REVIEW ARTICLE

CONTENTS

New diagnostic tools for obstructive sleep apnea

Jakub Piotr Bundyra, Agata Sochocka, Alicja Sikorska, Julia Parda, Emil Mian, Zuzanna Zapart, Martyna Szepietowska, Nina Nowicka, Oliwia Zuzanna Gańska, Dominika Janik
MEDICAL STUDENT, MEDICAL UNIVERSITY OF WARSAW, WARSAW, POLAND

ABSTRACT

Aim: To evaluate how multi-night home sleep apnea testing and other ambulatory monitoring strategies can complement or, in selected patients, replace single-night in-laboratory polysomnography when diagnosing obstructive sleep apnea, with emphasis on clinical decision-making, diagnostic accuracy, feasibility, and patient experience.

Materials and Methods: PubMed and Scopus were searched for English-language publications from 2015-2025. Selected landmark studies published before 2015, one American Academy of Sleep Medicine guideline and conference abstract were also included.

Current evidence shows substantial night-to-night variability in the apnea-hypopnea index (AHI), driven by sleep position, alcohol use, and sleep-stage distribution. Single-night testing may misclassify a large proportion of mild-to-moderate cases. Modern home testing devices (e.g., peripheral arterial tonometry-based systems, accelerometry, radar, and under-mattress sensors) enable extended monitoring, reduce the first-night effect, and may improve diagnostic precision. Most patients prefer to perform tests at home due to convenience. However, it is worth emphasizing that clear instructions and easily accessible technical support are very important factors for them.

Conclusions: For uncomplicated adults with a high pre-test probability of obstructive sleep apnea, multi-night home testing can be a pragmatic first-line option, especially around diagnostic thresholds. In-laboratory polysomnography remains preferred in patients with significant comorbidities, suspected coexisting sleep disorders, or when home testing is negative, inconclusive, or technically inadequate.

KEY WORDS: obstructive sleep apnea, polysomnography, home sleep apnea testing, telemedicine, apnea-hypopnea index

Wiad Lek. 2026;79(2):433-439. doi: 10.36740/WLek/216754 DOI

INTRODUCTION

Obstructive sleep apnea (OSA) is a common chronic disorder with intermittent hypoxia and sleep fragmentation. It is linked with cardiovascular, metabolic and neurocognitive complications [1, 2]. Despite its high prevalence, many patients remain undiagnosed or start treatment late, partly because in-laboratory testing is limited and costly [3-6].

In-laboratory polysomnography (PSG) is the reference diagnostic test [7, 8]. PSG usually records electroencephalography (EEG), electrooculography (EOG) and electromyography (EMG) plus airflow, respiratory effort, electrocardiography (ECG), oximetry and body position, so it allows sleep staging and standardized event scoring [7, 8]. However, apnea severity can change substantially between nights, so one night may not reflect typical disease burden [9-12]. This matters near diagnostic cut-offs, where an atypical night can lead to underestimation or a false-negative result [9, 10, 12]. In real-world pathways, the time from diagnosis to starting positive airway pressure (PAP) has been reported to be about 2-10 months, which supports the need for scalable alternatives [3]. This is especially relevant in high-risk groups such as patients assessed for bariatric surgery, where OSA prevalence has been estimated at 70-80%. [7] Because OSA is associated with higher postoperative cardiopulmonary complications, timely identification before major surgery is important [13].

AIM

The aim of our literature review is to provide evidence for multiday home monitoring as an alternative to single-day PSG for OSA and its complications. We focus on diagnostic accuracy, feasibility of modern home technologies, and patient experiences.

MATERIALS AND METHODS

A narrative literature review was conducted in PubMed and Scopus for publications from 2015-2025. Search terms combined concepts related to OSA,

night-to-night variability, home diagnostic testing and ambulatory monitoring technologies. Earlier landmark studies were included when they provided foundational evidence. Studies were prioritized if they compared multi-night approaches with laboratory PSG, quantified diagnostic misclassification, or reported patient experience and pathway-level outcomes.

