiovascular survival (100% vs. 89.9%, log rank test, p=0.015). Although there were fewer strokes in the nCPAP group (3 vs. 8), there was no significant difference between groups in cardiovascular event-free survival (89.5% vs. 75.4%, log-rank test p=0.059).
Bravata et al. 2011 **USA** **RCT**	CA: ☒ Blinding: Patient ☒ Assessor☒ ITT: ☑	55 patients recruited from 3 centres with ischemic stroke, NIHSSs score ≥ 2, and age ≥ 50 years. Mean age was 71 years, 67% were men.	Participants were randomized within 72 hours of stroke onset to receive auto-titrating continuous positive airway pressure (CPAP; n=31) or no treatment (n=24) for 30 days. For patients in the intervention group, treatment was	**Primary outcomes:** Sleep apnea prevalence at baseline and the proportion of intervention patients with sleep apnea with acceptable treatment adherence (>3	Of the 24 patients in the no-treatment control group, 15 completed baseline assessment and 18 completed the 30-day assessment. At baseline, 13 (87%) of those tested were found to have obstructive sleep apnea (OSA). At the 30-day assessment, patients in the active

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
		Patients with a previous diagnosis of sleep apnea, respiratory distress requiring mechanical ventilation oxygen dependent chronic obstructive pulmonary disease, pregnancy, intracranial hemorrhage, >72 hours from stroke onset to ED arrival, thrombolysis, and life expectancy <6 months, were excluded. 7% of potentially eligible patients were randomized.	discontinued after 2 nights if there was no evidence of airflow limitation. All participants underwent polysomnography. Sleep apnea was defined as >4 apneas/hypopneas per hour of sleep.	hours/night for 75% of nights). **Secondary outcome:** Change is stroke symptom severity (NIHSS). Assessments were conducted baseline (control group only) and 30 days post-stroke.	and control groups had a similar prevalence of OSA (72% vs 65%, p>0.05). 16 patients were found to be eligible for treatment with CPAP. Acceptable CPAP adherence was observed in 10 patients (62%). Patients in the intervention group were found to have significantly greater median improvement in NIHSS scores, (-3.0 vs -1.0, p=0.03). There was no difference in the numbers of vascular events (TIA, recurrent stroke, MI, hospitalization for CHF or any death) between groups (1 vs.3, p=0.31)
Bravata et al. 2010 **USA** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor☒ ITT: ☑	70 patients recruited from 3 centres, presenting with TIA, ≥ 45 years. Mean age was 67 years, 50% were women. 19% of those screened for eligibility were included in the study.	Participants were randomized to receive auto-titrating continuous positive airway pressure (CPAP; n=45) or no treatment (n=25) for 90 days. For patients in the intervention group, treatment was discontinued after 2 nights if there was no evidence of airflow limitation. All participants underwent polysomnography. Sleep apnea was defined as ≥5 apneas/hypopneas per hour of sleep.	**Primary outcomes:** Acceptable treatment adherence (>3 hours/night for 75% of nights). **Secondary outcome:** 90-day post-TIA recurrent vascular events rate. Assessments were conducted baseline (control group only) and 90 days post-TIA.	Sleep apnea was diagnosed in 57% (12/21) of participants in the control group at baseline and 59% (27/46) of all participants at 90 days post-TIA. 30 patients were found to be eligible for treatment with CPAP. Acceptable CPAP adherence was reported for 40% (n=12) of these patients. Participants in the control group had a non-significantly higher recurrent vascular event rate (12% vs 2%, p>0.05). Among participants with sleep apnea at baseline, the recurrent vascular event rate was highest among participants who did not use CPAP (16%), compared to those with some use (5%) or acceptable adherence (0%); although the differences were not significant (p=0.08).
Ryan et al. 2010 **Canada**	CA: ☑ Blinding:	48 patients admitted to a stroke rehabilitation unit within 3 weeks of stroke	Patients were randomized to a control group and received standard stroke occupational and	**Primary outcomes:** Canadian Neurological scale (CNS), the 6-	There were 4 withdrawals (1 in the control group and 3 in the CPAP group).

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
RCT	Patient ☒ Assessor☑ ITT: ☒	onset with OSA (API ≥15). Mean age was 61 years, 80% were men.	physiotherapy (control group) or an intervention group that also received CPAP for 4 weeks.	minute walk test (6MWT), distance, sustained attention response test (SART), Purdue Pegboard, and the digit or spatial span **Secondary outcomes:** ESS, Stanford Sleepiness scale (SSS), FIM, Chedoke McMaster Stroke assessment (CMSA), neurocognitive function, and Beck depression inventory (BDI)	At 4 weeks, there was significantly greater improvement in total mean CNS scores, and its motor and cognition components in the intervention group. At 4 weeks, there were no significant differences between groups in mean SART, Purdue Pegboard or Digital visual spatial span scores (forward or backward). At 4 weeks, there was significant improvement in distance walked on the 6MWT in the CPAP group, but not in the control group with no significant difference between groups. There was significant improvement in mean FIM scores in both groups with no significant difference between groups. There was significantly greater improvement in mean FIM motor scores in the CPAP group (p=0.05), but no difference in mean FIM cognition scores. Mean ESS and SSS scores were significantly lower in the CPAP group. BDI scores were not reported. There was significantly greater improvement in the mean leg score of the CMSA in the CPAP group.
Hsu et al. 2006 **UK** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor☑ ITT: ☑	30 ischemic stroke patients with severe sleep apnea (≥30 apneas/hypopneas per hour of sleep). Median age was 73 years, 67% were men. 4.5% of patients screened were randomized.	Participants were randomized 21-25 days post-stroke to receive continuous positive airway pressure (CPAP) with Autoset T (n=15) or conservative treatment (n=15) for 8 weeks.	**Primary outcome:** Nottingham Extended Activities of Daily Living Index (EADL). **Secondary outcomes:** EADL subscales, NIHSS, Barthel Index (BI), the Stanford	At 8 weeks, the median total EADL scores of patients in the CPAP and control groups were 18 and 30, respectively (p=0.229). The median EADL sub score for mobility was significantly lower for patients in the CPAP group (3 vs. 6, p=0.048). There were no significant differences between groups for the other subgroups (kitchen,

