Ischemic Stroke More Common in AFib Patients with OSA, but CHA_2DS_2-VASc Score Adequately Captures Risk

Team A: Kersten Bartelt, RN; Karen Wong, MD; Louis Kazaglis, MD; Alex Piff
Team B: Jeff Trinkl, MD; Joe Longo; Joe Deckert, PhD; Josh Tapper
Last updated 16 April 2024 • Check for updates at EpicResearch.org

Key Findings:

- Atrial fibrillation (AFib) patients with obstructive sleep apnea (OSA) have a higher rate of ischemic stroke compared to those without OSA.
- However, the inclusion of OSA in the existing CHA_2DS_2-Vasc stroke risk model does not enhance the model's performance, suggesting that the current factors sufficiently account for the increased risk.

Atrial fibrillation (AFib) and obstructive sleep apnea (OSA) have been independently linked to an elevated risk of ischemic stroke in prior research.[1,2] The relationship between OSA and AFib is complex. OSA is associated with a higher incidence and severity of AFib, and AFib outcomes seem to improve in patients with treated OSA.[3] However, it remains unclear whether OSA changes the relationship between AFib and stroke.

We analyzed the incidence of ischemic stroke in a cohort of 3.9 million AFib patients, comparing rates between patients with and without OSA. We observed a 27.4% higher rate of ischemic stroke within one year of initial AFib diagnosis in patients with OSA, as illustrated in Figure 1.