REVIEW AND DISCUSSION

NIGHT-TO-NIGHT VARIABILITY AND RISK OF MISCLASSIFICATION

As shown by Punjabi et al. [9] multi-night recordings show that apnea severity is not a fixed trait. Systematic reviews and large cohorts demonstrate frequent crossing of conventional severity categories across nights, particularly in mild-to-moderate disease [9, 10, 12]. In modelling and real-world datasets, the probability of misclassification based on a single night has been reported in the range of roughly 20-50%, depending on the diagnostic threshold and patient phenotype [9, 12]. Pragmatically, three to four nights often provide a reasonable balance between improved precision and feasibility, with diminishing returns beyond longer monitoring in many scenarios [9, 12, 14].

DRIVERS OF NIGHT-TO-NIGHT VARIABILITY AND EVERYDAY SLEEP CONDITIONS

Laboratory studies may be affected by the first-night effect, as highlighted in the meta-analysis by Roeder et al. [10]. This refers to changes in sleep when a person sleeps in an unfamiliar environment (for example, a sleep laboratory), often with increased arousal and lighter sleep during the first night [10, 11]. It can alter sleep architecture and reduce rapid eye movement sleep, which may lower the measured event rate [10, 11]. Home recordings are usually closer to a patient's typical sleep. They capture usual body position patterns and everyday factors such as supine sleep, alcohol intake, and day-to-day changes in sleep timing and fatigue [9, 11, 15]. For this reason, averaging results from multiple home nights provides a more representative estimate of usual sleep and reduces reliance on a single potentially atypical night [9, 12, 15].

TECHNOLOGIES ENABLING MULTI-NIGHT HOME MONITORING

Conventional portable monitors can provide accurate respiratory signals but may be burdensome for repeated use [4-6, 8]. Newer devices prioritise simplified application and comfort, making multi-night protocols more practical. Validated approaches include peripheral arterial tonometry systems, [16] photoplethysmography-based fingertip or ring devices, [17, 18] mandibular movement sensors, [19] acoustic patches, [20, 21] bio-impedance patches, [22] and contactless under-mattress or radar-based sensors [12, 23]. In appropriately selected patients, these platforms show clinically acceptable agreement with laboratory PSG for obstructive events, while enabling repeated measurements in the home environment [17-25]. Several newer home sleep apnea testing (HSAT) systems use automated (including machine-learning) analysis to detect respiratory events and generate indices that facilitate multi-night monitoring [17, 20, 21]. Examples are summarized in (Table 1).

From a physiological perspective, HSAT platforms differ in how they infer obstructive events. Peripheral arterial tonometry systems (e.g., WatchPAT) analyse changes in the PAT signal (a marker of peripheral vasoconstriction) together with oximetry to capture autonomic arousals and desaturation patterns linked to apneas and hypopneas [15, 16, 24]. Photoplethysmography fingertip or ring wearables extract pulse-wave and saturation features (often combined with actigraphy) and use automated algorithms, including deep learning, to estimate AHI-equivalent indices across multiple nights [17, 18, 25]. Mandibular movement sensors quantify characteristic jaw motion patterns associated with obstructive events, illustrating a mechanosignal-based HSAT approach [19]. Acoustic neck patches record tracheal breathing sounds and vibrations to classify respiratory events and snoring in the home environment [20, 21]. Bio-impedance patches track cyclical thoracic impedance changes as a surrogate of respiratory effort and incorporate body position, enabling repeated unattended recordings [22]. Finally, contactless under-mattress or radar-based sensors capture respiratory-related motion signals without attaching sensors to the patient, which may facilitate longer monitoring when signal quality is adequate [12, 23]. Notably, some newer fingertip- and patch-based systems integrate cloud connectivity with automated scoring, including deep-learning approaches for respiratory event detection and AHI estimation [17, 20, 21]. In high-volume settings, this may support faster triage while preserving clinician oversight for complex or discordant cases [17].

