

# Somnologie

Schlafforschung und Schlafmedizin

Offizielles Organ der DGSM, ÖGSM und SGSSC



## Abstracts of the 3rd Sleep and Breathing Conference

16-18 April 2015, Barcelona

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## Sleep and Breathing 2015

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16-18 April 2015, Barcelona

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# Abstracts of the 3<sup>rd</sup> Sleep and Breathing Conference

16–18 April 2015, Barcelona

## Thematic Poster Session “Chronic Disorders”

P1

### Observational sleep study on patients with non-cystic fibrosis bronchiectasis – preliminary results

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**Introduction.** Bronchiectasis represent a chronic disorder characterized by permanent, irreversible, abnormal dilation of the bronchi and bronchioles. Due to irreversible dilation of the bronchi, the presence of secretions and airflow obstruction, subjects with bronchiectasis may be predisposed to hypoxemia during sleep or symptoms that might lead to arousal. Therefore, we describe sleep characteristic through the standard overnight polysomnography.

**Methods.** An observational study was carried out involving 21 patients with non-cystic fibrosis bronchiectasis at the Sleep Laboratory of the Nove de Julho University in the city of Sao Paulo, Brazil.

**Results.** Mean age was 51.6±15.1 years; 57.1% of the patients were female and mean body mass index was 23.9±3.7 kg/m<sup>2</sup>. Mean income was 1.3 times the minimum wage and only 28.6% had completed high school. The subjects and there was a predominance of obstructive lung disease. Mean total sleep time was 282.7±69.5 min, with sleep efficiency of 79.2±29.2%. The mean sleep apnea and hypopnea index was 3.7±4.9 events/hour. The number of arousals was 5.6±2.9/h. The oxyhemoglobin desaturation index was 5.9±8.9/h and minimum oxyhemoglobin saturation was 84.5±5.8%, during sleep.

**Conclusion.** In our study, patients with non-cystic fibrosis bronchiectasis had a changes in sleep quality.

P2

### Overlap of obstructive sleep apnea and bronchial asthma: effect on asthma control

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**Introduction.** Obstructive sleep apnea (OSA) and asthma are highly prevalent respiratory disorders that share several risk factors and are frequently comorbid. Multiple mechanisms have been postulated to explain this frequent coexistence, which is recently referred to as the “alternative overlap syndrome”. Moreover, OSA is generally linked to worse asthma outcomes.

**Objectives.** First, to assess the prevalence of OSA in a group of asthmatics. Second, to evaluate the potential risk factors underlying the development of OSA in these patients. Third, to determine the effect of this overlap on asthma control.

**Methods.** Polysomnography was done for 30 asthmatics and 12 healthy controls. Demographics, spirometry, comorbidities and clinical data were collected. Asthma control was assessed according to the latest GINA guidelines.

**Results.** OSA defined by an AHI of ≥5 events/h was present in 18 (60%) asthmatics and 2 (17%) controls. Linear regression analysis revealed that high body mass index (BMI), coexistent gastroesophageal reflux disease (GERD) and asthma severity (FEV<sub>1</sub>%) are significant independent predictors for the development of OSA in asthmatics ( $p=0.03$ ,  $0.034$ , and  $<0.001$  respectively). Moreover, the presence of OSA in asthmatic patients was significantly associated with worse asthma control ( $p<0.001$ ).

**Conclusion.** A high index of suspicion is warranted for the overlap of OSA and asthma, particularly in the presence of obesity, GERD, and in patients with severe asthma. Individualized therapy addressing these moderating factors is warranted for optimal health outcomes. Recognition and treatment of OSA in asthmatics is an important element in improving asthma control.

P3

### Prevalence of obstructive sleep apnea among patients with coronary artery disease in Saudi Arabia

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**Background.** Despite the association between obstructive sleep apnea (OSA) and coronary artery disease (CAD), few studies have investigated this issue in Saudi Arabia.

**Objectives.** This study aimed to identify the prevalence of OSA among CAD patients.

**Subjects and methods.** This was a cross-sectional (descriptive) study conducted at King Abdul-Aziz University Hospital in Jeddah, Saudi Arabia from April 2012 to December 2013. All consecutive patients referred to the cardiac catheterization lab for coronary angiography who exhibited evidence of CAD were included in this study. This study was conducted in two stages. During the first stage, each participant was interviewed individually. The administered interview collected data pertaining to demographics, comorbidities, and the STOP-BANG questionnaire score. The second stage of this study consisted of a diagnostic overnight polysomnography (PSG) of 50% of the subjects at high risk for OSA according to the STOP-BANG questionnaire.

**Results.** Among the patients with CAD ( $n=156$ ), 128 (82%) were categorized as high risk for developing OSA. PSG was conducted on 48 patients. The estimated prevalence of OSA in the study sample was 57%. Approximately 61% of the documented sleep apnea patients suffered from moderate to severe OSA.

**Conclusion.** This local study concurs with reports in the literature indicating that OSA is very common among CAD patients.

#### P4

### Pulmonary function evaluation and OSAS in acromegalic syndrome

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**Background.** Acromegaly is an acquired endocrinology disease related to excessive production of growth hormone (GH) by a tumor hipofisis, causing a progressive somatic disfigurement and changes of several organs. The changes in anatomical facial of soft-tissue thickening, of bone segments, that due to hypercollapsibility of the hypopharyngeal walls and of hypertrophy of the tongue can give rise to OSAS in patients with acromegaly diagnosis. The alteration of the respiratory function is caused by anatomical and mechanical changes in the chest.

**Objectives and methods.** We have employed 19 patients affected with acromegalic syndrome, 8 male and 11 female, mean age 60 years old; of which 19 patient 10 have normal IGF-1 value whereas 9 have altered IGF-1 values. The anthropometric measurements and score evaluated are: BMI, neck circumference, Mallampati index, ESS. The patient are subjected to different exams: serum level of GH and IGF-1, ABGs, spirometry, DLCO, home cardiorespiratory monitoring (AHI, AI, ODI).

**Results.** In the population study OSAS is represented in 73.6% of the cases, of which 42.8% affected by mild grade (AHI 11.4±1.4; AI 2.2±2.8, ODI 10.8±0.6), by 28.5% moderate grade and by 48.5% severe grade (AHI 42.4±12.4; AI 21.8±20.8, ODI 43.3±11.7). We have observed a proportionality direct between serum GH level and DLCO (115.6±15.7) and DLCO/VA (111±2.12)

**Conclusion.** In acromegalic population the OSAS disorder is common, probably related to anatomical alterations caused by stimulation of high serum GH and IGF-1 level. The same pathophysiological pathway could justified the increment of alveolar hyperinflation.

#### P5

### Different effect of transient and chronic hypoxia on the L-arginine pathway

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**Introduction.** Asymmetric and symmetric dimethylarginines (ADMA and SDMA, respectively) are markers of endothelial dysfunction. Hypoxia facilitates protein arginine methylation. We compared the serum level of L-arginine, ADMA and SDMA in two different cohort: patients with OSA as transient and COPD as chronic hypoxia.

**Methods.** A total of 65 patients with OSA and 45 patients with COPD were investigated. Venous blood was taken for evaluation of biomarkers (L-arginine, ADMA, SDMA and hsCRP). All markers were compared with normal controls (NC, n=64). Beside, polysomnography for OSA and blood gas analysis for COPD patients was recorded.

**Results.** L-arginine was significantly higher in OSA compared to COPD. Both, ADMA and SDMA were significantly higher in COPD compared to OSA. All markers were significantly higher in patients compared to NC. In OSA patients, a significant positive correlation was found between SDMA and the lowest measured O<sub>2</sub> saturation (SpO<sub>2</sub>). After selecting patients with OSA based upon apnoe-hypopnoe index (AHI), a significant positive correlation was found between hsCRP and L-arginine in patients with AHI>15. While in patients with AHI<15, ADMA and the lowest SpO<sub>2</sub> recorded by polysomnography showed a significant positive correlation. In contrast, a significant negative correlation was

found between ADMA and capillary partial oxygen pressure in patients with COPD.

**Conclusions.** Both types of hypoxia are associated with elevated L-arginine-pathway markers. While lower SDMA is more informative for episodic hypoxia in OSA, ADMA is proportional to depth of chronic hypoxia in COPD. The precursor molecule L-arginine might express a protective role against inflammation in severe transient hypoxia.

#### P6

### Obstructive sleep apnea (OSA) and excessive daytime sleepiness (EDS) are independently associated with depression in a community based population of Australian men

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**An association between OSA and depression is uncertain.** Using cross-sectional and longitudinal analyses we examined the hypotheses that EDS and previously diagnosed and undiagnosed OSA are associated with depression prevalence and incidence in a male population-based cohort. Depression was assessed using Beck's Depression Inventory/Centre for Epidemiological Studies Depression Scale in 1875 adult men at 2 time points 5 years apart. A random sample of men without previously diagnosed OSA (n=857) undertook at home polysomnography (PSG) and completed the Epworth Sleepiness Scale questionnaire. 1660 men without depression at baseline were included in the longitudinal analysis of incident depression. Previously undiagnosed severe OSA (OR 1.9, 95% CI 1.07–3.70) was associated with depression prevalence in the cross-sectional analyses after adjustment for confounders and EDS. EDS (OR 2.4, 95% CI 1.40–3.95) was also associated with depression. Men with previously undiagnosed OSA and EDS had 4.2 times greater odds of depression than subjects without OSA and EDS and 3.5 times greater odds of depression than individuals with either OSA or EDS alone. Both previously diagnosed OSA (OR 2.0, 95% CI 1.15–3.45) and previously undiagnosed severe OSA (AHI≥30; OR 2.9, 95% CI 1.19–6.92) were significantly associated with depression onset. Other PSG parameters were not associated with depression prevalence or incidence. Severe OSA and EDS are independently associated with depression prevalence and onset in men. Clinicians should recognise the risk of OSA in men recently diagnosed with depression.

#### P7

### Sleep disorders, social status and self-rated health in Russian female population

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**Purpose.** To explore the prevalence of sleep disorders (SD) depending on social status and its relation with awareness and attitude towards the health in female population aged of 25–64 y in Russia/Siberia.



**Methods.** Under the third screening of the WHO program “MONICA-psycho-social” random representative sample of women aged 25–64 y (n=870) were surveyed in Novosibirsk. Estimation of sleep was assessed by the test Jenkins Sleep Questionnaire (JSQ).

