Introduction: Analysis of sleep breathing sounds has been employed to screen obstructive sleep apnea (OSA). However, most current methods rely on specialized equipment (e.g., tracheal microphones), require additional physiological data (e.g., oxygen saturation), are rule-based, or are trained on data collected in-lab, making them less suitable for home use. In this study, deep learning methods were leveraged to explore the hypothesis that sleep audio recordings collected via smartphones can be used alone to screen for OSA by exploiting the temporal pattern of respiration sounds.
Methods: Adult participants with suspected sleep-disordered breathing of varying degrees of severity were recruited from the general population and from GP referrals to sleep clinic. Audio recordings were collected via smartphones during home sleep apnea testing (HSAT). HSAT data were scored by a registered polysomnographic technologist in accordance with current international guidelines (AASM V2.5, 2018) and used as reference. To exploit acoustic respiration temporal pattern, time interval histograms were computed for sequences of audio-words that were automatically learned from spectral features with a deep neural network. Means and standard deviations of the time intervals for each audio-word were employed by a Gaussian mixture model to classify 2-minute audio recording segments as either containing OSA events or not.
Results: Preliminary data from 4 valid nights' recordings obtained from 2 consented participants was analysed. 550 segments were used for training, with 180 segments used for evaluation. Audio recording demonstrated a sensitivity of 0.71 and specificity of 0.66 when compared with manually-scored HSAT.
Conclusion: Preliminary results suggest that an approach to OSA screening based on deep learning with inter-audio-word intervals to capture information about respiration temporal pattern may be a useful tool in diagnosis of OSA. Further model development is underway using data collected from up to 200 patients and full study data will be presented.
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PREVALENCE AND CHARACTERISTICS OF RAPID EYE MOVEMENT OBSTRUCTIVE SLEEP APNOEA (REM OSA) IN A MULTI-ETHNIC OSA COHORT

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Introduction: Recent studies have shown that REM OSA is associated with increased incidence of hypertension and insulin resistance. However, there is a lack of Asian data on REM OSA. Our study aimed to examine the prevalence and characteristics of REM OSA in a multi-ethnic OSA cohort.
Methods: This was a retrospective observational study of all patients who underwent an overnight diagnostic polysomnography at a Singapore tertiary hospital from 1st August 2017 to 31st August 2018. All patients with a diagnosis of OSA (Apnoea Hypopnea Index (AHI) ≥5) were included in the study. REM OSA is defined as an overall AHI≥5, REM AHI/Non REM (NREM) AHI>2, NREM AHI<15 and at least 15 minutes of REM sleep.
Results: 457 OSA subjects were included in the analysis. 19% (87/457) had REM OSA. Univariate analysis showed that REM OSA was more prevalent among female OSA than male OSA [34/115 (29.6%) versus 53/342 (15.5%) respectively, p<0.001]. Compared to non REM OSA, REM OSA had milder OSA severity [mean AHI 12.74±4.71 versus 45.34±28.38, p<0.001] and lower prevalence of hypertension [21/87 (24.1%) versus 138/370(37.3%), p=0.02]. No differences were found between both groups for age (p=0.273), ethnicity (p=0.615), Body Mass Index (p=0.336), diabetes mellitus (p=0.245) and Epworth Sleepiness Scale (0.06). Gender and OSA severity differences between both groups remained statistically significant in multivariate analysis (higher prevalence of REM OSA in female, p=0.043 and milder disease severity in REM OSA, p=0.006).
Conclusion: REM OSA was common in our OSA cohort and had higher prevalence in female and milder disease severity compared to non REM OSA. However, we did not find an increased prevalence of hypertension or diabetes mellitus in REM OSA. Further population-based study on REM OSA is needed to understand this phenotype better.
Support: NIL