Table 1. Examples of home monitoring technologies suitable for multi-night protocols

Technology	Examples	Typical strengths / caveats
Peripheral arterial tonometry	WatchPAT ONE/300 [16] (PAT signal from a finger probe + oximetry; events inferred from autonomic responses and desaturation patterns)	Comfortable; derives events from autonomic signals; may be less suitable for complex comorbidities.
Photoplethysmography wearables	NightOwl (fingertip PPG) [17] (Pulse-wave/SpO_2 features with automated/AI analysis to estimate an AHI-equivalent index) SleepImage ring (ring PPG) [18] (Pulse-wave/SpO_2 features with algorithm-based analysis and actigraphy-derived sleep surrogates)	Very low burden; scalable to multi-night; relies on automated algorithms and sleep-wake surrogates.
Acoustic neck patch	AcuPebble SA100 [20, 21] (Adhesive neck patch; records tracheal breathing sounds/vibrations with automated scoring)	High usability; automated analysis; validation vs PSG in home settings.
Bio-impedance patches	Wesper system [22] (Bio-impedance patch monitoring thoracic effort-related impedance changes + body position)	Wireless effort signals and position; requires correct patch placement.
Contactless sensors	Under-mattress / radar-based systems [12, 23] (Contactless sensing of respiratory-related motion via under-mattress pressure/ballistocardiography signals or radar-based motion tracking)	Zero-touch, ideal for long-term monitoring; performance depends on signal quality and phenotype

Table 2. Practical triage for selecting HSAT versus PSG in suspected obstructive sleep apnea

Clinical scenario	Preferred test / next step	Rationale and practical notes
Uncomplicated adult; high pre-test probability of moderate-to-severe OSA	HSAT, preferably multi-night (≥2 nights); initiate treatment pathway if diagnostic	Guidelines support home testing for uncomplicated high-risk adults. Multi-night sampling reduces misclassification near decision thresholds [7, 9-13, 31, 32]
Uncomplicated adult; suspected mild disease or borderline severity; symptoms fluctuate	Multi-night home testing; consider PSG if results are discordant with clinical picture	Mild disease is most vulnerable to night-to-night variability. Repeated nights can improve sensitivity and ecological validity [9-12, 15, 31, 32]
Significant cardiopulmonary disease, suspected hypoventilation, neuromuscular weakness, or need for oxygen/ventilation assessment	In-laboratory PSG (add carbon dioxide monitoring when available)	Higher risk of hypoventilation/complex breathing disorders; home testing may underestimate severity.[7]
Suspected coexisting sleep disorders (central sleep apnea, parasomnia, periodic limb movements, narcolepsy) or differential diagnosis needed	In-laboratory PSG	Requires neurophysiology and broader signal set; home testing cannot reliably evaluate many comorbid sleep disorders [7, 8, 13]
HSAT negative, inconclusive, or technically inadequate but clinical suspicion remains high	Proceed to in-laboratory PSG	Guidelines recommend PSG after a negative or inadequate home study in symptomatic patients [7]
Need to accelerate access to therapy (severe symptoms, long waiting lists) after appropriate safety screening	Multi-night home testing with tele-support; fast-track treatment when diagnostic	Home pathways can shorten time to diagnosis and treatment; reserve laboratory capacity for complex cases [5, 6, 30]

PATIENT EXPERIENCE AND SUPPORT NEEDS

Most patients report higher comfort and a more natural sleep environment when testing at home. [26, 27] However, a minority prefer laboratory testing due to reassurance from professional supervision and concerns about device failure or incorrect setup [26-28]. Highly simplified devices and telemedicine-supported pathways can reduce "technostress" and improve acceptability, especially when multi-night protocols allow at least one usable night even if a recording fails [4, 16, 22, 28, 29].

According to Pendharkar et al., [27] stakeholders involved in primary-care OSA pathways emphasized

that clear education, communication and easy access to support are critical when diagnostic and therapeutic steps move beyond specialist sleep laboratories [27].

Similarly, Moffa et al. [16] reported that a telemedicine-based diagnostic service using WatchPAT® ONE was generally well accepted by patients, but highlighted the practical importance of straightforward instructions and accessible technical support for successful home recordings [16].

