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USING AI TO PREDICT FUTURE CPAP ADHERENCE AND THE IMPACT OF BEHAVIORAL AND TECHNICAL INTERVENTIONS

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Introduction: Clinical management of CPAP adherence remains an ongoing challenge. Behavioral and technical interventions such as patient outreach, coaching, troubleshooting, and resupply may be deployed to positively impact adherence. Previous authors have described adherence phenotypes that retrospectively categorize patients by discrete usage patterns. We design an AI model that predictively categorizes patients into previously studied adherence phenotypes and analyzes the statistical significance and effect size of several types of interventions on subsequent CPAP adherence.
Methods: We collected a cross-sectional cohort of subjects (N = 13,917) with 455 days of daily CPAP usage data acquired. Patient outreach notes and resupply data were temporally synchronized with daily CPAP usage. Each 30-days of usage was categorized into one of four adherence phenotypes as defined by Aloia et al. (2008) including Good Users, Variable Users, Occasional Attempters, and Non-Users. Cross-validation was used to train and evaluate a Recurrent Neural Network model for predicting future adherence phenotypes based on the dynamics of prior usage patterns. Two-sided 95% bootstrap confidence intervals and Cohen's d statistic were used to analyze the significance and effect size of changes in usage behavior 30-days before and after administration of several resupply interventions.
Results: The AI model predicted the next 30-day adherence phenotype with an average of 90% sensitivity, 96% specificity, 95% accuracy, and 0.83 Cohen's Kappa. The AI model predicted the number of days of CPAP non-use, use under 4-hours, and use over 4-hours for the next 30-days with OLS Regression R-squared values of 0.94, 0.88, and 0.95 compared to ground truth. Ten resupply interventions were associated with statistically significant increases in adherence, and ranked by adherence effect size using Cohen's d. The most impactful were new cushions or masks, with a mean post-intervention CPAP adherence increase of 7-14% observed in Variable User, Occasional Attempter, and Non-User groups.
Conclusion: The AI model applied past CPAP usage data to predict future adherence phenotypes and usage with high sensitivity and specificity. We identified resupply interventions that were associated with significant increases in adherence for struggling patients. This work demonstrates a novel application for AI to aid clinicians in maintaining CPAP adherence.
Support:

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COMPARISON OF AHI AND ESS OUTCOMES BETWEEN PATIENTS WITH OBSTRUCTIVE SLEEP APNEA UNDERGOING SLEEP SURGERY VERSUS UPPER AIRWAY STIMULATION

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Introduction: Single or multi-level soft tissue surgical interventions are common options for CPAP-intolerant patients with OSA. Upper Airway Stimulation (UAS) is an alternative option using an implantable hypoglossal nerve stimulator. We compared patient outcomes between traditional sleep surgery (TSS) and UAS.
Methods: We selected patients who underwent TSS (including palate, oropharynx, tongue, and/or epiglottis-based procedures) for OSA and also met general UAS criteria (BMI≤35, AHI between 15-65, absence of palate concentric collapse during DISE, if available) for chart review. UAS outcomes were collected from the ADHERE international registry. For both groups, post-op AHI was collected, including full-night UAS efficacy studies. Data are presented as mean and standard deviation.
Results: The TSS group (n=284) and UAS group (n=541) were predominantly male and overweight. The TSS group was younger than UAS (47±12 vs 60±11 years, p<0.001). At baseline, both groups had severe OSA with AHI of 34±14 and 36±15 (p=0.23) and excessive daytime sleepiness with ESS of 12±5 and 12±6, (p=0.38), respectively. TSS follow-up was 169±151 days vs 392±181 days for UAS, which was significantly different. UAS had significantly larger decrease in AHI than TSS (-21/h±18 vs -16/h±16, p<0.0001). Both groups had a large decrease in ESS, however, the UAS group had a slightly smaller decrease, (-6±5 vs -5±5, p=0.01). Using the Sher response criteria of 50% AHI reduction and ≤ 20 events/hour, UAS had a 70% response rate vs 51% for TSS.
Conclusion: This study represents largest and first international, multicenter comparison of UAS to traditional surgical interventions for OSA, albeit with limitations of potential differential patient selection. While both TSS and UAS show similar improvement in symptoms, upper airway stimulation has a larger reduction of AHI with higher rates of therapy response than traditional sleep surgery
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EVALUATION OF AN ORAL DRUG PYRIDOSTIGMINE BROMIDE IN PATIENTS WITH MILD TO MODERATE OBSTRUCTIVE SLEEP APNEA

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Introduction: A randomized, double-blind, cross-over, placebo-controlled clinical study with pyridostigmine bromide (PYD) in obstructive sleep apnea (OSA) patients ranging from mild to moderate disease was conducted to evaluate its clinical efficacy and safety.