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COST-EFFECTIVENESS OF A 3-YEAR TELE-OSA INTERVENTION

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Introduction: Trial-based tele-obstructive sleep apnea (OSA) cost-effectiveness analyses have often been inconclusive due to small sample sizes and short follow-up. In this study, we report the cost-effectiveness of Tele-OSA using a larger sample from a 3-month trial that was augmented with 2.75 additional years of epidemiologic follow-up.
Methods: The Tele-OSA study was a 3-month randomized trial conducted in Kaiser Permanente Southern California that demonstrated improved adherence in patients receiving automated feedback messaging regarding their positive airway pressure (PAP) use when compared to usual care. At the end of the 3 months, participants in the intervention group pseudo-randomly either stopped or continued receiving messaging. This analysis included those participants who had moderate-severe OSA (Apnea Hypopnea Index >=15) and compared the cost-effectiveness of 3 groups: 1) no messaging, 2) messaging for 3 months only, and 3) messaging for 3 years. Costs were derived by multiplying medical service use from electronic medical records times costs from Federal fee schedules. Effects were average nightly hours of PAP use. We report the incremental cost per incremental hour of PAP use as well as the fraction acceptable.
Results: We included 256 patients with moderate-severe OSA (Group 1, n=132; Group 2, n=79; Group 3, n=45). Group 2, which received the intervention for 3 months only, had the highest costs and fewest hours of use and was dominated by the other two groups. Average 1-year costs for groups 1 and 3 were $6035 (SE, $477) and $6154 (SE, $575), respectively; average nightly hours of PAP use were 3.07 (SE, 0.23) and 4.09 (SE, 0.42). Compared to no messaging, messaging for 3 years had an incremental cost ($119, p=0.86) per incremental hour of use (1.02, p=0.03) of $117. For a willingness-to-pay (WTP) of $500 per year ($1.37/night), 3-year messaging has a 70% chance of being acceptable.
Conclusion: Long-term Tele-OSA messaging was more effective than no messaging for PAP use outcomes but also highly likely cost-effective with an acceptable willingness-to-pay threshold. Epidemiologic evidence suggests that this greater use will yield both clinical and additional economic benefits.
Support (if any): Tele-OSA study was supported by the AASM Foundation SRA Grant #: 104-SR-13

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ASSOCIATION BETWEEN POSITIVE AIRWAY PRESSURE ADHERENCE AND HEALTHCARE COSTS

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Introduction: The impact of positive airway pressure (PAP) therapy for obstructive sleep apnea (OSA) on healthcare costs is uncertain. We explored the relationship between 3-year PAP adherence and direct healthcare cost utilizing the Tele-OSA study cohort.
Methods: The Tele-OSA randomized clinical trial demonstrated improved PAP adherence in patients receiving automated feedback messaging regarding their PAP use versus usual care. The study enrolled patients at Kaiser Permanente Southern California, a large integrated healthcare system, from 2014–2015. Patients with moderate-severe OSA (Apnea Hypopnea Index [AHI] ≥15) from all study arms were consolidated, then stratified into PAP adherence groups based on mean PAP hours and PAP use patterns over 3-year follow-up period: (a) high adherence (consistent ≥4 hours/night); (b) moderate adherence (2–3.9 hours/night or inconsistent ≥4 hours/night); (c) low adherence (<2 hours/night). Healthcare costs (2020 US dollars) were derived by assigning costs from Federal fee schedules to healthcare utilization extracted from electronic health records. The 6-month mean healthcare costs during follow-up were estimated using generalized linear models adjusting for patient demographics, comorbidities, Medicaid coverage, prior healthcare cost, and AHI.
Results: Of 374 patients (mean age 50 years, 63% male), 22% were categorized into high adherence, 18% moderate adherence, and 60% low adherence to PAP therapy. Mean (SD) hours of PAP use were 6.5 (1.1) hours, 3.7 (1.3) hours, and 0.3 (0.5) hours for high, moderate, and low adherence groups, respectively. The high adherence group had the lowest average (SE) adjusted 6-month healthcare costs compared with other groups (High: $2,991 [$234]; Moderate: $3,604 [$412]; Low: $3,854 [$300]). Cost savings of high vs low adherence were $862 (95% CI $1540, $185). Cost savings of moderate vs low adherence were $250 (95% CI -$694, $1,193).
Conclusion: Better PAP adherence was associated with significantly lower healthcare costs over 3 years in patients with moderate-severe OSA. Findings support the importance of care strategies to enhance long-term PAP adherence for OSA therapy.
Support (if any): The Tele-OSA Study was supported by AASM Foundation SRA Grant #: 104-SR-13

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THE EFFECTS OF POSITIONAL AND SLEEP STAGE DEPENDENCY ON MANDIBULAR ADVANCEMENT DEVICE TREATMENT OUTCOME IN OBSTRUCTIVE SLEEP APNEA

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Introduction: Mandibular advancement device (MAD) responder phenotype are not well understood in patients with obstructive sleep apnea (OSA). Recent studies have reported the association between MAD treatment response and polysomnographic phenotypes using positional and sleep stage dependency, but with inconsistent findings. Thus, the study aims to investigate the relationship between the two phenotypes and MAD response.
Methods: This retrospective study recruited patients with OSA (apnea-hypopnea index [AHI] >10/h), who were 20 to 80 years old, treatment naïve, and received MAD treatment for more than three months from 2009 to 2017. AHIsupine/AHInon-supine ≥2 and <2 meant supine predominant (supine-p) and non-positional OSA,

respectively. REM-AHI/NREM-AHI ≥2, ≤0.5, and between 0.5 to 2 indicated REM-predominant (REM-p), NREM-predominant (NREM-p), and stage-independent (SI) OSA, respectively. Three criteria defined successful MAD treatment (i.e., criterion 1: residual AHI <5/h with >50% reduction; criterion 2: residual AHI 50% reduction; criterion 3: reduction >50%). The association between the two phenotypes and the three treatment criteria was identified using multivariable logistic regression.