SYSTEM-LEVEL IMPLICATIONS

Home-based pathways can shorten time to diagnosis and treatment initiation compared with a laboratory-first approach and may reduce initial diagnostic costs [3-6, 30]. Even if multi-night testing collects more data, better classification near decision thresholds may reduce repeat testing and the downstream costs of delayed or missed diagnosis [3-6, 30]. At the health-system level, using validated HSAT for uncomplicated patients can reserve laboratory PSG capacity for more complex cases and help reduce waiting times [3, 7, 27].

In addition, Pendharkar et al., [30] evaluated an alternative care provider clinic model for severe sleep-disordered breathing, supporting the feasibility of non-traditional, pathway-based approaches to improve access while maintaining clinical oversight [30].

HEALTH-SYSTEM IMPACT AND FUTURE DIRECTIONS (AI-ENABLED HSAT)

Multi-night HSAT can help reduce diagnostic bottlenecks by moving uncomplicated assessments from sleep laboratories to home, which may shorten the time from suspected OSA to starting treatment [3, 27, 30]. In real-world pathways, delays from diagnosis to PAP therapy have been reported to be around 2-10 months [3]. In a large retrospective multi-night dataset using wearable PPG, Nygate et al. [31] found that relying on the first night would have missed a proportion of OSA cases and that many patients increased by at least one severity category on later nights [31]. Faster confirmation of clinically relevant OSA may be important in time-sensitive preoperative pathways. OSA is common among candidates for bariatric surgery (reported estimates 70-80%) and is associated with increased postoperative cardiopulmonary complications [7, 13]. Some newer devices combine simplified sensors with automated, cloud-based analysis. For example, Chen et al. [17] validated a system using deep-learning methods to detect respiratory events in the home environment [17]. More automation may reduce manual scoring workload and support scalable telemedicine models, alongside patient education and accessible technical support [16, 27, 30]. AI tools may also help with signal-quality checks, artifact detection and triage to PSG when home results are inconclusive or clinical complexity is high [7]. Future studies should evaluate AI-assisted, multi-night HSAT pathways against single-night strategies for time-to-diagnosis, patient-centred outcomes and health-system efficiency [3, 27, 30].

A multi-night approach treats the diagnostic "gold standard" as getting a representative picture of sleep over time, not just one laboratory night. Laboratory PSG is still essential in complex phenotypes, discordant cases, suspected non-obstructive sleep disorders or when home testing is non-diagnostic [7, 8, 13]. For uncomplicated adults with high pre-test probability, multi-night home monitoring may offer a practical balance between accuracy, access and patient preference [3, 4, 9, 12, 26].

IMPORTANT LIMITATIONS REMAIN

Many home monitoring technologies do not record EEG and instead use sleep-wake surrogates, which can be less accurate in patients with fragmented sleep [8, 18, 24]. In addition, reimbursement and accreditation structures may lag behind technological capability, which can slow the adoption of multi-night protocols despite evidence of efficiency benefits [3-6].

CLINICAL DECISION-MAKING: WHEN TO USE HOME TESTING AND WHEN TO REFER FOR POLYSOMNOGRAPHY

Clinical practice guidelines recommend either PSG or HSAT for diagnosing OSA in uncomplicated adults with an increased risk of moderate-to-severe disease, provided that the home study is technically adequate and interpreted within a clinical evaluation [7]. In this setting, multi-night HSAT (e.g., 2-4 nights) can better reflect everyday sleep, reduce first-night effects and limit night-to-night variability that may shift patients across severity categories [9-12, 14] (Table 2).

PSG remains preferable when the probability of measurement error or alternative diagnoses is higher, including significant cardiopulmonary disease, suspected hypoventilation, neuromuscular weakness, chronic opioid use, prior stroke, severe insomnia, or suspected non-obstructive sleep disorders (e.g., central sleep apnea, parasomnias, periodic limb movement disorder) [7,

8, 13]. Because many home platforms rely on surrogate sleep-wake measures and may underestimate event rates in fragmented sleep, careful phenotyping and follow-up are essential when home results and symptoms do not align [8, 18, 24].