**Results.** The prevalence of SD in female population aged 25–64 y was 65.3%. 36.5% of women with SD have negative self-rated health as “poor” ( $\chi^2=82.32$  df=16 p<0.001). More than 90% persons with SD have health complaints but taking care of their health is insufficient (77.3%;  $\chi^2=18.28$  df=8 p<0.05). With increasing levels of SD women more likely continue to work if caught a cold previously (poor sleep-56.5%, good sleep-37.5%;  $\chi^2=15.91$  df=4 p<0.05). In structure of marital status in women with SD proportion of married ones was tend to be higher. Prevalence of SD was 2-fold higher in women with elementary level of education compared to women with good sleep (15.5% and 7.1%, respectively;  $\chi^2=10.33$  df=3 p<0.05). Rates of SD were significantly higher in middle managers and executives compared to those with good sleep (9.6% vs 5.1%); the same findings were observed in easy manual workers experienced any SD – 21.1% and 15.4%, respectively ( $\chi^2=23.55$  df=9 p<0.01).

**Conclusions.** The prevalence of sleep disorders in female population 25–64 y is high: 65.3%. SD affected both white and blue collar equally and it indicates high strain at job and family-career intrapersonal conflict in married women as well as low awareness about the health.

## P8

### The relationship between excessive daytime sleepiness, functional capacity and autonomic modulation in adult controlled asthmatics

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**Background.** Excessive daytime sleepiness (EDS) is a particularly frequent complaint in patients with asthma and has a negative impact on quality of life and work performance. Daytime sleepiness is often the result of poor sleep quality and we hypothesized that could reflect in cardiac autonomic function. The aim of our study was evaluate the relationship between EDS, respiratory muscle strength, estimated by functional capacity and autonomic control.

**Methods.** 24 adult controlled asthmatics (29±9 years) were screened. Epworth Sleepiness Scale score (ESS); Maximum inspiratory pressure (MIP) and estimated functional capacity using the Duke Activity Status Index (DASI) were assessed. Heart rate (HR) and R-R interval were recorded at rest and spectral indices of heart rate variability (HRV) were calculated.

**Results.** Among all subjects, 11 subjects (55%) had ESS>10. The level of ESS was negatively correlated with MIP ( $r=-0.51$ ), with estimated  $VO_2$  ( $r=-0.46$ ) and LF/HF ratio ( $r=-0.59$ ) and LF ( $r=-0.71$ ).

**Conclusions.** Excessive daytime sleepiness is frequent in asthmatics and may reflect poor estimated functional capacity and lower autonomic control.

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## P9

### Gender differences of predictors of severity of obstructive sleep apnea

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**Background.** In spite of many studies, the reason for the gender-related differences in obstructive sleep apnea prevalence is not entirely understood. The aim of the study was to evaluate and to identify the main predictors of severity of obstructive sleep apnea in patients according to the gender.

**Methods.** 101 consecutive patients with obstructive sleep apnea were enrolled into the study. Age, gender, anthropometric and polygraphic data were thoroughly analysed. In all subjects daily sleepiness was assessed by Epworth Sleepiness Scale.

**Results.** The cohort consisted of 29 women with mean age 61.8±6.3 years and 72 men with mean age 54.5±13.1 years. Patients in both groups had the similar severity of obstructive sleep apnea syndrome: Apnea-Hypopnea Index (AHI) was 20.2±15 events per hour versus 28.1±20.1 (p=0.07). Females had higher Body Mass Index (BMI) and more comorbidities. The forward stepwise regression analysis shows that the age, Epworth Sleepiness Scale score and abdominal circumference are the important predictors of severity of obstructive sleep apnea in men, which explain 56% of the AHI (p<0.01). In women, BMI and abdominal circumference explain 41% of AHI.

**Conclusion.** Age, Epworth Sleepiness Scale score and abdominal circumference were found to be the major determinants of severity of obstructive sleep apnea in men, meanwhile BMI and abdominal circumference in women.

## P10

### Bilateral congenital choanal stenosis and changes in sleep: a case report

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**Introduction.** Congenital choanal stenosis as risk factor for the syndrome of upper airway resistance (UARS) is not well described.

**Objectives.** Case report of choanal stenosis with upper airway resistance syndrome and disorders sleep microstructure.

**Methods and results.** 22-year-old male with allergic rhinitis and insomnia, adenoid face, tonsils 2+/4 Brodsky Classification, Modified Mallampati 1, high-arched palate. Obese, 40 cm neck circumference, 98 cm waist circumference. Nasal endoscopy with bilateral choanal stenosis. Epworth Sleepiness Scale 2. In polysomnography, there were null AHI, 9/h of respiratory disturbance index, by elevated RERA index. No oxyhemoglobin desaturation, reduced sleep efficiency, reduced percentage of REM sleep. Increased arousal rate (16/h), nasal cannula with permanent flattening of the curve and cyclic alternating pattern in stage 2 non-REM sleep.

**Conclusion.** The consequence of this adaptation to airflow limitation in the upper airway is noticed by the adenoid face, neuromuscular and cognitive changes. The nasal cavity is not well defined as a risk factor for OSA, it is not related to significant oxyhemoglobin desaturation, or apnea/hypopnea, but makes the adaptation of CPAP better. The microstructure of sleep shows arousals and CAP. The later is an event of cerebral electrical activity with periods of activation and inhibition during the second phase of non-REM sleep. It's possible that the increased number of awakenings, compromises the quality and quantity of REM sleep, causing a possibly non-restorative sleep and sleep fragmentation. CAP inclusion in AASM manual may increase PSG sensitivity and diagnosis neglected disorders.

P11

Phenotypes of comorbidity in OSAS patients

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**Background.** Several comorbidities commonly either develop or coexist with OSA. The aim of our study was to detect predictors of comorbidities in OSA patients.

**Methods.** We performed phenotyping on 879 OSA patients with a polysomnographically determined AHI over 15. Dimension reduction via Categorical Principal Component Analysis (CPCA) was performed on the items of the Charlson Comorbidity Index (CCI). A reduced dimension solution with an increase in variance explained was elected for two step clustering (TSC) employing the Schwarz-Bayesian Criterion as the clustering rule. One Way ANOVA with Bonferroni correction and Classification Trees with the ECHAID algorithm were used to detect differences between clusters. Multinomial Regression Analysis (MRA) was used to detect independent predictors of cluster membership.

**Results.** CPCA revealed that cardiovascular disease (CVD), age, cerebrovascular events and COPD explained 68% of the variance associated to comorbidity compared to 36% of the full CCI (Fig. 1). The TSC produced 3 clusters with a 0.9 Average Silhouette. Clusters differed significantly in Age, AI, CCI, BMI, ESS, daytime and minimum SaO<sub>2</sub> but not AHI or DI. Age, BMI and daytime SaO<sub>2</sub> independently predicted cluster membership (Likelihood Ratio Test p<0.0001). Cluster 1 (n=440) included subjects with no CVD, COPD or hypertension. Cluster 2 (n=53) included COPD patients, the majority (n=41) of which had CVD and/or hypertension. Cluster 3 (n=387) included patients with CVD and/or hypertension (Fig. 2).

**Conclusion.** CVD, COPD, BMI, daytime SaO<sub>2</sub> and Age were determined as significant features of underlying comorbidity phenotypes in our population of OSAS patients. Notably, OSAS clinical features were not predictive of phenotype membership.

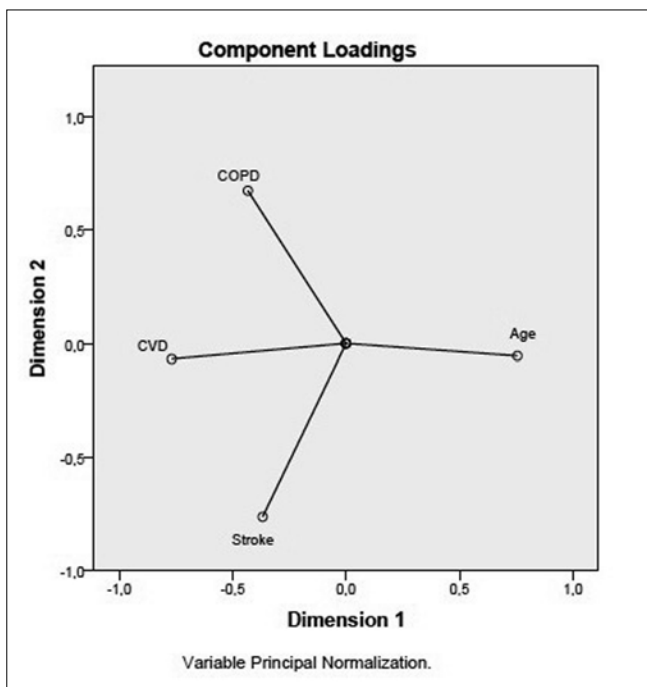


Fig. 1 | P11 ▲ CPCA with 63% variance explained in a 2D solution

P12

Age specific long term reduction of blood pressure under CPAP treatment in hypertensive patients with obstructive sleep apnea syndrome

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**Introduction.** In hypertensive (HT) patients with obstructive sleep apnea (OSA) reduction of blood pressure (BP) under CPAP is controversial, often reported using sphygmomanometer (SM), without long term follow up.

**Aims.** To study difference between young (<60 years) vs elderly (≥60 years) patients with OSA and HT regarding BP values, measured by SM and ABPM after 3 and 6 months of CPAP.

**Method.** We excluded patients with hypoventilation syndromes, respiratory dysfunctions, secondary HT, modified HT treatment during study, noncompliance (SPSS 17: Chi test, T-test).