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
				Sleepiness Scale (SSS), ACE and the Mini Mental State Examination (MMSE), Hospital Anxiety and Depression Scale (HADS), the Short Form 36 (SF-36), and ambulatory blood pressure. Assessments were conducted baseline, post treatment and 6 months.	domestic, leisure). At 6 months, there was no longer a significant difference in median mobility sub scores between groups (4 vs. 6, p=0.053) There were no other significant differences between groups for any of the secondary outcomes at either 8 weeks or 6 months except for mean SF-36 physical summary scores. Patients in the CPAP group had significant higher scores at 8 weeks (30.8 vs. 23.7, p=0.022). Only 7 (50%) patients randomized to receive CPAP used the device for 4 weeks or longer and only 2 participants used the CPAP for a mean of 6 or more hours per night over the 8-week treatment period.
Sandberg et al. 2001 **Sweden** **RCT**	CA: ☑ Blinding: Patient ☒ Assessor☒ ITT: ☒	63 patients consecutively admitted to a stroke rehabilitation unit 2–4 weeks after a stroke, with an AHI ≥15. Mean age was 77 years, 46% were men. 4 patients dropped out after randomization.	Patients were randomized to receive nasal continuous positive airway pressure (nCPAP, n=33) or no nCPAP (control group, n=30) for 4 weeks. Adequate adherence was defined as ≥4hours/day	**Primary outcomes:** Depression (Montgomery-Asberg Depression Rating Scale [MADRS], Barthel Index (BI), delirium and MMSE Assessments were conducted at baseline, days 7 and 28.	Mean nCPAP use was 4.1 hours/day. At baseline, 22/31 patients in the nCPAP group had delirium vs. 24/28 in the control group. At days 7 and 28, the percentage of patients with delirium had decreased in both groups, with no significant difference between groups. At baseline the mean MADRS score was 21.0 in the nCPAP group vs. 20.5 in the control group. At days 7 and 28, there was a mean decrease of -4 and -4.5 points, respectively in the CPAP group with an increase of 2.6 and 1.8 points. The difference in change scores between groups was significant (p=0.04). At baseline the mean MMSE score was 16.6 in the nCPAP group vs. 15.4 in the

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Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
					control group. At days 7 and 28, scores in the nCPAP group had improved by 1.4 and 2.6 points, while in the control group, there was an increase of 0.9 and 2.8. The difference in change scores between groups was not significant. At baseline the mean BI score was 8.5 in the nCPAP group vs. 7.5 in the control group. At days 7 and 28, scores in the nCPAP group had improved by 1.5 and 1.1 points, while in the control group, there was an increase of 1.0 and 1.1. The difference in change scores between groups was not significant.

Treatment of Post-Stroke Insomnia

Study/Type	Quality Rating	Sample Description	Method	Outcomes	Key Findings and Recommendations
Song et al. 2023 **China** **Network meta-analysis**	Trials were generally at low risk of bias in all domains assessed.	23 RCTs including 1,593 participants with post-stroke insomnia. Mean age ranged from 40 to 72 years. Percentage of men ranged from 18 to 70.	Treatment modalities included acupuncture (n=516), herbal therapies (n=192), estazolam (n=563), zopiclone (n=30), dexzopiclone (n=75), alprazolam (n=149), electrical stimulation (n=40) and rTMS (n=128). All trials included an active comparator (e.g., herbal therapy vs. electrical stimulation). Treatment cycles ranged from one to 12 weeks.	**Primary outcome:** Pittsburgh sleep quality index (PSQI) score change	Acupuncture and herbal therapies were associated with significantly greater improvements in PSQI score change compared with estazolam (MD=-2.49, 95% CI -3.63 to -1.31 and MD= − 2.79; 95 % CI-4.9 to − 0.69), respectively. In ranked probabilities, herbal therapy was 1st (SUCRA, 0.797), zopiclone 2nd (SUCRA, 0.772), and acupuncture 3rd (SUCRA, 0.757).

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Abbreviations

AHI: apnea-hypopnea index	CA: concealed Allocation
CABG: coronary artery bypass grafting	CI: confidence Interval
CPAP: continuous positive airway pressure	ESS: Epworth Sleepiness Scale
FIM: Functional Independence Measure	HR: hazard ratio
ITT: Intention to treat	MMSE: Mini Mental State Examination
mRS: modified Rankin scale	N/A: Not Assessed
PCI: percutaneous coronary intervention	OR: Odds Ratio
OSA: obstructive Sleep apnea	RCT: Randomized Controlled Trial
SUCRA: surface under the cumulative ranking curve	rTMS: repetitive transcranial magnetic stimulation

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