This preference reflects the broader PSG signal set (including EEG-based sleep staging and, when indicated, additional monitoring such as carbon dioxide), which enables differential diagnosis and more robust phenotyping than most HSAT devices. [7, 8, 13] A practical triage approach is summarized in Table 2.

LIMITATIONS OF CURRENT EVIDENCE

Most available data on multi-night strategies are observational, device-validation studies, or pragmatic pathway evaluations. Comparative randomized studies are limited, and protocols vary in the number of nights, sensor types, and scoring algorithms. Future work should standardize multi-night thresholds, clarify which phenotypes benefit most, and evaluate implementation outcomes in routine care.

CONCLUSIONS

For uncomplicated adults at increased risk of moderate-to-severe OSA, HSAT is an appropriate diagnostic option alongside in-laboratory PSG, and multi-night protocols can reduce misclassification near diagnostic thresholds. PSG should remain the preferred test in patients with significant comorbidities or suspected coexisting sleep disorders, and it is indicated when HSAT is negative, inconclusive, or technically inadequate despite persisting clinical suspicion. Implementation should prioritise patient instructions, rapid technical support and telemedicine-enabled pathways to minimize failed studies and reduce delays in treatment initiation.

REFERENCES

1. Benjafield AV, Ayas NT, Eastwood PR, Heinzer R, Ip MSM, Morrell MJ, et al. Estimation of the global prevalence and burden of obstructive sleep apnoea: a literature-based analysis. Lancet Respir Med. 2019;7(8):687-698. doi:10.1016/S2213-2600(19)30198-5. DOI
2. Lal C, Strange C, Bachman D. Neurocognitive impairment in obstructive sleep apnea. Chest. 2012;141(6):1601-1610. doi:10.1378/chest.11-2214. DOI
3. Wickwire EM, Zhang X, Munson SH, Benjafield AV, Sullivan SS, Payombar M, et al. The OSA patient journey: pathways for diagnosis and treatment among commercially insured individuals in the United States. J Clin Sleep Med. 2024;20(4):505–514. doi:10.5664/jcsm.10908. DOI
4. Phua CQ, Jang IJ, Tan KB, Hao Y, Senin SRB, Song PR, et al. Reducing cost and time to diagnosis and treatment of obstructive sleep apnea using ambulatory sleep study: a Singapore sleep centre experience. Sleep Breath. 2021;25(1):281–288. doi:10.1007/s11325-020-02115-z DOI
5. Deutsch PA, Simmons MS, Wallace JM. Cost-effectiveness of split-night polysomnography and home studies in the evaluation of obstructive sleep apnea syndrome. J Clin Sleep Med. 2006;2(2):145–153. doi:10.5664/jcsm.26508 DOI
6. Chai-Coetzer CL, Antic NA, Rowland LS, Reed RL, et al. Primary care vs specialist sleep center management of obstructive sleep apnea and daytime sleepiness and quality of life: a randomized trial. JAMA. 2013;309(10):997–1004. doi:10.1001/jama.2013.1823. DOI
7. Kapur VK, Auckley DH, Chowdhuri S, Kuhlmann DC, Mehra R, Ramar K, Harrod CG. Clinical practice guideline for diagnostic testing for adult obstructive sleep apnea: an American Academy of Sleep Medicine clinical practice guideline. J Clin Sleep Med. 2017;13(3):479–504. doi:10.5664/jcsm.6506. DOI
8. Berry RB, Brooks R, Gamaldo CE, Harding SM, Lloyd RM, Marcus CL, Vaughn BV. The AASM Manual for the Scoring of Sleep and Associated Events: Rules, Terminology and Technical Specifications. Version 2.4. Darien IL: American Academy of Sleep Medicine; 2017. J Clin Sleep Med. 2017 May 15;13(5):665-666. doi: 10.5664/jcsm.657.
9. Punjabi NM, Patil S, Crainiceanu C, Aurora RN. Variability and misclassification of sleep apnea severity based on multi-night testing. Chest. 2020;158(1):365-373. doi:10.1016/j.chest.2020.01.039. DOI
10. Roeder M, Bradicich M, Schwarz EI, Thiel S, et al. Night-to-night variability of respiratory events in obstructive sleep apnoea: a systematic review and meta-analysis. Thorax. 2020;75(12):1095–1102. doi:10.1136/thoraxjnl-2020-214544. DOI
11. Stepnowsky CJ Jr, Orr WC, Davidson TM. Nightly variability of sleep-disordered breathing measured over 3 nights. Otolaryngol Head Neck Surg. 2004;131(6):837-843. doi:10.1016/j.otohns.2004.07.011. DOI
12. Lechat B, Naik G, Reynolds A, Aishah A, et al. Multinight prevalence, variability, and diagnostic misclassification of obstructive sleep apnea. Am J Respir Crit Care Med. 2022;205(5):563-569. doi:10.1164/rccm.202107-17610C. DOI
13. Laratta CR, Ayas NT, Povitz M, Pendharkar SR. Diagnosis and treatment of obstructive sleep apnea in adults. CMAJ. 2017;189(48):E1481-E1488. doi:10.1503/cmaj.170296. DOI
14. Lechat B, Scott H, Manners J, Adams R, Proctor S, Mukherjee S, et al. Multi-night measurement for diagnosis and simplified monitoring of obstructive sleep apnoea. Sleep Med Rev. 2023;72:101843. doi:10.1016/j.smrv.2023.101843. DOI