**Results.** We studied remaining 15 patients: 7 young, 8 elderly, without significant differences regarding AHI and somnolence. Measured with SM, elderly had reduction in systolic BP (SBP-connected with age) and diastolic BP (DBP) after 3 months (from 141.2±8.3 to 123.6±15.9 mmHg, p=0.019, respectively from 80.0±9.2 to 66.2±7.4 mmHg, p=0.006), without any differences after 6 months of CPAP. Measured by ABPM elderly patients had a significant decrease only in DBP minimum nocturnal values from 55.3±6.3 to 47.5±5.7 mmHg after 3 months, p=0.021. In young patients DBP measured by SM was significantly lower after CPAP (from 85.0±12.5 to 71.4±6.9 mmHg, p=0.028 after 3 months, to 70.0±7.0 mmHg, p=0.038

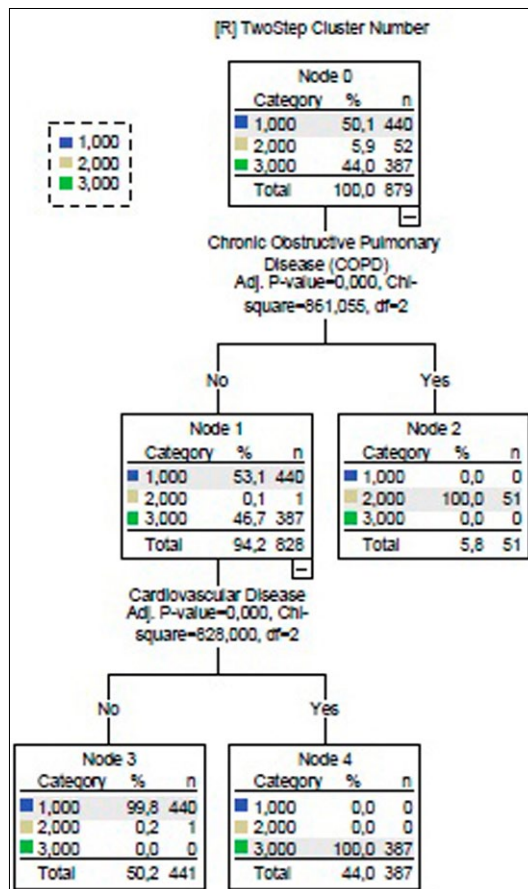


Fig. 2 | P11 ▲ Classification tree employing the exhaustive CHAID (ECHAID) algorithm

after 6 months), without differences regarding (SBP) or in ABPM measurements. No modification regarding the dipper pattern at 3 or 6 months. **Conclusion.** Regardless comorbidities, there was a significant reduction in DBP in both young and elderly OSA patients under CPAP only in SM measurements which is not so reliable in terms of cardiovascular risk as ABPM.

**P13**  
**Sleep in North Indian patients of chronic obstructive pulmonary disease (COPD)**

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**Objectives.** Primary: sleep pattern in patients of chronic stable COPD. Secondary: presence and correlation of obstructive sleep apnea (OSA) in COPD.

**Study Design.** Case Control (Fig. 1).

**Material and methods.** 40 Patients of COPD as per GOLD staging (20 each of moderate and severe severity) and 10 age and gender matched healthy controls were included with exclusion of known cases of OSA, hypothyroidism, diabetes, heart failure and hypertension. Epworth sleepiness score (ESS), Berlin's score, anthropometry, metabolic profile and blood gases were measured. OSA was diagnosed as per AASM guidelines with Apnea hypoapnea Index (AHI)  $\geq 5$ .

**Results.** 25% of COPD patients had OSA. ESS, Berlin's Score and Modified Mallampati Grade (MMG) were significantly higher in patients with OSA. Sleep architecture was distorted in COPD patients with increased awakenings and decreased efficiency. Severity of respiratory events had linear correlation with the severity of COPD.

**Conclusion.** Sleep architecture is distorted and less efficient in patients COPD. OSA is not uncommon in these patients. ESS, Berlin's score and MMG are good tools for screening of OSA in COPD.

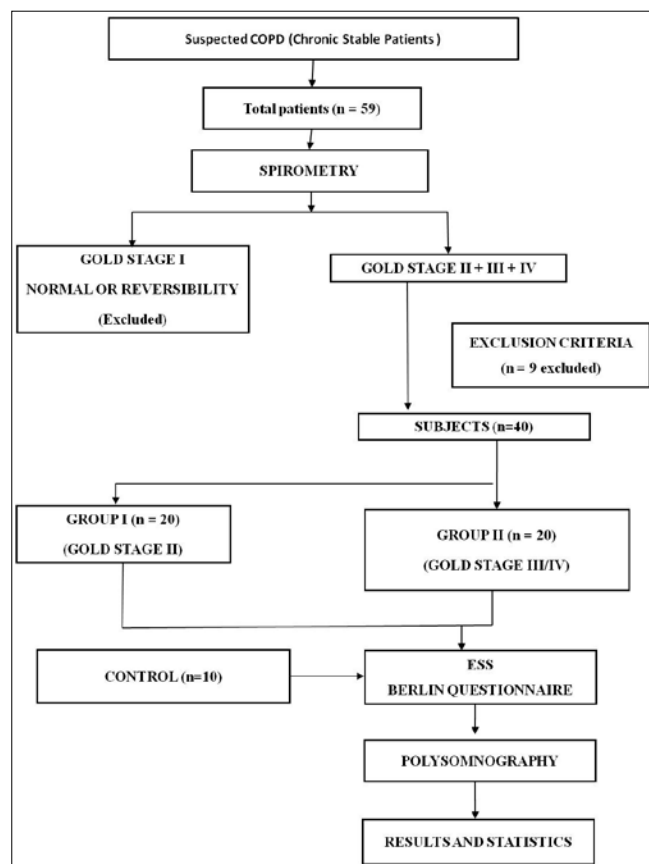


Fig. 1 | P13 ▲ Study design

**P14**  
**Ellagic acid ameliorates bleomycin induced pulmonary fibrosis in wistar rats**

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**Introduction.** Bleomycin (BLM) a cytotoxic antibiotic is widely used in cancer chemotherapy. Among the various side effects of BLM, lung fibrosis is a major deterrent in its clinical use. Ellagic acid (EA) showed protective action.

**Methods.** We wanted to study the prophylactic effect of EA on the toxicity profile of BLM. Wistar rats were exposed to standardized dose of BLM (10 mg/kg b.w., intratracheally) and EA (15 mg/kg b.w., orally) for 14 days of treatment schedule. Lung fibrosis was measuring by checking the level of hydroxyproline which was supported by massive trichome analysis of the lung samples to check the level of fibrosis. Antioxidant profile of lungs was also measured along with histopathological examination of tissues.

**Results.** In exposed animals, there was a significant increase in the level of hydroxyproline level as a mark of collagen. Various antioxidant enzymes activities such as GPx, GR,GST,SOD and CAT decreases when exposed to BLM which was significantly restored by EA pretreatment. EA treatment modulates enhanced NO production, MPO activity in rat lungs exposed to BLM. Treatment of EA also caused significant decrease in LPO and increase in GSH content in rat lungs. It was also revealed that there was discernible edema formation in lungs of treated animals which was subsequently attenuated by EA.

**Conclusion.** Massive trichome and histological findings strongly support the onset of pulmonary fibrosis and biochemical alterations showing changes such as inflammation and fibrosis in BLM exposed rat lungs which was attenuated by EA resembles to control. BLM exposure showed a toxic effect and administration of EA showed protection.

**P15**  
**Mandibular movements during Cheyne Stokes breathing in heart failure**

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**Introduction.** During Cheyne Stokes breathing (CSB) in patients with heart failure (HF), central apnea or hypopnea (CAH) alternate periodically with a crescendo/decrescendo pattern of breathing (CDB). Respiratory effort (RE) occurs to force the ventilation in response to a powerful respiratory drive. We previously showed that RE is associated with an increase in mandibular movements (MM) during OSA. The ability to detect CDB by recording MM in HF patients was investigated here.

**Methods.** Ten consecutive patients with systolic/diastolic HF and CSB were included. MM were measured during polysomnography (PSG) with a magnetometer device. Sensors were placed on the chin and forehead. MM patterns were evaluated by measuring peak to peak fluctuations >0.3 mm in mandibular excursion (MML) driven by the respiratory cycles and/or sharp movements(MMS) of high amplitude closing the mouth (Fig. 1).

**Results.** Among 892 recorded CDB events, 67% were associated with a cortical arousal (CAr). Whatever the presence or not of a CAr, CDB was associated with MM in 94%. MMS were present in 88% CDB marked by a CAr and in 63% without CAr. No effect of sleep stage was observed on data. MML were observed in 91% CDB.

**Conclusion.** The monitoring of MM during sleep looks useful to detect CSB in HF patients. CSB pattern during sleep is known to participate in the HF progression, thus the record of MM could be recommended with a home based device to identify such patients at risk of deterioration.