Results: A total of 218 patients with a median age of 52.5 years, body mass index (BMI) of 25.4 kg/m2, and AHI of 28.2/h were recruited. Supine-p OSA had lower waist circumferences than non-positional OSA. The REM-p group had lower AHI and more female than the NREM-p and SI group. Supine-p OSA had better response than non-positional OSA (criterion 1: 43.2% vs 34.1%; criterion 2: 63.6% vs 34.1%; criterion 3: 77.3% vs 51.2%). NREM-p OSA had lower response across all three criteria (REM-p vs NREM-p vs SI: criterion 1: 57.6% vs 0% vs 42.0%; criterion 2: 75.8% vs 16.7% vs 56.5%; criterion 3: 75.8% vs 33.3% vs 77.1%). The odds of MAD response for supine-p OSA was 3.78 (95% CI = 1.44–9.93) to 3.98 (95% CI = 1.58–9.99)-fold than non-positional OSA while the odds for NREM-p OSA were 0.06 (95% CI = 0.01–0.58) to 0.15 (95% CI = 0.03–0.67)-fold than SI OSA after adjusting demographics and clinical features affecting MAD response.

Conclusion: Positional and sleep stage dependency were associated with MAD response and could be indicators for personal-tailored OSA treatment.

Support (if any): The Ministry of Science and Technology, Taiwan (MOST 109-2314-B-002-252)

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CELLULAR ENERGY MONITORING FOR DIAGNOSIS AND MANAGEMENT OF THERAPY FOR SLEEP DISORDERED BREATHING

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Introduction: Polysomnogram (PSG) monitoring, including pulse oximetry, is the current diagnostic standard in sleep medicine. However, potentially confounding aspects of PSG testing include: test site other than the subject's normal bed, distracting sensors and wires, subjective interpretation of complex recorded signals, and limited sensitivity to relevant phenomena. There is currently an unmet need for a sleep test that is more clinically effective than PSG, and that can be administered in the subject's normal sleeping environment. Additionally, confirmation that home therapy has been optimized cannot be achieved by PSG titration.

Methods: A recent proof of concept (POC) study of the armband-wearable Reveal Cellular Energy Monitor (CE monitor) directly compared its data product, Cellular Energy Index (CEi), with PSG data. Scoring methods were adapted from AASM guidance for interpretation of PSG data. At-home recording with the CE monitor was also performed prior to and following PSG studies. At-home incremental adjustment of APAP settings and mask selection was documented with CE monitoring and compared with the information recorded by the home APAP machine.

Results: The comparison of the POC data consistently found the CE monitor to be more sensitive and responsive to hypoxic stress than the PSG pulse oximeter during primary snoring. Obstructive and central apnea events were detected by both, but the CE monitor provided finer resolution of the breath-by-breath effort of breathing compared with PSG RIP and nasal sensors. At-home CE monitor optimization of therapy was documented to often differ from the settings and mask selection determined by PSG titration, and resulted in 'normal' sleep breathing data.

Conclusion: All diagnostically-relevant physiologic responses detected by PSG were also detected by the CE monitor. Evidence of cellular hypoxia in the skin, by CE monitor, was consistently recorded during prolonged periods of 'primary snoring;' i.e., SpO2 is less sensitive to hypoxic stress during sleep than CEi. Breath-by-breath effort is detected by the CE monitor.

Support (if any): The POC study costs at UCSF were paid by Reveal Biosensors, Inc.

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CHANGE OF SLEEP DISORDERED BREATHING SEVERITY IN OBESE PATIENTS RECEIVING LAPAROSCOPIC SLEEVE GASTRECTOMY

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Introduction: Bariatric surgery via laparoscopic sleeve gastrectomy (LSG) was proved to alleviate significantly in apnea hypopnea index (AHI) in obesity patients. We aimed to investigate LSG effects on AHI in different sleep stage (REM vs NREM) and in position (supine vs non-supine) and on CO2 reduction and to identify the factors associated of AHI reduction.

Methods: From April 2016 to December 2020, 22 obese patients who underwent PSG before and after bariatric surgery at National Taiwan university Hospital were retrospectively studied. The simultaneously nocturnal percutaneous transcutaneous CO2 (PtcCO2) monitoring was applied. Demographic, anthropometric characteristics, Epworth sleepiness scale (ESS), Pittsburgh Sleep Quality Index (PSQI), PSG parameters were reviewed. Responsive to treatment was defined as AHI reduction ≥50% and residual AHI< 10/hour.

Results: Postoperative PSG was performed in 22 patients [13 men and 9 women, median age 38 years (interquartile range, 32.8–46.5), median body mass index (BMI) 44.5 kg/m2 (39–52.5)] and median follow up days of 535 days (440–687) after LSG. The median post-op BMI was 32.4 kg/m2 (28.3–37.1). The AHI decreased from 51.9/h (27–85.9) to 10.7/h (2–16.3) (p<0.01). The AHINREM decreased from 49.9/h (31.8–91.5) to 5.8/h (1.1–17.3) while the AHIREM decreased from 63.7/h (52.5–83.2) to 19.6/h (4.4–49.7) /h. The AHIsupine decreased from 64.1/h (40.1–88.8) to 11.9/h (2.3–18.7) while the AHInon-supine decreased from 27.5 /h (17.6–78.3) to 1 /h (0–2). The average PtcCO2 decreased from 51.6 mmHg (39.3–54.7) to 46 mmHg (36.6–49.3) while %PtcCO2-total sleep time>50mmHg decreased