

Patient-Centric Personalized Approach in Sleep Medicine – From Theory to Practice

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A large majority of patients with obstructive sleep apnea (OSA) are currently treated with a device-therapy, such as continuous positive airway pressure (CPAP), mandibular advancement device (MAD), or hypoglossal nerve stimulation (HNS) therapy, or a combination of these and other modalities.¹⁻⁴ In most cases a **one-size-fits-all** approach will be used: CPAP is prescribed as the initial treatment for all patients with moderate to very severe OSA. This editorial provides a critical viewpoint of the strengths and weaknesses of this traditional, “CPAP-therapy-first-for-every-OSA-patient” as a **one-size-fits-all** approach.

The effectiveness of a chosen therapy will be mainly determined by that therapy's ability to decrease the severity of the disease and the adherence to said therapy. The net overall clinical effectiveness can be expressed as the Mean Disease Alleviation (MDA), ranging from 0 to 100 percent.^{5, 6} Data from the literature suggest that MDA group values for CPAP and MAD are similar, being around 50% at one-year follow-up.^{7, 8} This equal effectiveness of MAD and CPAP at the group level can be explained by the greater efficacy of CPAP being offset by inferior patient adherence with CPAP, relative to MAD, potentially explaining the similar health outcomes for both therapies.^{6, 9} Improving adherence to CPAP is obviously a key step in increasing the effectiveness of CPAP, whereas the MDA of MAD can be significantly boosted by precision medicine, standardization of the titration process, and improved patient selection.¹⁰⁻¹⁶

Among others, the results of the SAVE trial were puzzling.¹⁷ In this trial, which included up to 2.717 OSA patients with established cardiovascular disease, the mean duration of CPAP usage was 3.3 hours per night.¹⁷ Moreover, a recent study based on the analysis of 480,000 OSA patients in a French nationwide database who had started CPAP indicated that the overall CPAP termination rates after one, two and three years were 23, 37 and 49 percent, respectively.¹⁸ If half of CPAP users discontinue this therapy after 3 years while the average overnight usage in the continuing CPAP users is around 3.3 hours per night, long-term mean MDA values for CPAP at 3-year follow-up are estimated to be around 20 percent. This leaves four out of five patients ineffectively treated or untreated with the “gold standard” therapy.

This editorial has no ambition to make another non-CPAP therapy the new “gold standard” for the treatment of OSA. On the contrary, the “trial-and-error” approach when defining MAD treatment as the first-line alternative for CPAP has the same limitations. It also seems to confirm what they want us to believe is the current first-line standard therapy for all OSA patients: CPAP.

In **patient-centered care**, which was proclaimed a core health system aim in a 2001 Institute of Medicine report, an individual's specific health needs and desired health outcomes are the driving force behind all health care decisions and quality measurements.¹⁹ **Personalized medicine** warrants the health care providers to design and manage a customized, comprehensive care plan in each individual patient.

There is growing understanding that the endotype, being the underlying etiology, and the phenotype, being the clinical manifestation, in an individual OSA patient are not well described by the apnea/hypopnea-index (AHI).²⁰ The so-called pathophysiological OSA endotypic traits need to be added to the decision-making process in OSA therapy, as these traits influence clinical treatment decisions and allow treatments to be individualized on the basis of the underlying cause of OSA.^{14, 20-22} Using this approach, the MDA could be much higher than 20 or 50 percent in this carefully selected individual. Multimodality management (adding another therapy in order to effectively control OSA) can be an effective strategy when the chosen therapeutic option would eventually lead to a limited effect.²³ Combination therapy for OSA should indeed not be a taboo. If successful, it truly highlights the personalization and adaptability of OSA therapy to suit patient needs and to increase the true clinical effectiveness.^{4, 23}

In conclusion, there is a high need for “change management” in the field of sleep medicine and, more specifically, in the treatment algorithm of OSA. Based on evidence in the literature, the traditional “one-size-fits-all” approach, prescribing CPAP first to all OSA patients, is not only too simplistic, too expensive, not evidence based, etcetera..., it simply cannot be accepted anymore in the era of patient-centered personalized medicine. After all, this traditional approach does not consider the

heterogeneity of the individual OSA patients, reflected by varying risk factors, pathophysiological causes, clinical manifestations, and consequences.²⁴ The only appropriate method of operation is to provide an effective OSA treatment for the individual OSA patient in an “upfront” setting. An increasing armory of endotyping methods and treatment selection criteria exists in order to select the therapeutic option that is most likely to be successful in the individual patient. This approach would allow better prognostication, leading to a precision medicine approach in the field of OSA.²⁴

Time has come to move beyond ‘one-size-fits-all’ and ‘trial-and-error’ in patients with moderate to very severe OSA – please spread the word.