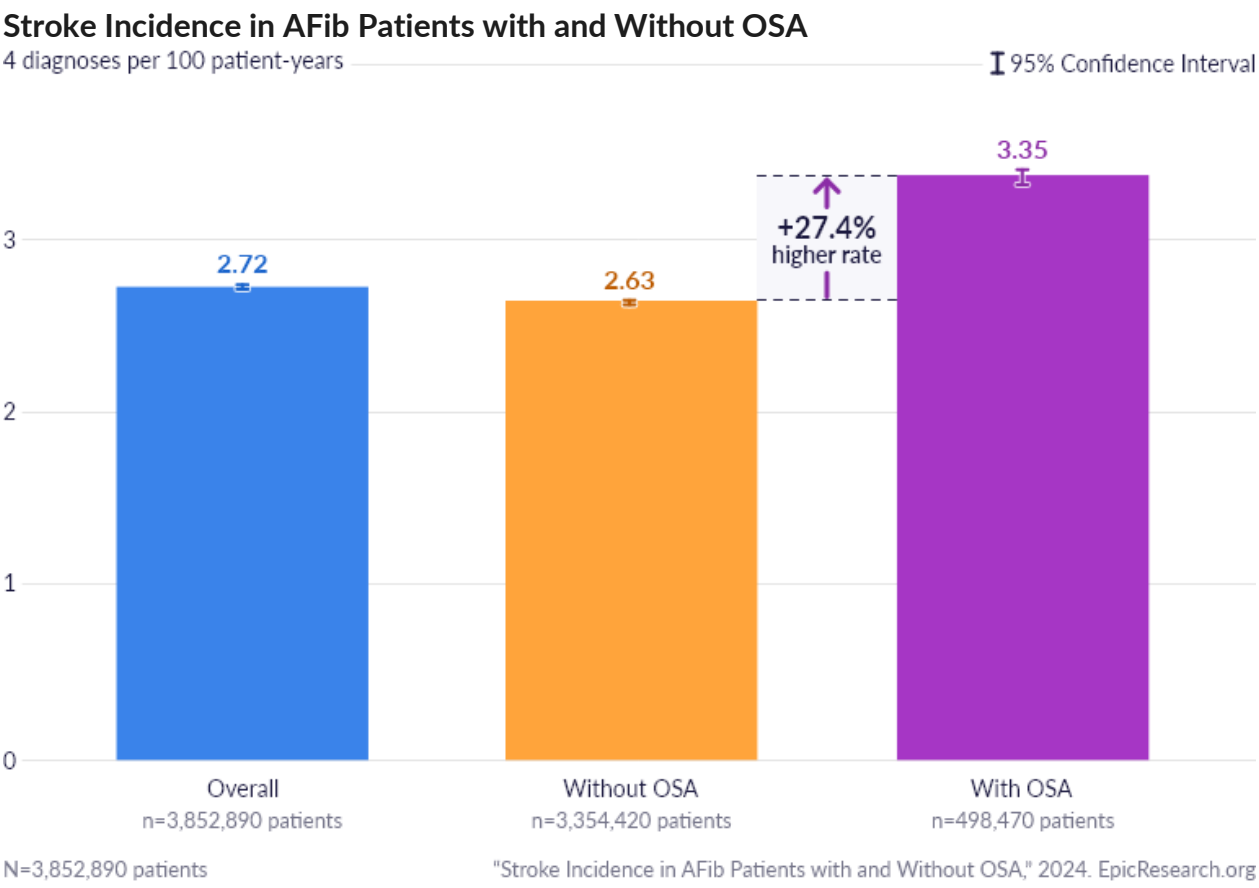

Figure 1. The unadjusted rate of ischemic stroke diagnoses in the year after AFib diagnosis per 100 patient-years by presence of OSA.

In clinical practice, the CHA_2DS_2-VASc tool is widely used to assess the risk of adverse cardiovascular events, including stroke, in AFib patients. The tool assigns a risk score based on patient age, sex, and the presence of various health conditions. A higher score indicates a greater likelihood of adverse cardiovascular outcomes. Some researchers have proposed adding OSA to the CHA_2DS_2-VASc tool as an additional risk factor.[4]

However, stratifying patients by OSA diagnosis at each risk score did not change the relationship between CHA_2DS_2-VASc score and stroke risk. As expected, stroke rates increased as the risk score rose, but there was no statistically significant difference in stroke rates for patients with and without OSA at each risk score level, as shown in Figure 2.

To evaluate the value of incorporating OSA as a risk factor for stroke, we added one point to a patient's CHA_2DS_2-VASc score when OSA was present. This is in line with currently proposed methods.[5] Doing so, however, did not increase the model's accuracy. This suggests that while ischemic stroke is more common among AFib patients with OSA compared to those without OSA, the existing CHA_2DS_2-VASc score components adequately capture this risk.