0575

SLEEP MONITORING WITH A SINGLE CHANNEL EEG RECORDER IN PATIENTS WITH PSYCHIATRIC DISORDERS

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Introduction: The gold standard of sleep measurement has been laboratory polysomnography (PSG). However, electrodes and cables can cause discomfort, and exposure to an unfamiliar environment can cause the "first-night effect." Difficulty falling asleep or maintaining sleep, poor sleep quality, and nightmares are some of the key clinical symptoms observed among individuals with psychiatric disorders. Those suffering from sleep disorders often present with symptoms of discontent with regard to sleep quality, timing, and quantity, and these symptoms have an adverse impact on function and quality of life. A minimally invasive technique would be preferable in patients with psychiatric disorders, who tend to be sensitive to environmental change. Accordingly, we evaluated the performance of a single-channel electroencephalography (EEG)-based sleep monitoring system in patients with psychiatric disorders.
Methods: Fifty-nine patients undergoing PSG were enrolled in this study. Single-channel EEG sleep monitoring was performed simultaneously with PSG. PSG and the EEG recordings were used to evaluate sleep parameters, such as total sleep time (TST), sleep efficiency, rapid eye movement (REM) sleep, light sleep (stages N1 and N2), and deep sleep (stage N3). Correlation analysis was used to evaluate the agreement on sleep parameters and attributing factors to the inaccuracies of the single-channel EEG recording.
Results: TST, sleep efficiency, REM sleep duration, and non-REM sleep duration of the single-channel EEG-based sleep monitoring showed a significant correlation with those of PSG. Lower sleep efficiency, a decrease in REM sleep, and increases in waking after sleep onset, arousal index, and apnea/hypopnea index were associated with the difference of sleep parameters between the two methods.
Conclusion: Among patients with psychiatric disorders who are sensitive to environmental change single-channel EEG sleep monitoring would be a useful technique to objectively evaluate sleep quality.

Support: Collaboration study with The KAITEKI Institute, Inc.

0576

VARIATION IN NIGHT TO NIGHT HOME SLEEP TESTING

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Introduction: Home sleep testing (HST) is becoming common in the evaluation of Obstructive Sleep Apnea (OSA). Studies confirmed good HST AHI correlations from different nights in a single patient. The following reviewed AHI and additional measures from HST's. (Alice Night One))
Methods: We collected data from 20 patients from two consecutive nights of HST's. 5 F 15 M, means AGE 49 (sd 14) and BMI 36 (sd 8). Both studies had over 4 hours of good sleep and acceptable data. Measures include abs(Night 1- Night 2) of AHI (Diff.AHI), of mean EKG (Diff.EKG) mean time SaO2 less than 90% (Diff. SaO2).
Results: These results reproduced the strong correlation of AHI, Time SaO2 less than 90 %: and mean EKG between two nights, .96, .72, .87 respectively. There was a strong correlation between Diff.AHI and Diff.SaO2, .63 (p .003). There were weaker correlations between AHI and Time SaO2 less than 90% on Night 1, .67 and Night 2, .75. Linear regression: Diff.AHI on Age (p=.2), BMI (p = .9), and Diff.EKG (p=.4).
Conclusion: These results again validate the small degree of AHI variation in night to night HST. They confirm a small degree of variation in the mean EKG and Time SaO2 less than 90%. There is a high correlation between AHI and time SaO2 less than 90% as these variables are dependent and the fall in SaO2 is used to define an event, especially on the HST. The BMI did not explain variation in AHI, there is a low correlation between AHI and BMI. Age could be a factor in AHI variation; yet, this is highly speculative with an N = 20. The correlations between AHI and Time SaO2 less than 90% are likely to be due to the relative health of the subjects and small number of subjects. One night of good, greater than 4 hours HST may be sufficient. This study did not evaluate success in meeting these parameters with a single night of testing.
Support: Louis B Stokes VHA, Cleveland, OH

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CLUSTER ANALYSIS FOR THE ASSOCIATION BETWEEN OBSTRUCTIVE SLEEP APNEA PHENOTYPES: A POPULATION-BASED LONGITUDINAL STUDY