CITATION

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REFERENCES

- Sullivan CE, Issa FG, Berthon-Jones M, Eves L. Reversal of obstructive sleep apnoea by continuous positive airway pressure applied through the nares. *Lancet.* 1981; 1(8225): 862-5.
- Sutherland K, Vanderveken OM, Tsuda H, et al. Oral appliance treatment for obstructive sleep apnea: an update. *J Clin Sleep Med.* 2014; 10(2): 215-27.
- Strollo PJ, Jr., Soose RJ, Maurer JT, et al. Upper-airway stimulation for obstructive sleep apnea. *N Engl J Med.* 2014; 370(2): 139-49.
- Vanderveken OM. Combination therapy for obstructive sleep apnea in order to achieve complete disease alleviation: From taboo to new standard of care? *J Dent Sleep Med.* 2015; 2: 7-8.
- Vanderveken OM, Dieltjens M, Wouters K, De Backer WA, Van de Heyning PH, Braem MJ. Objective measurement of compliance during oral appliance therapy for sleep-disordered breathing. *Thorax.* 2013; 68(1): 91-6.
- Vanderveken OM, Braem MJ, Dieltjens M, De Backer WA, Van de Heyning PH. Objective measurement of the therapeutic effectiveness of continuous positive airway pressure versus oral appliance therapy for the treatment of obstructive sleep apnea. *Am. J. Respir. Crit.* 2013; 188(9): 1162.
- Grote L, Hedner J, Grunstein R, Kraiczi H. Therapy with nCPAP: incomplete elimination of Sleep Related Breathing Disorder. *Eur. Clin. Respir. J.* 2000; 16(5): 921-7.
- Dieltjens M, Braem MJ, Vroegop AV, et al. Objectively measured vs self-reported compliance during oral appliance therapy for sleep-disordered breathing. *Chest.* 2013; 144(5): 1495-502.
- Phillips CL, Grunstein RR, Darendeliler MA, et al. Health outcomes of continuous positive airway pressure versus oral appliance treatment for obstructive sleep apnea: a randomized controlled trial. *Am. J. Respir. Crit.* 2013; 187(8): 879-87.
- Dieltjens M, Vanderveken OM, Heyning PH, Braem MJ. Current opinions and clinical practice in the titration of oral appliances in the treatment of sleep-disordered breathing. *Sleep Med. Rev.* 2012; 16(2): 177-85.
- Op de Beeck S, Dieltjens M, Verbruggen AE, et al. Phenotypic labelling using drug-induced sleep endoscopy improves patient selection for mandibular advancement device outcome: A prospective study. *J Clin Sleep Med.* 2019; 15(8): 1089-99.
- Vanderveken OM. Drug-induced sleep endoscopy (DISE) for non-CPAP treatment selection in patients with sleep-disordered

- breathing. *Sleep Breath.* 2013; 17(1): 13-4.
- Charkhandeh S, Kuhns D, Kim S. A fully digital workflow and device manufacturing for mandibular repositioning devices for the treatment of obstructive sleep apnea: a feasibility study. *J Dent Sleep Med.* 2017; 4(4): 97-102.
- Bamagoos AA, Cistulli PA, Sutherland K, et al. Polysomnographic endotyping to select patients with obstructive sleep apnea for oral appliances. *Ann. Am. Thorac. Soc.* 2019; 16(11): 1422-31.
- Sutherland K, Takaya H, Qian J, Petocz P, Ng AT, Cistulli PA. Oral appliance treatment response and polysomnographic phenotypes of obstructive sleep apnea. *J Clin Sleep Med.* 2015; 11(8): 861-8.
- Zhao M, Barber T, Cistulli P, Sutherland K, Rosengarten G. Computational fluid dynamics for the assessment of upper airway response to oral appliance treatment in obstructive sleep apnea. *J. Biomech.* 2013; 46(1): 142-50.
- McEvoy RD, Antic NA, Heeley E, et al. CPAP for Prevention of cardiovascular events in obstructive sleep apnea. *N Engl J Med.* 2016; 375(10): 919-31.
- Pepin JL, Bailly S, Rinder P, et al. Relationship between CPAP termination and all-cause mortality: A French nationwide database analysis. *Chest.* 2022; 161(6): 1657-65.
- Weissman JS, Millenson ML, Haring RS. Patient-centered care: turning the rhetoric into reality. *Am J Manag Care.* 2017; 23(1): e31-e2.
- Edwards BA, Redline S, Sands SA, Owens RL. More than the sum of the respiratory events: Personalized medicine approaches for obstructive sleep apnea. *Am. J. Respir. Crit.* 2019; 200(6): 691-703.
- Op de Beeck S, Dieltjens M, Azarbarzin A, et al. Mandibular advancement device treatment efficacy is associated with polysomnographic endotypes. *Ann. Am. Thorac.* 2020.
- Op de Beeck S, Wellman A, Dieltjens M, et al. Endotypic mechanisms of successful hypoglossal nerve stimulation for obstructive sleep apnea. *Am. J. Respir. Crit.* 2020.
- Lowery MM, Rundo JV, Walia HK, Shah V. Personalized multimodal management for severe obstructive sleep apnea in a patient intolerant of positive airway pressure with hypoglossal nerve stimulator and mandibular advancement device. *J Clin Sleep Med.* 2022.
- Zinchuk A, Yaggi HK. Phenotypic subtypes of OSA: A challenge and opportunity for precision medicine. *Chest.* 2020; 157(2): 403-20.

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