15. Tschopp S, Wimmer W, Caversaccio M, Borner U, Tschopp K. Night-to-night variability in obstructive sleep apnea using peripheral arterial tonometry: a case for multiple night testing. J Clin Sleep Med. 2021;17(9):1751-1758. doi:10.5664/jcsm.9300. DOI
16. Moffa A, Giorgi L, Nardelli D, Ferro A, et al. A new telemedicine-based sleep service using WatchPAT® ONE for patients with suspected OSA: what does the patient experience?. Sleep Breath 29, 47 (2025). doi:10.1007/s11325-024-03218-7 DOI
17. Chen KW, Tseng CH, Lee HC, Liu WT, Chou KT, Wu HT. Validation of a fingertip home sleep apnea testing system using deep learning AI and a temporal event localization analysis. Sleep. 2025;48(5):zsae317. doi:10.1093/sleep/zsae317. DOI
18. Lu M, Brenzinger L, Rosenblum L, Salanitro M, Fietze I, Glos M, et al. Comparative study of the SleepImage ring device and polysomnography for diagnosing obstructive sleep apnea. Biomed Eng Lett. 2023;13(3):343-352. https://doi.org/10.1007/s13534-023-00304-9.
19. Martinot JB, Cuthbert V, Le-Dong NN, Coumans N, et al. Clinical validation of a mandibular movement signal-based system for the diagnosis of pediatric sleep apnea. Pediatr Pulmonol. 2022;57(8):1904-1913. doi:10.1002/ppul.25320. DOI
20. Devani N, Pramono RXA, Imtiaz SA, Bowyer S, Rodriguez-Villegas E, Mandal S. Accuracy and usability of AcuPebble SA100 for automated diagnosis of obstructive sleep apnoea in the home environment setting: an evaluation study. BMJ Open. 2021;11(12):e046803. doi:10.1136/bmjopen-2020-046803. DOI
21. Sanchez Gomez J, Pramono RXA, Imtiaz SA, Rodriguez-Villegas E, Valido Morales A. Validation of a wearable medical device for automatic diagnosis of OSA against standard PSG. J Clin Med. 2024;13(2):571. https://doi.org/10.3390/jcm13020571
22. Raphelson JR, Ahmed IM, Ancoli-Israel S, Ojile J, Pearson S, Bennett N, et al. Evaluation of a novel device to assess obstructive sleep apnea and body position. J Clin Sleep Med. 2023;19(9):1643-1649. doi:10.5664/jcsm.10644. DOI
23. Edouard P, Campo D, Bartet P, Yang RY, Bruyneel M, Roisman G, Escourrou P. Validation of the Withings Sleep Analyzer, an under-the-mattress device for the detection of moderate–severe sleep apnea syndrome. J Clin Sleep Med. 2021;17(6):1217-1227. doi:10.5664/jcsm.9168. DOI
24. Lyne CJ, Hamilton GS, Turton ARE, Stupar D, Mansfield DR. Validation of a single-use and reusable home sleep apnea test based on peripheral arterial tonometry. J Clin Sleep Med. 2023;19(8):1429-1435. doi:10.5664/jcsm.10568. DOI
25. Walter J, Lee JY, Blake S, Kalluri L, et al. A new wearable diagnostic home sleep testing platform: comparison with available systems and benefits of multinight assessments. J Clin Sleep Med. 2023;19(5):865–872. doi:10.5664/jcsm.10432. DOI
26. Chua AP, Soh ZY, Abd Rahman S, Luo N, Shorey S. Lived experience of patients with sleep apnea: a systematic synthesis of qualitative evidence. Qual Life Res. 2023;32(5):1447-1467. doi:10.1007/s11136-022-03332-7. DOI
27. Pendharkar SR, Blades K, Kelly JE, Tsai WH, et al. Perspectives on primary care management of obstructive sleep apnea: a qualitative study of patients and health care providers. J Clin Sleep Med. 2021;17(1):89-98. doi:10.5664/jcsm.8814. DOI
28. Abma IL, van der Wees PJ, Veer V, Westert GP, Rovers M. Measurement properties of patient-reported outcome measures (PROMs) in adults with obstructive sleep apnea (OSA): a systematic review. Sleep Med Rev. 2016;28:18-31. doi:10.1016/j.smrv.2015.07.006. DOI
29. Taweesedt P, Najeeb H, Surani S. Patient-centered therapy for obstructive sleep apnea: a review. Medicina (Kaunas). 2022;58(10):1338. doi:10.3390/medicina58101338. DOI
30. Pendharkar SR, Tsai WH, Penz ED, Santana MJ, Ip-Buting A, Kelly J, et al. A randomized controlled trial of an alternative care provider clinic for severe sleep-disordered breathing. Ann Am Thorac Soc. 2019;16(12):1558-1566. doi:10.1513/AnnalsATS.201901-087OC. DOI
31. Nygate Y, Wodnicki J, Rusk S, Fernandez C, Hwang D, Watson NF. Evaluating the impact of multi-night home sleep apnea testing for obstructive sleep apnea diagnosis. Sleep. 2025;48(Suppl 1):A297-A298. doi:10.1093/sleep/zsaf090.0683. DOI
32. Lechat B, Loffler KA, Reynolds AC, Naik G, Vakulin A, Jennings G, et al. High night-to-night variability in sleep apnea severity is associated with uncontrolled hypertension. NPJ Digit Med. 2023;6(1):57. doi:10.1038/s41746-023-00801-2. DOI