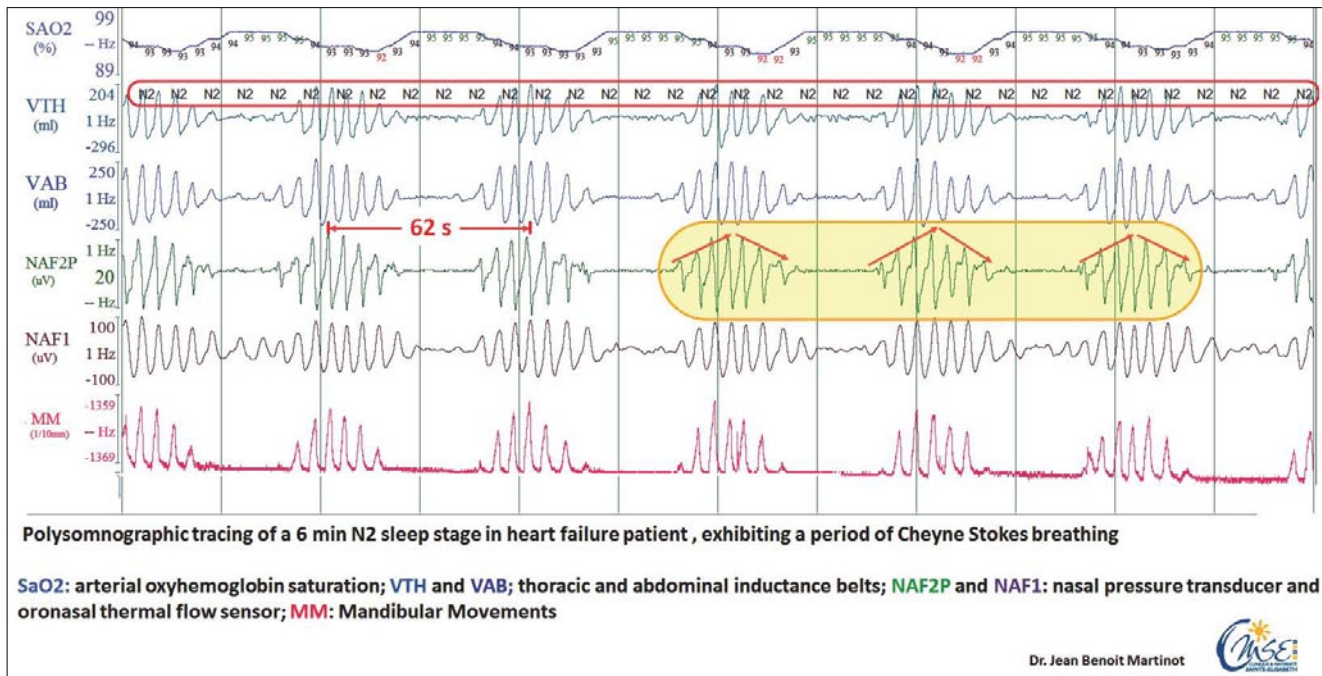


Fig. 1 | P15 ▲ Polysomnographic tracing

**P16**  
**Daytime sleepiness in patients with chronic obstructive pulmonary disease**

Sanja Dimic Janjic<sup>1</sup>, Jelena Cvejic<sup>1</sup>, Branislava Milenkovic<sup>1</sup>  
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**Background.** Patients with COPD report subjective sleep difficulties concerning initiating and maintaining sleep, diminished time, efficiency and sleep quality, daily sleepiness that interrupts everyday activities. This research was aimed to identify COPD patients with subjective excessive daytime sleepiness and relation with their anthropometric characteristics and lung function. Sleep disturbances can be consequence of COPD, as the underlying lung disease, but can suggest possible co-existent sleep apnea-hypopnea syndrome (SAHS).

**Methods.** Forty patients with stable COPD underwent spirometry, body weight and height measurement, body mass index (BMI) and neck circumference. Serbian version of Epworth sleepiness scale [Kopitovic I. et al, Sleep Breath. 2011 Dec;15(4)] was administered to all, with ESS >10 considered as signifying excessive daytime sleepiness.

**Results.** We recruited 40 COPD patients (Global Initiative – GOLD stage I (12.5%), II (45%), III (30%) and IV (12.5%), 19 women (47.5%) and 21 men (52.5%), average age 67±9.7 years; BMI 28,01±6.72; neck circumference 39,51±4.17 cm. Group A (29 patients; 72.5%) had Epworth sleepiness score (ESS) ≤10. Group B (11 patients; 27.5%) had score ESS >10 (ESS from 11 to 15 in 15% and ESS ≥16 in 12.5% of all COPD patients). There was no statistically significant correlation between groups in age, sex, BMI, neck circumference, FEV1 and Epworth sleepiness score.

**Conclusion.** Further investigations of possible predictors for SAHS are required to add to Epworth sleepiness score in screening COPD patients with possible coexisting SAHS.

**P17**  
**The relationship between substance abuse (tobacco and opium) and chronic obstructive pulmonary disease in hospitalized patients**

Mitra Safa<sup>1</sup>, Saeid Fallah Tafti<sup>2</sup>, Fatemeh Ghassem Boroujerdi<sup>3</sup>, Firouzeh Talischi<sup>4</sup>

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**Background.** Holistic care for patient involves seeing the patients not just as a lung organ for example but as a person, and treating both body and psyche; otherwise desired treatment might not be reached. The purpose of this study was to assess amount and pattern of substance abuse among hospitalized chronic obstructive pulmonary disease patients to be able to better plan a treatment program for them.

**Methods.** 90 patients with chronic obstructive pulmonary disease participated in this cross-sectional and analytic research project. Information was entered into the computer and analyzed with SPSS16 statistical software.

**Results.** Mean age of participants was 66 years of which 90% were male and 84% were married. 37.9% smoked at the time of research and 51.2% lit their cigarette in the first 5 minutes upon waking up. Most patients (50.9%) started using opium at 20–39 years of age. 71% used opium regularly. Of all opium users, 64.8% smoked it and 35.2% used it orally. Pattern of opium use and number of hospitalizations were related. Correlation between job and pattern of abuse of substances was found.

**Discussion.** Most patients despite having progressive pulmonary disease continue to smoke and use opium, so they have been noncompliant with treatment and have required multiple hospitalizations. As a result, comprehensive treatment of these patients including both pulmonary disease and addiction need to be addressed.

P18

**Severity of anxiety disorders in patients with chronic obstructive pulmonary disease**Mitra Safa<sup>1</sup>, Saeid Fallah Tafti<sup>2</sup>, Fatemeh Ghassem Boroujerdi<sup>3</sup>, Firouzeh Talischi<sup>4</sup>

<sup>1</sup>Medical Medicines, Clinical Tuberculosis and Epidemiology Research Center, National Research Institute of Tuberculosis, Tehran, Iran, <sup>2</sup>Medical Medicines, Tobacco Prevention and Control Research Center, National Research Institute of Tuberculosis and Lung, Tehran, Iran, <sup>3</sup>Medical Medicines, Chronic Respiratory Disease Research Center, National Research Institute of Tuberculosis and Lung, Tehran, Iran, <sup>4</sup>Medical Medicines, Nursing and Respiratory Health Management Research Center, National Research Institute of Tuberculosis, Tehran, Iran

**Background.** Patients with chronic physical diseases sometimes show increased loss of function. These patients need more care. Anxiety is a well-known symptom that is usually prevalent among Chronic Obstructive Pulmonary Disease patients that can prolong exacerbations of disease and increase the risk of hospitalization. The purpose of this study was evaluation of severity of anxiety in mentioned patients, prevalence and awareness of symptoms and appropriate treatment strategy in a timely fashion.

**Materials and methods.** This was a cross sectional study at Masih Daneshvari Hospital. 143 patients entered to the project with informed consent and by accessible method and they filled demographic information and Hamilton anxiety and depression questionnaires. Information analyzed by SPSS-16.

**Results.** 68% were above 60 years. 22% were female and 78% were male. 89% were married. 38% were self employed. 28% were unemployed. 72% had history of smoking. 46% had history of substance abuse. 19.6% had mild anxiety disorder. 16.8% had mild to moderate and 49% had moderate to severe anxiety disorder.

**Conclusions.** Research in recent years show that infectious diseases in humans may also accompany with mental changes. According to these findings many chronic diseases such as Chronic Obstructive Pulmonary Disease may be the cause of anxiety and depression which result in weakness of the patient and taking no action for self-care and improvement, which lead to relapse of the disease and more vulnerability and they would be prone to increased impact of illness. Therefore evaluation of patients, anxiety is worthy for improving his or her disease.

P19

**Excessive daytime sleepiness in patients with chronic kidney disease undergone hemodialysis**Nina Fonseca<sup>1</sup>, Israel Santos<sup>1</sup>, Virgilio Fernandes<sup>2</sup>, Vinicius Fernandes<sup>2</sup>, Viviane Lopes<sup>2</sup>, Leticia Guimaraes<sup>1</sup>, Nadua Apostolico<sup>1</sup>, Jessica Urbano<sup>1</sup>, Sergio Nacif<sup>1</sup>, Luis Oliveira<sup>1</sup>

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**Introduction.** Approximately 80% of patients with chronic kidney disease complain about sleep disorders, which is a much higher percentage than in the general population. Excessive daytime sleepiness is the third most frequent complaint in these patients, and it is significantly associated with a higher risk of sleep apnea. The aim of this study was to assess the presence of daytime sleepiness in patients with end stage renal disease (ESRD) who were undergoing diurnal hemodialysis.

**Materials and methods.** The Epworth Sleepiness Scale (ESS) was applied to patients with ESRD who underwent diurnal hemodialysis in the Centro de Nefrologia da Zona Norte in Sao Paulo, Brazil.

**Results.** A total of 168 patients were included in the study. According to the ESS, 31% presented mild propensity to excessive sleepiness, 22% moderate, and 17% severe.

**Conclusion.** Our study concluded that 70% of the sample of patients with ESRD who were undergoing hemodialysis presented with a propensity to excessive sleepiness in inappropriate circumstances on the ESS. When excessive daytime sleepiness is associated with sleep apnea and other comorbidities, it is essential to carefully assess patients' complaints.

**Keywords.** Sleep, Renal dialysis, Sleepiness, Chronic renal insufficiency

P20

**Negative expiratory pressure test as screening to obstructive sleep apnoea in Myasthenia Gravis patients**Sergio Nacif<sup>1</sup>, Ezequiel Oliveira<sup>1</sup>, Nadua Apostolico<sup>1</sup>, Nina Fonseca<sup>1</sup>, Ismael Dias<sup>1</sup>, Giuseppe Insalaco<sup>2</sup>, Salvatore Romano<sup>2</sup>, Valeria Cavalcante<sup>2</sup>, Acary Bulle<sup>3</sup>, Luis Oliveira<sup>1</sup>

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**Background.** Expiratory flow limitation (EFL) has been described as a transient or sustained decrease in expiratory flow during the application of the NEP test. The aim of this study was to describe the application of a new NEP method for assessing EFL during spontaneous breathing to identify myasthenia gravis patients at risk for OSA.

**Materials and methods.** Upper airway collapsibility was evaluated by measuring decreases in flow and expired volume during the first 0.2 s after the application of NEP at 06 and 10 negative cmH<sub>2</sub>O. The NEP test was easily applied to evaluate EFL caused by upper airway obstruction in patients with OSA.

**Results.** 15 clinically stable patients with MG (13 females) were evaluated. Of these 15 completed the pulmonary function tests and answered questionnaires of quality of life MGQOL-15. The average score of MGQOL-15 of these 15 patients was 27.8 and the average Epworth these 15 patients was 9.73 the clinical questionnaire Berlin was positive in only one patient. The mean age of the 20 patients was 41±11 years and the mean BMI was 29.3±5.4. Regarding polysomnographic variables highlights the average AHI of 15 patients was 17.8 (0.8–66.7) percentage of REM sleep average was 12.6±4.02. FVC (%) found is 87%. The values for the test NEP were 29.4±12.5, and 27.4±14.6 Vo.2/6 s and Vo.2/10 s respectively.

**Conclusion.** The NEP test can be a new method to assessing expiratory flow limitation during spontaneous breathing used to identify in MG patients at risk for obstructive sleep apnoea, detecting upper airway collapsibility.