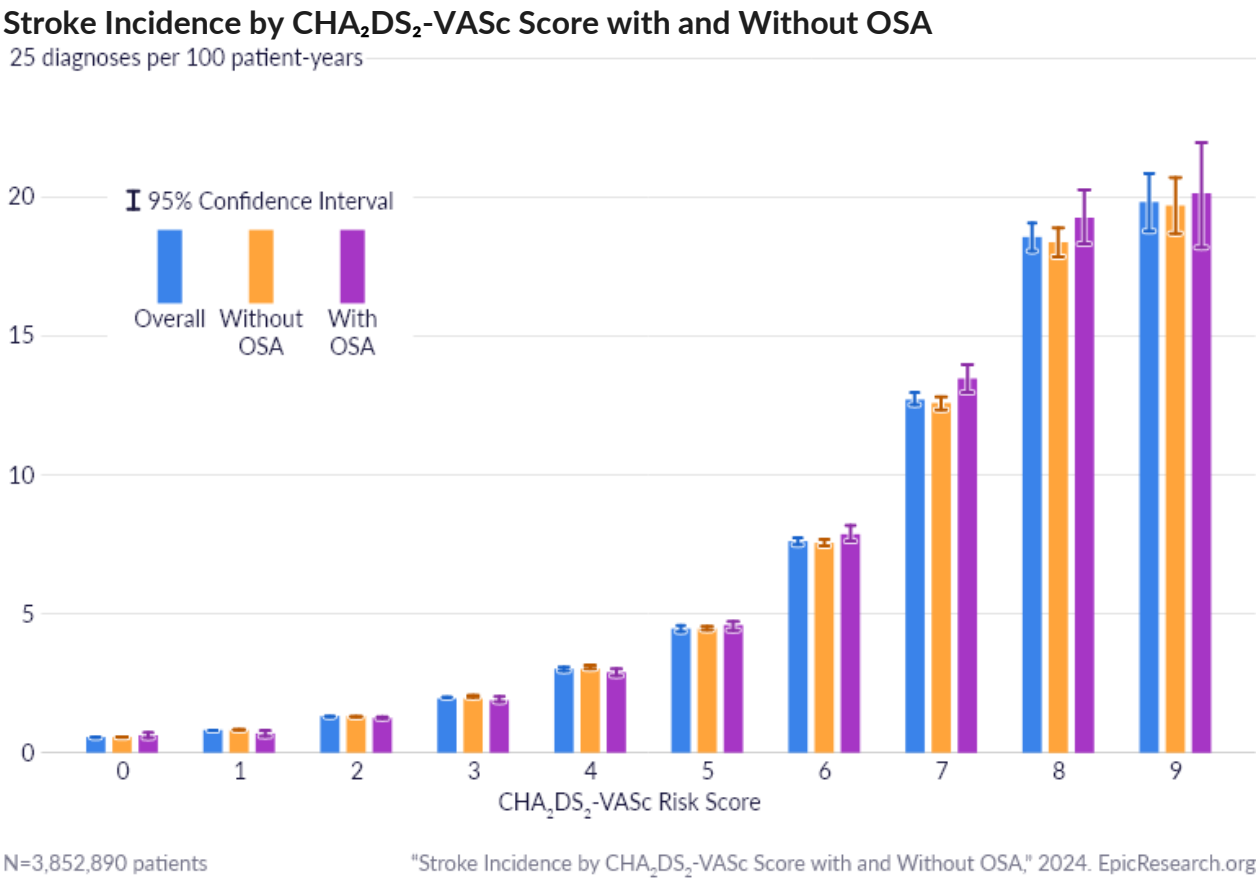

Figure 2. The rate of ischemic stroke diagnoses per 100 patient-years by CHA_2DS_2-VASc risk score and presence of OSA.

These data come from Cosmos, a dataset created in collaboration with a community of Epic health systems representing more than 243 million patient records from 1,400 hospitals and more than 32,500 clinics from all 50 states and Lebanon. This study was completed by two teams that worked independently, each composed of a clinician and research scientists. The two teams came to similar conclusions. Graphics by Aishwarya Shettigar.

References

1. Marin JM, Carrizo SJ, Vicente E, Agusti AG. Long-term cardiovascular outcomes in men with obstructive sleep apnoea-hypopnoea with or without treatment with continuous positive airway pressure: an observational study. *Lancet.* 2005;365(9464):1046-1053. doi:10.1016/S0140-6736(05)71141-7
2. Wolf PA, Abbott RD, Kannel WB. Atrial fibrillation as an independent risk factor for stroke: the Framingham Study. Stroke. 1991;22(8):983-988. doi:10.1161/01.str.22.8.983
3. Marulanda-Londoño E, Chaturvedi S. The Interplay between Obstructive Sleep Apnea and Atrial Fibrillation. Front Neurol. 2017 Dec 11;8:668. doi: 10.3389/fneur.2017.00668. PMID: 29312113; PMCID: PMC5732262.
4. Goudis C, Daios S, Korantzopoulos P, Liu T. Should we incorporate obstructive sleep apnea in CHA2DS2-VASc score?. Sleep Breath. 2021;25(4):2099-2101. doi:10.1007/s11325-021-02305-3
5. Yazdan-Ashoori P, Baranchuk A. Obstructive sleep apnea may increase the risk of stroke in AF patients: refining the CHADS2 score. Int J Cardiol. 2011;146(2):131-133. doi:10.1016/j.ijcard.2010.10.104

Data Definitions

Term	Definition
Study period	Sleep study population 2/2004 to 1/2024 Ischemic stroke incidence population 1/2017 to 9/2023
Study population	General Patients 18 or older. Sleep study Excluded patients with either of the following: • An **obstructive sleep apnea** diagnosis prior to the **sleep study** or the **atrial fibrillation** diagnosis • An **atrial fibrillation** diagnosis after their **sleep study** Ischemic stroke incidence Patients were required to have an initial diagnosis of **atrial fibrillation** within the **study period**.
Atrial fibrillation (AFib)	A diagnosis with ICD-10-CM code I48.0*, I48.1*, I48.2*, or I48.91.
Obstructive sleep apnea (OSA)	A diagnosis with ICD-10-CM code G47.33.
Sleep study	A procedure with CPT code 95806, 95807, 95810, 95811, 95800, or 95801 or HCPCS code G0398, G0399, or G0400.
Ischemic stroke	A diagnosis with ICD-10-CM code I63.*.