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Introduction: The identification of subgroups of obstructive sleep apnea (OSA) is critical to understand disease causality and ultimately develop optimal care strategies customized for each subgroup. In this sense, we aimed to perform a cluster analysis to identify subgroups of individuals with OSA based on clinical parameters. Furthermore, we aimed to analyze whether subgroups remain after 8 years.
Methods: We used data derived from the Sao Paulo Epidemiologic Sleep Study (EPISONO) cohort, which was followed over 8 years. All individuals underwent polysomnography, answered questionnaires and had their blood collected for biochemical exams. OSA was defined according to an AHI equal or greater than 15 events per hour. Cluster analysis was performed using latent class analysis (LCA).
Results: Of the 1,042 individuals in the EPISONO baseline cohort, 68.3% accepted to participate in the follow-up study (n=712). We were able to replicate the OSA 3-cluster solution observed in previous studies: disturbed sleep, minimally symptomatic and excessively sleepy in both baseline (35.5%, 45.4% and 19.1%, respectively) and follow-up studies (41.9%, 43.4% and 14.8%, respectively). 44.8% of the participants migrated clusters between the two evaluations and the factor associated with this was a greater delta-AHI (B=-0.033, df=1, p=0.003). The optimal cluster solution for our sample based on Bayesian information criterion (BIC) was 2 clusters for baseline (disturbed sleep and excessively sleepy) and 3 clusters for follow-up (disturbed sleep, minimally symptomatic and excessively sleepy).
Conclusion: The results found replicate and confirm previously identified clinical clusters in OSA even in a longitudinal analysis.
Support: This work was supported by grants from AFIP, FAPESP and CAPES.

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INCIDENT HYPERTENSION RATES IN OSA IDENTIFIED USING AMERICAN ACADEMY OF SLEEP MEDICINE (AASM) HYPOPNEA CRITERIA, BUT MISCLASSIFIED BY MEDICARE (CMS) HYPOPNEA DEFINITION

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Introduction: The impact of not treating OSA identified using AASM standards (hypopneas scored using a minimum 3% O_2 desaturation or arousal), but misclassified by CMS standards (hypopneas scored only if minimum 4% O_2 desaturation) remains unclear. This analysis determined the ~5 year incident hypertension rates using the new 2018 ACC/AHA blood pressure (BP) guidelines in these individuals.
Methods: Data were analyzed from all Sleep Heart Health Study exam 2 study participants (N=1219) who were normotensive (BP≤120/80) at exam 1. The apnea hypopnea index (AHI) at exam 1 was classified into 4 categories of OSA severity: <5, 5 ≤15, 15 ≤30 and ≥30/hour using both the AASM or CMS definitions. Three definitions of hypertension were used: Elevated BP (>120/80), Stage 1 (>130/80) and Stage 2 (>140/90) to determine incidence rates at exam 2.
Results: Five year follow-up data were available for 476 participants classified as having OSA (AHI ≥5) by AASM criteria, but not by CMS standards at exam 1. Incident hypertension rates in these misclassified participants for ACC/AHA defined BP categories were 15% (Elevated BP), 15% (Stage 1) and 6% (Stage 2). 4% of normotensive participants used hypertensive medications. Overall incidence rate of at least an elevated BP was 40% (191/476) in those with OSA defined using AASM, but not by CMS criteria and 17% (191/1219) of the overall population at risk. In comparison to those with incident hypertension and OSA identified by CMS standards, BMI (27.7 vs 30.1 kg/m^2, p<.001) and % men were lower (45 vs 58%, p=.012), but age and race were not different.
Conclusion: Use of the CMS hypopnea definition as a component of the AHI resulted in the failure to identify a significant number of individuals with OSA who eventually developed hypertension and could have benefited from earlier diagnosis and treatment.
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