P21

**Sleep, lung function and quality of life in patients with myasthenia gravis clinically stable**Ezequiel Oliveira<sup>2</sup>, Sergio Nacif<sup>2</sup>, Leticia Guimaraes<sup>2</sup>, Nadua Apostolico<sup>2</sup>, Rafael Almeida<sup>2</sup>, Nina Fonseca<sup>2</sup>, Valeria Cavalcante<sup>2</sup>, Fernando Leitao-Filho<sup>1</sup>, Claudia Oliveira<sup>2</sup>, Acary Oliveira<sup>3</sup>, Luis Oliveira<sup>2</sup>

<sup>1</sup>Medicine School, University of Fortaleza (UNIFOR), Fortaleza (CE), Brazil, <sup>2</sup>Sleep Laboratory, Nove de Julho University (UNINOVE), Sao Paulo (SP), Brazil, <sup>3</sup>Division of Neuromuscular Disorders; Department of Neurology and Neurosurgery, Federal University of Sao Paulo (UNIFESP), Sao Paulo (SP), Brazil

**Introduction.** The presence of sleep disorders in Myasthenia gravis (MG) patients, can negatively affect the ventilation and the mechanics of breathing in wake and sleep. Some studies have shown a poor quality of sleep, excessive daytime sleepiness and the presence of sleep disordered breathing, while others did not observe a positive correlation. The aim of the study was to investigate sleep quality, lung function, ventilatory patterns, disease severity, clinical status and quality of life in clinically stable MG patients.

**Methods.** We propose a cross sectional analysis and prospective observational study with MG patients. The design, conduct, and reporting of this study will follow the rules of The STROBE Statement.

**Results.** The mean age of the 20 patients (17 females) evaluated was  $44 \pm 11.6$  years and the mean BMI was  $28.0 \pm 6.0$ . The average score of MGQOL-15 was 27.8 and the average Epworth Sleepiness Scale was 9.73, and the Berlin questionnaire was positive in only one patient. Regarding polysomnographic variables highlights the average AHI was  $19.82 \pm 20.16$  percentage of REM sleep average was  $13.16 \pm 4.16$ .

**Discussion.** Observing our results we can highlight a significant drop in oxyhemoglobin saturation, reduced REM time, increased NREM3 stage in two patients, a significant increase in AHI and a high risk for OSA by clinical questionnaire Berlin sleep. Only one patient had abnormal ventilatory pattern by spirometry.

**Conclusion.** We conclude that patients with clinically stable MG have a high rate of respiratory sleep disorders.

**Keywords.** Myasthenia gravis, Sleep; Pulmonary function; Quality of life

## P22

### Negative expiratory pressure technique as screening to obstructive sleep apnoea

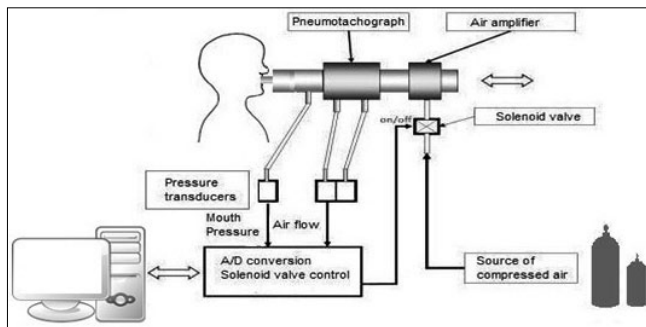
Sergio Nacif<sup>1</sup>, Nadua Apostólico<sup>1</sup>, Nina Fonseca<sup>1</sup>, Ezequiel Oliveira<sup>1</sup>, Israel Santos<sup>1</sup>, Jessica Urbano<sup>1</sup>, Salvatore Romano<sup>2</sup>, Giuseppe Insalaco<sup>2</sup>, Luis Oliveira<sup>1</sup>  
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**Background.** Negative expiratory pressure (NEP) technique is used to assess upper airway collapsibility in patients with obstructive sleep apnea, in which expiratory flow limitation has been described as a transient or sustained decrease in expiratory flow during application of NEP. **Aim.** The aim of this study was to describe the negative expiratory pressure NEP, a new method assessing expiratory flow limitation during spontaneous breathing used to identify patients at risk for obstructive sleep apnea.

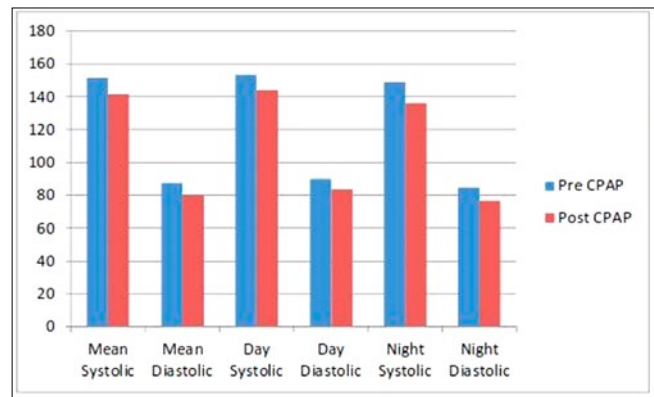
**Material and methods.** Upper airway collapsibility is evaluated by measuring decreases in flow and in expired volume in the first 0.2 seconds after negative expiratory pressure application at 10 cmH<sub>2</sub>O.

**Results.** The NEP is a new method to detect upper airway flow limitation and has been disseminated worldwide over two decades of research. Authors have applied the NEP in different subjects such as healthy individuals, patients with chronic obstructive pulmonary disease, obesity and sleep disorders obstructive sleep apnea to detect airflow limitation (Fig. 1).

**Conclusion.** Some studies have been conducted under different population and have shown that this new method is reliable to detect upper airway collapsibility and could be used as a screening method for diagnostic obstructive sleep apnea (OSA).



**Fig. 1 | P22** ▲ Block diagram of the instrument for the analysis of airflow limitation by the negative expiratory pressure technique



**Fig. 1 | P23** ▲ Ambulatory blood pressure readings pre and post CPAP

## P23

### Effect of continuous positive airway pressure (CPAP) on blood pressure and medications in patients with obstructive sleep apnoea (OSA) and resistant hypertension

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**Introduction.** Patients from a resistant hypertension clinic were selected to investigate the effect of CPAP on blood pressure (BP) in patients with OSA and resistant hypertension.

**Methods.** 22 patients [age 53.3 (SD=16.7), BMI 37.3 (SD=5.9)] with OSA [Apnoea-hypopnea Index 31.2 (SD=15.5), Epworth Score 9.9 (SD=3.1)] and resistant hypertension were started on CPAP for 6 months. Anti-hypertensive number and dose were analysed to ensure the results were not attributable to medication titration.

**Results.** The intervention of CPAP elicited a statistically significant mean reduction across all BP values including systolic  $-9.7$  (95% CI 4.7–14.6),  $p=0.001$ ; diastolic  $-7.3$  (95% CI 3.1–11.5),  $p=0.002$ ; day systolic  $-9.5$  (95% CI 4.1–14.9),  $p=0.002$ ; day diastolic  $-6.4$  (95% CI 2.2–10.7),  $p=0.005$ ; night systolic  $-12.8$  (95% CI 7.8–17.9),  $p<0.000$  and night diastolic  $-8.4$  (95% CI 2.9–13.8),  $p=0.004$ . The reduction in BP was not due to medication titration as the reduction in antihypertensives was not statistically significant ( $-0.1$ ,  $p=0.67$ ) and there was a statistically significant mean decrease in medication percentage dose of 11.7% (95% CI 4.4–19.0),  $p=0.03$  (Fig. 1).

**Conclusion.** The analysis suggests that CPAP reduces ambulatory blood pressure readings in patients with OSA and resistant hypertension. Randomised control trials are needed to confirm these results.

## P24

### Sleep disordered breathing in patients with heart failure with normal ejection fraction

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**Background.** It has been shown that patients with chronic heart failure frequently suffer from sleep disordered breathing (SDB). Obstructive sleep apnea (OSA) as well as Cheyne-Stokes respiration (CSR) have been observed, even though often these patients do not show typical symptoms. Most publications were conducted on patients with heart failure with reduced ejection fraction. As there are only few evidence based options for treating patients with heart failure with normal ejection fraction (HFNEF), we want to investigate if therapy of SDB has a benefit regarding HFNEF.

**Methods.** We screened patients with HFNEF by portable monitoring for SDB (ApneaLink plus, ResMed). Patients with suspicious findings undergo polysomnographic examination. We are aiming at a total of 50



patients. If they show relevant SDB, we initiate positive airway pressure (PAP) therapy or oxygen treatment if PAP-intolerance occurs. Also, we perform physical exercise testing, echocardiographic examination of diastolic parameters (E/A-ratio, E/E'-ratio, left atrial volume), measurement of NT-pro-BNP and use several questionnaires. Patients are followed up after 6 months performing all mentioned examinations again.

**Results.** So far 31 patients underwent polysomnographic examination, 7 of which did not show relevant SDB, 15 showed OSA and 9 CSR. Of those patients, 14 now receive PAP therapy and 10 oxygen treatment. The first follow-up patient showed promising results (e.g. NT-pro-BNP changed from 623 ng/l to 446 ng/l). By the time of the congress in April, more results will be available.

**Conclusions.** We hope to find that therapy of SDB in patients with HFNEF does not only better sleep apnea, but also objective heart failure parameters.

## P25

### Impact of obstructive sleep apnea on the right ventricle

Abouda Maher<sup>1</sup>, Yangui Ferdaous<sup>1</sup>, Harbegue Besma<sup>2</sup>, Zakhama Lilia<sup>2</sup>, Triki Mariem<sup>1</sup>, Khouani Hend<sup>1</sup>, Charfi Mohamed Ridha<sup>1</sup>

<sup>1</sup>Department of pulmonology, Hospital of FSI, La Marsa, Tunisia, <sup>2</sup>Department of cardiology, Hospital of FSI, La Marsa, Tunisia

**Background.** Right ventricular (RV) involvement in obstructive sleep apnea syndrome (OAS) is controversial. The aim of this study was to determine a correlation between echocardiographic parameters of RV function and severity of OSA assessed by the apnea-hypopnea index (AHI).

**Methods.** Sixty patients with suspected OSA were included. All patients had overnight polygraphy and an echocardiographic assessment of RV structure and function. Patients were divided into three groups: a control group (n=20) with an AHI<5/h, a group of moderate OSA (n=18) with an AHI=5-30/h and a group of severe OSA (n=22) with AHI≥30/h.