Patient-years	Ischemic stroke incidence
	From date of **atrial fibrillation** diagnosis to:
	• **Ischemic stroke** diagnosis
	• Date of death
	• Date of oral anticoagulant prescription
	  ○ Dabigatran
	  ○ Rivaroxaban
	  ○ Apixaban
	  ○ Edoxaban
	  ○ Warfarin
	• Date of last known "Outpatient," "Inpatient," or "Admission" encounter in **study period**
	• End of study

CHA_2DS_2-VASc score	Calculated at time of **AFib** diagnosis as follows: Congestive heart failure adds 1 point Hypertension adds 1 point Age > 75 adds 2 points Measured at time of **AFib** diagnosis Age 65-74 adds 1 point Measured at time of **AFib** diagnosis Diabetes mellitus adds 1 point Stroke/TIA/thrombo-embolism adds 2 points Vascular disease adds 1 point Female sex adds 1 point

	https://acforum-excellence.org/Resource-Center/resource_files/-2017-04-07-075205.pdf
Congestive heart failure	A diagnosis with ICD-10-CM code I50.*.
Hypertension	A diagnosis with ICD-10-CM code I10.*, I11.*, I12.*, I13.*, I14.*, or I15.*.
Diabetes mellitus	A diagnosis with ICD-10-CM code E08.*, E09.*, E10.*, E11.*, or E13.*.
Stroke/TIA/thrombo-embolism	A diagnosis with ICD-10-CM code I63.*, G46.*, G45.9, or I82.*.
Vascular disease	A diagnosis with ICD-10-CM code I20.*, I21.*, I22.*, I23.*, I24.*, I25.*, I70.0*, I70.1*, I70.2*, I70.3*, or I70.92.

Table 1. Stroke Incidence in AFib Patients with and Without OSA

	Counts	Cases Per 100 Patient-Years	95% CI
Overall	114,331	2.72	(2.7,2.73)
No OSA	97,720	2.63	(2.62,2.65)
OSA	16,611	3.35	(3.3,3.4)

Table 2. Stroke Incidence by CHA_2DS_2-VASc Score with and Without OSA

Score	Overall Counts	OSA Event Counts	No OSA Event Counts	Overall Rate per 100 Patient Years	95% CI	OSA Rate per 100 Patient Years	95% CI	No OSA Rate per 100 Patient Years	95% CI
0	1,450	104	1,346	0.50	(0.47,0.53)	0.52	(0.42,0.62)	0.50	(0.47,0.52)
1	4,380	355	4,025	0.72	(0.7,0.75)	0.63	(0.57,0.7)	0.73	(0.71,0.76)
2	9,542	950	8,592	1.22	(1.2,1.25)	1.19	(1.12,1.27)	1.23	(1.2,1.25)
3	17,009	1,884	15,125	1.92	(1.89,1.95)	1.89	(1.8,1.97)	1.93	(1.9,1.96)
4	23,681	2,851	20,830	3.01	(2.97,3.05)	2.86	(2.76,2.97)	3.03	(2.99,3.07)
5	22,041	3,302	18,739	4.45	(4.38,4.51)	4.51	(4.36,4.66)	4.43	(4.37,4.5)
6	18,010	3,234	14,776	7.57	(7.46,7.69)	7.85	(7.59,8.11)	7.52	(7.4,7.63)
7	11,441	2,360	9,081	12.74	(12.49,12.98)	13.45	(12.94,13.95)	12.56	(12.32,12.81)
8	5,313	1,219	4,094	18.56	(18.05,19.07)	19.26	(18.29,20.23)	18.37	(17.86,18.88)
9	1,464	352	1,112	19.84	(18.8,20.88)	20.11	(18.24,21.99)	19.72	(18.68,20.75)