

What's Next if AHI is Not a Strong Predictor?

Jean-François Masse, DMD, MSc, FACD, Diplomate, ABDSM

Editor-in-Chief *Journal of Dental Sleep Medicine*
Université Laval, Quebec City, Quebec, Canada

For the past few years, researchers and clinicians have challenged the accuracy and clinical predictive value of the apnea-hypopnea index (AHI) to assess health risk and treatment outcomes. Such concerns are not trivial, considering the consequences of untreated sleep-related breathing disorders. The current debate highlights that we may not be able to rely on a single outcome to make all treatment decisions; the patient's medical condition must be assessed at all levels, with more than one variable, including psycho-social metrics.

The Agency for Healthcare Research and Quality (AHRQ) is a government-based agency. In April 2021, it published a 155-page draft report¹ which was commissioned by the Centers for Medicare and Medicaid Services (CMS). In this report, the AHRQ evaluated 25 studies which compared continuous positive airway pressure (CPAP) to no CPAP treatment. Though the report is not meant to be a substitute for clinical judgement, it is intended to help healthcare decision makers to make well-informed decisions. Thus, it can potentially greatly impact the field of sleep. The results of the report have shaken the foundations of dogmas most thought could not be questioned. The report also highlighted two major issues that need our attention.

First, the report states that CPAP does not affect long-term clinically important outcomes. This statement from the AHRQ is bothersome to say the least, as the agency suggests more rigorous CPAP studies need to be conducted. If one considers the SAVE² study lasted 10 years and cost \$10 million and the Sleep SMART study,³ which is due to finish in about two years will have cost about \$45 million, then it is easy to see it will take some time for a fair number of better CPAP studies to be published. Furthermore, DSM does not have access to the funding, whether private industry or public, to participate in such an endeavor. So, while we as clinicians see positive outcomes in our patients daily, the value of CPAP treatment, as well as the value of OA, oral surgery, and ENT surgery for sleep apnea treatment, remain somewhat under scrutiny due to this draft report.

Second, the report questioned the validity of AHI as an intermediate surrogate measure of clinical outcome. This comes as no surprise as we have, since the publication of the SAVE study,² questioned the value of treating a patient based on AHI alone.⁴⁻⁶ In fact, it is not rare nowadays to hear physicians choose to recommend

no therapy to the asymptomatic apnea patient. This has a tremendous implication for our field: in the future, should asymptomatic snorers evaluated by a medical general practitioner continue to be referred to a sleep lab before getting an oral appliance? Could we, as dentists, treat the asymptomatic snorers without referring to doctors, provided we are adequately trained? Please note that I am just asking these questions and not trying to answer them at this moment... This paradigm change would not only democratize the field but allow the diminishing number of sleep physicians to concentrate on the difficult cases, as my colleague Dr. Michael Simmons suggested at one of our annual meetings a while ago.

In response to the report, an AASM task force suggested the following concerns (among other things, as the response is 20 pages in length):⁷ the AHRQ did not consider excessive sleepiness and improvement in blood pressure to be clinically important long-term outcomes and thus were excluded from the agency's analysis. These factors should obviously be considered. So, if one is not giving AHI the weight it used to have but looks at blood pressure and Epworth's scale among other metrics, an oral appliance becomes a very interesting option. We know by looking at the published data from randomized controlled trials comparing OA to CPAP that both means of treatment score about equally well in these two fields.⁸⁻¹³ If the AASM's distinguished task force considers that sleepiness and blood pressure are two important factors for sleep apnea, then sleep physicians should be thinking more about OAT.

Moreover, a number of sleep physicians have suggested that one of the reasons that the AHRQ came up with their concern about CPAP utility is the high dropout rate of CPAP users. This implies that CPAP patient selection was inadequate and CPAP machines may be overprescribed. It would then be in the physician's best interest to prescribe less CPAPs and more OAs, as their numbers would look better, and the population would benefit since OA compliance is vastly superior to CPAP compliance.

Although the AHRQ assessed the strength of AHI in relation to CPAP, we must be humble and recognize that DSM and our use of OAT is not totally hermetic to such concerns. A mono therapy for which patient improvements are assessed on a single outcome is far

from what current precision medicine paradigm needs to be. For sure, as clinicians in DSM, we should not focus on a single variable to make our treatment decisions and to assess therapeutic outcome. Furthermore, some patients may benefit of bi- or tri-therapy when we use OA, including combination CPAP-OA therapy, addition of sleep positioning device or other treatments. By broadening our viewpoint of therapies and treatment success, we will have a greater impact on the millions of patients struggling with sleep apnea.