The Authors used Generative AI only for the purpose to improve language and readability, text formatting. After using this tool, the authors have reviewed and edited the content as needed and accept full responsibility for the substantive content of the publication

CONFLICT OF INTEREST

The Authors declare no conflict of interest

CORRESPONDING AUTHOR

Jakub Piotr Bundyra

Medical student, Medical University of Warsaw,
Warsaw, Poland
e-mail: kubabundyra4@gmail.com

ORCID AND CONTRIBUTIONSHIP
Jakub Piotr Bundyra: 0009-0008-7042-1990 A D E F
Agata Sochocka: 0009-0004-5384-2014 B E
Alicja Sikorska: 0009-0009-6274-6944 D
Julia Parda: 0009-0006-9079-5936 F
Emil Mian: 0009-0006-1538-7190 F
Zuzanna Zapart: 0009-0007-0466-4508 E
Martyna Szepietowska: 0009-0000-2423-4563 E
Nina Nowicka: 0009-0004-1942-0045 B
Oliwia Zuzanna Gańska: 0009-0007-9024-0209 B
Dominika Janik: 0009-0000-8527-7428 B

A – Work concept and design, B – Data collection and analysis, C – Responsibility for statistical analysis, D – Writing the article, E – Critical review, F – Final approval of the article

RECEIVED: 25.11.2025
ACCEPTED: 20.01.2026

CREATIVE COMMONS 4.0