**Results.** There were no differences of age, body mass index and sex among the three groups. RV free wall thickness, end-diastolic surface and right atrium surface were statistically higher in OSA patients compared with controls. The peak systolic myocardial velocity at tricuspid lateral annulus S' were significantly lower in patients compared with controls (14.5±3 vs 11.1±2 cm/s, p<0.001; respectively). This decrease was greater in patients with severe OSA compared with moderate OSA (11.4±3 vs 13.0±1 cm/s, p=0.05, respectively). Right ventricular myocardial performance index (MPI) was significantly higher in OSA compared with controls (0.5 ±0.12 vs 0.46±0.14, p=0.024, respectively) but it was not correlated with the severity of IAH.

**Conclusions.** In OSA patients, there was a significant RV dysfunction, although the correlation with the severity of IAH was moderate.

## Thematic Poster Session "Obesity and Physiology"

## P26

### Association between sleep disordered breathing and glaucoma

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**Aim.** To assess the prevalence of glaucoma in patients with obstructive sleep apnea and to assess the prevalence of obstructive sleep apnea in patients with glaucoma.

**Subjects and methods.** The study included 36 subjects (12 males and 24 females) divided into groups. Group1 included patients who were referred to the sleep lab at the chest department for assessment of symptomatic sleep disturbance disorders and who had no history suggestive of ophthalmological complaint. This group was subdivided according to results of PSG into: Group 1A Patients with OSA, Group 1B Patients

without OSA. Group 2 Patients with primary open angle glaucoma referred from the glaucoma clinic underwent PSG study for assessment of the presence of OSA. This group was further subdivided according to results of PSG into: Group 2A: Patients with OSA. Group 2B: Patients without OSA. All patients were subjected to: 1. Thorough histostaining, 2. ESS, 3. anthropometric measurements, 4. PSG, 5. detailed ocular examination.

**Results.** 40% of patients presented from glaucoma had OSA as proved by polysomnography, 50% had mild OSA and 50% had moderate OSA with odds ratio 13.3 times the patient presented to sleep lab at the chest department for assessment of sleep disturbance disorders and with confidence interval 95%. It was found that RDI and SaO<sub>2</sub> time <90% were significantly higher among patients with combined OSA and glaucoma so, they may be possible predictors for occurrence of glaucoma in patients with OSA.

**Recommendations.** POAG patients referred to glaucoma outpatient clinic, sleep study should be performed to exclude OSA as a relative association that may contribute to the presence POAG.

## P27

### Relation between body mass index and control of bronchial asthma among Egyptian adults with asthma

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**Introduction.** Recent literature suggests that asthma in the obese may represent a unique phenotype of the disease that is often referred to as "obese-asthma" or "obesity-associated asthma".

**Objectives.** To evaluate the degree of asthma control among Egyptian asthmatics and to determine whether obesity or increased body mass index (BMI), contributes to worse asthma control.

**Methods.** Asthma control was determined using the asthma control questionnaire (ACQ) for 300 asthmatics. According to their BMI, patients were categorized into normal weight, overweight, obese and morbidly obese and were compared for demographics, clinical characteristics and ACQ scores. General linear models were used to evaluate the impact of BMI on asthma control (ACQ score).

**Results.** Asthmatics showed poor asthma control on average (ACQ=1.6). 64% of them were either overweight or obese. Patients with higher BMI scores showed significantly worse asthma control (ACQ scores; p<0.001). General linear models confirmed that higher BMI is an important predictor of poor asthma control even after adjusting for age, sex, duration of asthma, selected comorbidities and controller medications. Patients with higher BMI reported more hospitalization, use of controller medications and oral steroids (p<0.001 for each).

**Conclusions.** Patients need not be classified as "obese" for excess weight and body fat to compromise several important asthma variables. Higher BMI, irrespective of BMI "category", may have important implications for asthma control, medication use, and asthma-specific hospitalization. Hence, suggesting important avenues for asthma management and control.

## P28

### Evaluation of the frequency of overlap syndrome in mild hypoxemic chronic obstructive pulmonary disease patients without obstructive sleep apnea syndrome symptoms

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Chronic obstructive pulmonary disease (COPD) and obstructive sleep apnea syndrome (OSAS) are both common diseases. The co-existence of both disorders is also common, and is referred to as overlap syndrome (OS). In the present study, we evaluated the prevalence of OS in mild



hypoxemic COPD patients without OSAS symptoms. Out of 183 COPD patients screened, 45 with mild hypoxemia (96% men, mean age 67.7±8.5 years) were included in our study and underwent polysomnography. Twenty-six patients with a RDI of ≥15 events/h were defined as OS. When OS (n=26) and COPD (n=19) groups were compared, BMI (29.6±6.6 vs. 25.6±4.9 kg/m<sup>2</sup>; p=0.03) and TNF-α level (24.77±8.15 vs. 3.59±0.83 ng/ml; p=0.03) were found to be significantly higher in OS group. Sleep time with SpO<sub>2</sub><90% was also significantly higher in OS patients (23.9±29.4 vs. 9.7±21.9%; p=0.02). Multiple regression analysis revealed a significant correlation between BMI and RDI (p<0.01). BMI was also correlated to FEV<sub>1</sub>/FVC ratio (p<0.01), duration of COPD (p=0.031), minimum SpO<sub>2</sub> (p=0.007) and sleep time with SpO<sub>2</sub><90% (p=0.001). BMI as a predictor of OSAS was examined with ROC curve analysis, the area under the curve was found to be 0.691 (p=0.03). For identifying OS patients, BMI>27.2 kg/m<sup>2</sup> had a sensitivity of 73% and specificity of 68%. The present findings support that high prevalence of OS in mild hypoxemic COPD patients is related to BMI, and a sleep study should be considered in obese COPD patients, even in those with no sleep apnea symptoms.

### P30

#### Sleep disorders and the TNF-α/G-308A polymorphism in program WHO MONICA MOPSY

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**Purpose.** To examine the association of the TNF-α/G-308A polymorphism genes with sleep disorders (SD) in the population of men in Russia  
**Material and methods.** Under the third screening of the WHO program “MONICA-psychosocial” random representative sample of men aged 25–64 years (n=657) were surveyed in Novosibirsk. Estimation of sleep was assessed by the Jenkin’s test.

**Results.** SD in man’s population of 25–64 years made: 48,3%. The genotype of G/G of a gene of TNF-α met at 79.1% of persons, A/G genotype in 19% of cases, and A/A genotype at 1,9% of men. Among carriers of a genotype of G/G of a gene of TNF-α, in comparison with carriers of all other genotypes, the sleep assessment “well” meets much more often (98,3%). On the contrary, among carriers of genotype of A/G of a gene of TNF-α, in comparison with carriers of all other genotypes, the sleep “satisfactory” (30%), than “good” (15,2%) was more often.

**Conclusion.** Determined that the genotype A/G of a gene of TNF-α is associated with sleep disorders.

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### P31

#### Is there any association between the severity of SAOS and glycated hemoglobin?

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**Introduction.** The OSA cause hypoxia and are associated with glycolipids changes, formation of free radicals and oxidative stress, being a risk factor for development of insulin resistance, glucose intolerance, type 2 diabetes mellitus and metabolic syndrome.

**Objectives.** Evaluate whether an association between the severity of apnea and hypopnea index and serum levels of glycated haemoglobin (HbA<sub>1c</sub>) exists in subjects with suspected OSAS without self-referred diabetes diagnosis.

**Methods.** Cross-sectional study of consecutive cases of a university hospital in Brazil. Twenty-two men with suspected OSA have taken part in

this study, within one year. All of them had no self-reported prior diagnosis of diabetes mellitus and they have undergone a full-night in-lab polysomnography so as it was possible to calculate the AHI. Blood sampling was performed for analysis of HbA<sub>1c</sub> levels. Summary statistics were calculated and statistical tests used were Spearman’s correlation test and odds ratio. The level of significance was 5%.

**Results.** The results of the study showed a strong positive correlation between the variables AHI and HbA<sub>1c</sub> and it was demonstrated by Spearman’s correlation coefficient =0.663, p=0.001 and odds ratio: OR=21.00 (CI 95%=1.00 to 438.25; p=0.0495).

**Conclusion.** These data suggest that the severity of OSAS may be associated with abnormal A<sub>1c</sub> levels in non-diabetics. There is an association between the severity of OSAS, measured by AHI/h, and serum levels of HbA<sub>1c</sub> in middle-aged men. Additional studies with larger samples are needed to obtain a better understanding of the association between OSAS severity and HbA<sub>1c</sub> levels.

### P32

#### Neutrophil-to-lymphocyte ratio in patients with obstructive sleep apnea syndrome

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**Introduction.** Obstructive sleep apnoea syndrome (OSAS) is a multi-systemic disease characterised by chronic inflammation. Though mechanisms taking role on inflammatory process of OSAS is not certainly clear, hypoxia periods repeating with short periods during night causes the activation of various inflammatory particles. The neutrophil-to-lymphocyte ratio (NLR) is a simple, rapid parameter that indicates the presence of systemic inflammation.

**Aims and objectives.** In this study, we aimed to evaluate the relationship between OSAS and the NLR.

**Methods.** We retrospectively examined the laboratory results of 209 patients with suspected OSAS, evaluated by polysomnography. The patients were classified into either the control group (n=91) or the OSAS group (n=118) according to their apnoea–hypopnoea index. WBC, hemoglobin, MPV, PDW, RDW and other haematological parameters were measured using an automated blood cell counter. The NLR was calculated as the absolute neutrophil count divided by the absolute lymphocyte count.

**Results.** There were no differences in age, sex, body mass index and smoking habit between patients with OSAS and controls. The NLR was higher in the OSAS group than in the controls (p=0.007). As the NLR increased according to the severity of OSAS, no statistically significant difference was detected between the groups (p=0.539). The NLR was also negatively correlated with the average oxygen saturation levels in the OSAS group.

**Conclusion.** The NLR is reportedly associated with many chronic diseases such as chronic obstructive lung disease, cardiovascular disease. These findings suggest that the NLR may be used as a marker of inflammation in patients with OSAS.