CITATION

Masse, JF. What's next if AHI is not a strong predictor?. *J Dent Sleep Med.* 2021;8(4)

REFERENCES

1. Draft technology assessment: Continuous positive airway pressure treatment for obstructive sleep apnea. Agency for Healthcare Research and Quality. Accessed October 7, 2021. https://www.ahrq.gov/sites/default/files/wysiwyg/research/finding_s/ta/drafts-for-review/sleep-apnea-draftreport.pdf
2. Qiu ZH, Luo YM, McEvoy RD. The Sleep Apnea Cardiovascular Endpoints (SAVE) study: implications for health services and sleep research in China and elsewhere. *J Thorac Dis.* 2017;9(8):2217-2220. doi:10.21037/jtd.2017.06.142
3. Sleep SMART summary. National Institutes of Health. Accessed October 7, 2021. <https://www.nihstrokenet.org/sleep-smart-trial/home>
4. Pevernagie DA, Gnidovec-Strazisar B, Grote L, Heinzer R, McNicholas WT, Penzel T, Randerath W, Schiza S, Verbraecken J, Arnardottir ES. On the rise and fall of the apnea-hypopnea index: A historical review and critical appraisal. *J Sleep Res.* 2020 Aug;29(4):e13066. doi: 10.1111/jsr.13066. Epub 2020 May 14. PMID: 32406974.
5. Malhotra A, Ayappa I, Ayas N, Collop N, Kirsch D, Mcardle N, Mehra R, Pack AI, Punjabi N, White DP, Gottlieb DJ. Metrics of sleep apnea severity: beyond the apnea-hypopnea index. *Sleep.* 2021 Jul 9;44(7):zsab030. doi: 10.1093/sleep/zsab030. PMID: 33693939; PMCID: PMC8271129.
6. Malhotra A, Gottlieb DJ. The AHI is useful but limited: how can we do better? *Sleep.* 2021 Sep 13;44(9):zsab150. doi: 10.1093/sleep/zsab150. PMID: 34181025.
7. Comment letter. American Academy of Sleep Medicine. April 23, 2021.

Accessed October 7, 2021. <https://j2vjt3dnbra3ps7ll1clb4q2-wpengine.netdna-ssl.com/wp-content/uploads/2021/04/ahrq-cpap-sleep-apnea-report-comment-letter.pdf>

8. Aarab G, Lobbezoo F, Hamburger HL, Naeije M. Effects of an oral appliance with different mandibular protrusion positions at a constant vertical dimension on obstructive sleep apnea. *Clin Oral Investig.* 2010 Jun;14(3):339-45. doi: 10.1007/s00784-009-0298-9. Epub 2009 Jun 18. PMID: 19536571.
9. Barnes M, McEvoy RD, Banks S, Tarquinio N, Murray CG, Vowles N, Pierce RJ. Efficacy of positive airway pressure and oral appliance in mild to moderate obstructive sleep apnea. *Am J Respir Crit Care Med.* 2004 Sep 15;170(6):656-64. doi: 10.1164/rccm.200311-1571OC. Epub 2004 Jun 16. PMID: 15201136.
10. Ferguson KA, Ono T, Lowe AA, al-Majed S, Love LL, Fleetham JA. A short-term controlled trial of an adjustable oral appliance for the treatment of mild to moderate obstructive sleep apnoea. *Thorax.* 1997;52(4):362-368. doi:10.1136/thx.52.4.362
11. Gagnadoux F, Fleury B, Vielle B, Pételle B, Meslier N, N'Guyen XL, Trzepizur W, Racineux JL. Titrated mandibular advancement versus positive airway pressure for sleep apnoea. *Eur Respir J.* 2009 Oct;34(4):914-20. doi: 10.1183/09031936.00148208. Epub 2009 Mar 26. PMID: 19324954.
12. Phillips CL, Grunstein RR, Darendeliler MA, Mihailidou AS, Srinivasan VK, Yee BJ, Marks GB, Cistulli PA. Health outcomes of continuous positive airway pressure versus oral appliance treatment for obstructive sleep apnea: a randomized controlled trial. *Am J Respir Crit Care Med.* 2013 Apr 15;187(8):879-87. doi: 10.1164/rccm.201212-2223OC. PMID: 23413266.
13. Tan YK, L'Estrange PR, Luo YM, Smith C, Grant HR, Simonds AK, Spiro SG, Battagel JM. Mandibular advancement splints and continuous positive airway pressure in patients with obstructive sleep apnoea: a randomized cross-over trial. *Eur J Orthod.* 2002 Jun;24(3):239-49. doi: 10.1093/ejo/24.3.239. PMID: 12143088.

SUBMISSION AND CORRESPONDENCE INFORMATION

Submitted in final revised form October 3, 2021.

Address correspondence to: Jean-François Masse, DDS, MSc, FACD, D.ABDSM, Professor, Université Laval, 2780 Masson #200, Quebec City, QC, G1P 1J6, Canada; Tel: 418871-1447; Fax: 418-871-4983; Email: jean-francois.masse@fmd.ulaval.ca