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Letter

Respiratory arousal control needed for insomnia OSA patients-authors' reply

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The letter by Johnson & Johnson highlights important clinical variations on how sleep centers conduct titration studies to treat obstructive sleep apnea (OSA)/upper airway resistance syndrome (UARS). The American Academy of Sleep Medicine recommends decreasing the Respiratory Disturbance Index (RDI= total apneas+hypopneas+RERAs) to below 5 events/h. However, these subtle RERA (respiratory effort-related arousal) breathing events are largely ignored by most sleep centers that instead appear to focus exclusively on decreasing the apnea-hypopnea index (AHI) [1]. Note Johnson & Johnson raised the issue of RERAs/RDI and their treatment, yet later only mention AHI and do not describe how they resolve RERAs to bring the RDI < 5.

Nonetheless, eliminating RERAs is not straightforward, and we have found CPAP wanting as it almost invariably triggers expiratory pressure intolerance (EPI) when pressures are raised to eliminate RERAs. This phenomenon of EPI is most notable in mental health patients with OSA/UARS, the cases we have specialized in treating for a quarter century. EPI is associated with objectively disrupted sleep quality (more sleep stage transitions, less REM consolidation, and greater arousal activity or awakenings [2]); and, adaptive servo-ventilation (ASV) use has been associated with reversal of these sleep architecture abnormalities [2]. Indeed, among 4000+ cases of CPAP failure referred to us for second opinions, in every instance patients presented with EPI or central apneas or both on their first titration study, despite actively having been using CPAP for months or years [3]. This phenomenon is most pronounced in trauma patients who described EPI as "drowning in air." From our perspective, reliance on CPAP in a sizeable proportion of OSA/UARS patients violates the dictum, *primum non nocere.* Accordingly, 15 years ago we ceased use of CPAP and switched all patients to bilevel modes.

In our study, we proved ASV was superior to CPAP in yielding not only greater reductions in RERAs/RDI, but also in yielding significantly greater time spent with normalized breathing—a new metric we devised to highlight the value of looking at airflow improvement as opposed to residual breathing events [4]. Unfortunately, no evidence-based standard in the field of sleep medicine defines normalised breathing, thus we offered this metric as a starting point to guide further research. Clinically, we use the model developed by Condos et al. to round the airflow curve [5] as a consistently useful approach to fine-tune pressurised air settings. The vast majority of our patients are prescribed auto-bilevel or ASV, following manual titration of auto-adjusting technology in the sleep lab. This manual override of the auto-adjusting technology is a nuanced approach to ensure RERAs are eliminated while preventing EPI.

Declaration of Competing Interest

Authors NDM and VAU report grants from ResMed Science during the conduct of the study.

Author BK reports: 6 main activities related to his work in sleep medicine:

For websites, Dr. Krakow owns and operates 6 sites that provide education and offer products and services for sleep disorders patients: www.nightmaretreatment.com: www.ptsdsleepclinic.com: www.sleeptreatment.com: www.sleepdynamictherapy.com: www.soundsleepsoundmind.com: www.nocturiacures.com.

For other professional services, he is the medical director of a national DME company Classic SleepCare for which his sole functions are consultation and QA; he has neither patient encounters nor does he benefit from the sale of any DME equipment. For intellectual property, Dr. Krakow markets and sells 3 books for sleep disorders patients: *Insomnia Cures*, *Turning Nightmares into Dreams*, and *Sound Sleep, Sound Mind*. For clinical services, he owns and operates one commercial sleep center: Maimonides Sleep Arts & Sciences, Ltd. For educational and consulting services: Dr. Krakow conducts CME/CEU educational programs for medical and mental health providers to learn about sleep disorders. Sometimes these programs involve the attendee paying a fee directly to Maimonides Sleep Arts & Sciences. Other times, he conducts the workshops at other locations, which may be paid for by vendors such as Respironics and RESMED or other institutions such as the AMEDDC&S, VAMC, and regional sleep center conferences. He is also president and principal investigator of a non-profit sleep research

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center, the Sleep & Human Health Institute (www.sleepingresearch.org, www.shhi.org) that occasionally provides consultation services or receives grants for pilot studies, the most recent: ResMed ~$400,000 January 2015 (funding for this randomized control trial of treatment in insomnia patients). Recently, and after this research had been conducted, he provided a brief consultation to ASOCorp, a medical supply company that manufactures nasal strips.

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