### P33

#### Arginase contributes to hypertension and endothelial dysfunction induced by chronic intermittent hypoxia

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Chronic intermittent hypoxia (CIH), a main feature of obstructive sleep apnoea (OSA) elicits endothelial dysfunction and hypertension. Nitric oxide (NO) levels play a critical role in vasomotor regulation and depend

on L-arginine availability, which can be reduced by arginase activity. We hypothesized if an increased counteracting arginase effect on NO-dependent vasodilatation may contribute to the hypertension. Thus, we studied effects of arginase inhibition on arterial blood pressure (BP) and NO-dependent relaxation in a rat model of OSA. Male Sprague-Dawley rats (250 g) were exposed to CIH (5% O<sub>2</sub>, 12 times/h 8 h/day) or sham condition for 28 days. After 14 days, a group of CIH rats was treated with 2(S)-amino-6-borono-hexanoic acid (ABH, 400 µg/day, osmotic pumps) until day 28 of the protocol. BP was measured by telemetry in conscious rats. External carotid arteries were isolated to measure vasoactive responses to KCl and acetylcholine (ACh) using wire-myography, and eNOS and arginase-1 by Western blot. CIH-induced hypertension (~10 mmHg) was reversed by ABH treatment. Arteries from CIH rats showed higher active contraction induced by KCl than sham rats ( $3.4 \pm 0.4$  vs.  $2.4 \pm 0.2$  N/m<sup>2</sup>) and decreased relaxation to ACh ( $12.8 \pm 1.5$  vs.  $30.5 \pm 4.6\%$ ). ABH reversed the enhanced contraction ( $2.5 \pm 0.2$  N/m<sup>2</sup>) and the impaired ACh-induced relaxation in CIH arteries ( $38.1 \pm 4.9\%$ ). Arginase-1 protein levels increased, whilst eNOS decreased in CIH-arteries. Our results suggest that an imbalanced arginase-1/eNOS ratio may contribute to the endothelial dysfunction and hypertension induced by CIH.

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### P34

#### Activation of nodose ganglion cannabinoid receptors potentiates upper airway muscle activation

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**Introduction.** Dronabinol, a non-selective cannabinoid receptor antagonist, ameliorates obstructive sleep apnea syndrome (Prasad, B. et al. *Front. Psychiatry* 2013; PMID 23346060). We hypothesize that this derives from disinhibition of upper airway motor outputs following activation of inhibitory cannabinoid receptors in the nodose ganglia of the afferent vagus nerves. Here, we report the increase in genioglossus muscle activity (EMG<sub>gg</sub>) following direct bilateral local injection of dronabinol into the nodose ganglia.

**Methods.** In 6 anesthetized (ketamine/xylazine) intubated Sprague-Dawley rats, the nodose ganglia were dissected and fine wires were placed bilaterally into the tongue base to record EMG<sub>gg</sub>. Respiratory pattern and EMG<sub>gg</sub> were recorded before and after brief airway occlusion (5s). Dronabinol (1 mg/100 µl) was injected into each ganglion by Hamilton syringe. After 15 minutes, the measurements were repeated.

**Results.** Prior to injection, airway occlusion increased phasic EMG<sub>gg</sub> by  $94 \pm 39\%$  ( $p=0.03$ ). Dronabinol injection alone increased EMG<sub>gg</sub> by  $146 \pm 65\%$  ( $p=0.04$ ). Subsequent airway occlusion increased EMG<sub>gg</sub> by an additional  $47\%$  ( $p=0.01$  vs baseline).

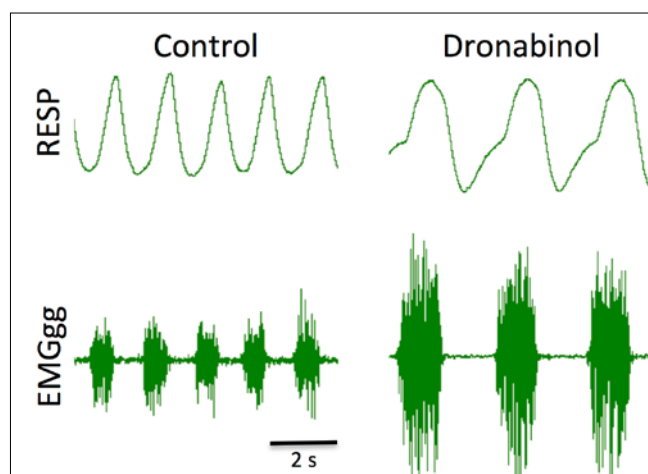


Fig. 1 | P34 ▲

**Conclusions.** We conclude that activation of cannabinoid receptors in the nodose ganglia significantly increases phasic respiratory activation of upper airway muscles without impairing negative pressure reflexes important for airway protection (Fig. 1).

### P35

#### CPAP treats sinus node dysfunction?

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**Introduction.** The association between sleep apnea-hypopnea syndrome (SAHS)-sinus node dysfunction (SND) is well recognized. We present a patient with both diseases in whom SAHS treatment with continuous positive airway pressure (CPAP) completely reversed SND.

**Case report.** Patient, 34 years with no cardiovascular history, with morbid obesity was presenting for excessive day sleepiness, with an Epworth scale of 17 point. The physical examination indicate a body mass index of 43,6. The electrocardiogram (ECG) confirmed sinus bradycardia. Laboratory analysis indicates low free testosterone value. Chest radiography, the lung function test was normal. Polysomnography was performed simultaneously with ECG holter recording there were 273 events during 8 hours, the longest apnoea of 52 s, apnoea hypopnea index of 70/hour of sleep, desaturation index of 52/hour, minimal O<sub>2</sub> saturation of 56%. Holter monitoring was with SND, an average heart rate of 60 bpm (31–120 bpm), pauses of up to 4 s in the daytime, 6,8 s at night, 11 pauses over 3 s. The echocardiogram was normal. We discussed the implantation of a dual-chamber pacemaker. CPAP treatment (10 cm H<sub>2</sub>O) was started, weight loss was recommended. After one month of CPAP treatment, he was asymptomatic. We performed another polysomnography simultaneously with ECG holter recording, improve cardiopulmonary parameters were observed: an apnea hypopnea index of 38/hour, desaturation index of 19/hour, minimal O<sub>2</sub> saturation of 70% (average of 87%). The baseline heart rate was now 68 bpm, daily or night time pauses were not observed.

**Conclusion.** The interest of our case lies in the complete disappearance of SND on Holter monitoring with CPAP treatment.

### P36

#### An observational study of obstructive sleep apnoea in Malta

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**Background.** The Maltese population has one of the highest BMIs in the EU. Up to 10% of the population suffers from diabetes, with CAD being the top cause of death. No data exists about OSA and associated comorbidities in Maltese patients.

**Aims.** Assess the appropriateness of referrals to the local sleep lab, describe the local OSA population for the first time, assess the coexistence of OSA and CAD in the local sleep clinic population.

**Results.** 377 patients aged 16 and over included, referred to the local sleep lab between August 2010 and December 2011. Mean BMI 37,31 kg/m<sup>2</sup>, mean AHI 31,81, 86,21% had a diagnosis of OSA; 50,77% had severe OSA, average HbA<sub>1c</sub> 7,3%. 78 (20,69%) of 377 patients included in the study underwent a coronary angiogram; 46 (58,95%) being diagnosed with CAD. 43 (93,48%) of those having documented CAD also had OSA. A positive correlation was found between AHI and BMI ( $r=0,35$ ,  $p=0,001$ ).

**Conclusion.** The local OSA population was severely obese with a mean AHI of 31,81. Referrals for investigation were appropriate in the majority of cases (86,21%). More than half of these patients (50,77%) had severe OSA. 12% of patients referred for sleep study had documented CAD with the majority being diagnosed with OSA (93,48%). The high mean AHI suggests that

these patients are being identified at a later stage of their disease. OSA is an independent risk factor for CAD and the two often co-exist. This is especially relevant in our local OSA population due to the high prevalence of diabetes and CAD. This study confirms that OSA within the local population is a potential major health problem that needs more research to describe the prevalence of the condition and associated comorbidities.

**P37**  
**Studying the central respiratory chemoreception using a mathematical model of phrenic nerve discharges**

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Central CO<sub>2</sub> chemoreceptors react primary on the intracellular pH decrease. Increase in CO<sub>2</sub> during hypercapnic acidosis, however, does not lead to intracellular pH recovery in chemosens. neurons, compared with non-chemosen. neurons under the same conditions. The regulatory mechanisms remains not explained, although a maintenance of different ion exchangers has been proposed to play a crucial role also in central chemorec [1]. Disregularities in the central chemosen. neurons are often associated with pathophysiol. mechanisms of SIDS or other serious ventilatory disorders. We study possible cellular mechanisms responsible for pH recovery by means of mathematical modeling using the ubiquitous Na<sup>+</sup>/H<sup>+</sup> and HCO<sub>3</sub><sup>-</sup>/Cl exchangers as the main transmembrane acid-base transporters. Different modeling approaches in eukaryotic cell and their adequacy for proposed task are evaluated. The simulations of phrenic nerve responses to central chemoreception have also been performed by means of modern mathematical approaches, such as wavelets or approximations entropy [2]. Decreased frequency ranges and complexity values were observed as a typical sign for hypoxic stages, suggesting the basic respiratory rhythm generator to become dominant for hypoxic and hypercapnic conditions. Future model implications are also suggested to evaluate prediction of (patho)physiological processes.

**References**

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**P39**  
**The effect of sleep on exhaled volatile compound pattern in obstructive sleep apnoea**

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**Introduction.** Previous studies reported that electronic nose could discriminate patients with obstructive sleep apnoea (OSA) from control subjects based on the analysis of exhaled breath volatile compound pattern. However, the effect of sleep on exhaled volatile compound pattern has not been studied before. We aimed to compare breath patterns in the evening and in the morning in patients with OSA, and to study the ability of the electronic nose to distinguish patients from controls based on these exhaled volatile patterns.

**Methods.** Exhaled breath volatile compound pattern was measured before and after night in 26 patients with suspected sleep-disordered breathing (53±15 years) who underwent polysomnography and in 10 control subjects (37±15 years), by whom sleep disordered breathing was excluded with a home apnoea screening device (ApneaLink, ResMed). Exhaled volatile compound pattern was processed with Cyranose 320 electronic nose, and principal component analysis was used for statistical analysis.

**Results.** Exhaled volatile compound patterns recorded in the evening and in the morning were different in patients with OSA (p=0.01) but not in non-OSA habitual snorers (p=0.49) or in control subjects (p=0.23). The electronic nose distinguished patients with OSA from control subjects based on the breath samples collected in the morning (p<0.001, classification accuracy 77%), but not in the evening (p>0.05).

**Conclusions.** Evening and morning exhaled volatile compound patterns are different in OSA. This might affect the ability of electronic noses to identify this disorder. Overnight alterations in volatile substances need to be taken into account during exhaled breath measurements in OSA.

**P40**  
**Healthy-lifestyle interventions for obstructive sleep apnea (OSA): current UK practice**

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**Introduction.** Obesity and a sedentary lifestyle are common in OSA and are associated with comorbidities. British Thoracic Society guidelines suggest Healthy-Lifestyle Interventions (HLI) for obesity-related OSA.

**Aims.** To assess the current practice regarding HLI for obese individuals with treated OSA in 1) a local tertiary care hospital and 2) across UK sleep services.

**Methods.** 1) Clinical records of individuals with obesity-related OSA attending a sleep clinic were reviewed. Lifestyle advice, HLI, and serial weights were assessed. 2) An on-line survey using five multiple-choice questions was sent to the leaders of UK sleep services about their practice and views on the provision of healthy lifestyle advice and interventions.

**Results.** 50 patient records were reviewed: 66% male, mean age 58 yrs. 82% of the patients had received healthy lifestyle advice: this was weight loss in 88% and increasing physical activity in only 20%. There was no change in serial weights (ANOVA p=0.99). Fig. 1 shows the results of the 35/126 responses to the survey sent to UK sleep services.

**Conclusions.** Weight loss is not currently achieved in obese individuals with OSA and written advice or support for increasing physical activity is rarely provided. Over a third of UK sleep services have no HLI available

Q1: Do you think a healthy lifestyle intervention should be part of the NHS treatment for individuals with obesity-related OSA?			
Yes: 76.5%			
No: 23.5%			
Q2: If answered "no" to Q1, who should be responsible for healthy lifestyle changes?			
Individual's responsibility: 37.5%			
Private initiative: 0.0%			
Other: 62.5%			
Q3: Do your patients routinely receive healthy lifestyle guidance from a healthcare professional to:			
Lose weight?	No: 2.9%	Yes (verbally): 76.5%	Yes (written): 20.6%
Increase daily activity?	No: 8.8%	Yes (verbally): 76.5%	Yes (written): 14.7%
What interventions do you have available to refer patients with obesity-related OSA?		Q4: For increasing physical activity or exercise	Q5: For weight loss
None		35.7%	43.8%
Support group		0.0%	0.0%
Home based self management programmes		0.0%	0.0%
Home based self management programme with periodic support from healthcare professional		7.1%	6.3%
Community programmes supervised by a healthcare professional		28.6%	15.6%
Private community programme		3.6%	0.0%
Hospital based programme supervised by healthcare professionals:		25.0%	9.4%
Pulmonary rehabilitation		N/A	21.9%
Cardiac rehabilitation		N/A	3.1%

**Fig. 1 | P40 ▲** Results of UK survey about the current provision of healthy lifestyle guidance and/or interventions for obese individuals with OSA

for obesity-related OSA. Further investigation of HLI is needed for this population.

#### P42

##### Visual evoked potentials alterations in OSAS patients with no visual impairment

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**Objectives.** The aim of the study is to evaluate the integrity of visual system in patients affected by obstructive sleep apnea syndrome (OSAS) by means of electroretinogram (ERGs) and visual evoked potentials (VEPs).

**Methods.** We performed ERGs and VEPs elicited by a reversal pattern generated on a TV monitor at low (55°) and high (15°) spatial frequencies stimulation in a group of patients affected by OSAS, as diagnosed by polygraphic cardiorespiratory monitoring. To be included in the study patients should not have visual impairment and other comorbidities affecting the visual system. Electrophysiological data were compared with those obtained in a group of age and sex matched healthy controls. In order to investigate the daytime sleepiness, both OSAS patients and controls underwent the Epworth Sleepiness Scale (ESS). We enrolled twenty-four OSAS patients; the control group included 24 subjects.

**Results.** In comparison to healthy controls, OSAS patients showed a significant latency delay coupled with a significant amplitude reduction of P100 wave of VEPs at both spatial frequencies. No significant differences between groups were detected as concern ERGs components. No correlations were found between polygraphic parameters and ESS scores with VEPs and ERGs components.

**Conclusion.** The present study shows that OSAS patients present VEPs alteration. It is well known that acidosis, hypercarbia, hypoxia and airway obstruction cause nerve damage. Therefore we hypothesize that in OSAS patients, the chronic hypoxia may affect the optic nerve function. We argue that changing in amplitude and latency of VEPs P100 component may be the electrophysiological expression of a neural damage in OSAS patients without other cause of nerve involvement.

#### P43

##### Sleep disordered breathing after facial nerve paralysis treatment with hemihypoglossal-facial nerve anastomosis

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**Objectives.** The aim of this preliminary report is to examine the influence of hemihypoglossal nerve transection on sleep study parameters.

**Methods.** The hemihypoglossal-facial nerve anastomosis was performed in two patients with iatrogenic facial paralysis. Both patients had normal parameters in the sleep study prior surgery and no tongue dysfunction. In patient P.A. postoperative study, there was no significant increase in breathing disturbances during sleep. Similarly, no deterioration was observed in three month follow-up. Whereas patient L.G. had an increase in all sleep disordered breathing (SDB) parameters two days following the surgery. Two month follow-up showed an improvement, but the results still remained high compared to the pre-surgical measurements.

**Results.** This report shows a potential worsening of SDB in patients undergoing a standard procedure for surgical facial nerve reconstruction. We hypothesize significant role of a partial hypoglossal nerve sectioning including nerve fibers of genioglossus muscle which prevents the posterior displacement of the tongue. As the nerve stimulator is used to find medial fibres innervating the genioglossus muscle during implantation of

hypoglossal nerve stimulation (HGNS), a similar method may be implemented as a part of a hemihypoglossal-facial nerve anastomosis procedure. This would allow this portion of the nerve to stay intact, and the lateral portion would be transected and attached to the facial nerve distal stump. It should be also considered whether prior to every hemihypoglossal-facial nerve anastomosis, the sleep study, as the part of preoperative tests, should be done to evaluate the patients' SDB status.

#### P44

##### Study of the possible relationship between the tissue intermittent hypoxia in sleep apnea and the serum uric acid/creatinine ratio

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**Objectives.** Determine if there are potential correlations between serum uric acid/creatinine ratio (UA/Cr) and sleep parameters and to determine whether the severity of sleep apnea syndrome (SAS) was associated with increased levels of UA/Cr ratio.

**Material and methods.** A sleep study was conducted on 106 patients and serum uric acid and creatinine was measured. The ratio UA/Cr was calculated. Anthropometric parameters and Epworth scale were recorded.

**Results.** 106 patients (77 men, 29 women), 54±13 years, BMI 30.1±5.8 kg/m<sup>2</sup>, neck circumference 42±5 cm, apnoea/hypopnoea index (AHI) 33.7±27.3 h-1 and Epworth scale 10±6. Using a Pearson correlation analysis, significant correlations were found between UA/Cr ratio and AHI (r=0.242), minimum SpO<sub>2</sub> (r=-0.251), desaturation index (DI; r=0.253), BMI (r=0.345) and neck circumference (r=0.303). No correlations with age and Epworth scale. To evaluate whether UA/Cr ratio varies according to the degree of severity, we differentiated 3 groups: 1 (AHI≤5), 2 (IAH>5-30), and 3 (AHI>30). The mean UA/Cr ratio from the groups were: 1) 4.9±1.1 2) 5.4±1.3 and 3) 5.9±1.2. Using an analysis of variance and a Bonferroni test, significant differences were found between groups 1 and 3 (p<0.015).

**Conclusions.** Significant positive correlations were found between serum uric acid/creatinine ratio and AHI, DI, BMI and neck circumference and negative correlations with minimum SpO<sub>2</sub>. Values of UA/Cr ratio increased as the severity of SAS increased. Then UA/Cr ratio could be considered a marker for intermittent hypoxia.

#### P45

##### Why exhaled nitric oxide is elevated in patients with obstructive sleep apnea syndrome

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**Background.** Airway inflammation in obstructive sleep apnea (OSA) has been reported. Snoring, hypoxia and obesity contribute to this inflammation. Measurement of exhaled nitric oxide (ENO) is a non-invasive method for evaluation of airway diseases.

**Objectives.** We aimed to evaluate the relation between level of ENO and severity of OSA.

**Patients and methods.** An exhaled nitric oxide measurement was performed in 52 consecutive patients referred for polysomnography or polygraphs. Patients with any respiratory diseases and active smoker were excluded. Subjects were divided into three groups according to the apnea-hypopnea index (AHI); group 1 subjects without or with mild OSA (AHI<15), group 2: patients with moderate OSA (AHI: 15-30), and group 3: severe OSA (AHI>30).

**Results.** 38 patients with mean age of 42.6±11 years were included. Patients were allocated to the three groups in the following way: G1: 12 patients, G2: 11 patients and G3: 15 patients. The EPOWORTH sleepiness scale was higher in the Group 3 (14.2) then the Group 2 (12.1) and the group 1 (10.6; p<0.05). The BMI in Group 1 (27.4) was lower than Group 2 (30.2) and Group 3 (31.3; p<0.05). The ENO in Group 1 (18.2 ppb) was lower than



Group 2 (20.4 ppb) and Group 3 (24.3 ppb). The ENO was more correlated to the obesity and the EPWORTH sleepiness scale than the IAHL.

**Conclusions.** Obesity and sleepiness are promoting factor in the inflammation of airways in patients with obstructive sleep apnea.

## OSA and Central Sleep Apnoea I

### P46

#### Obstructive sleep apnea in women and risk factors – retrospective analysis

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**Introduction.** Obstructive sleep apnea (OSA) affects mostly men but the prevalence of OSA in women may be higher than previously recognized which could be associated with its unique clinical expression and association to specific comorbidities. Regarding OSA risk factors, their prevalence in women are still unclear. OSA has a strong relation with cardiovascular diseases but when with psychiatric diseases the relationship has been inconsistent.

**Aim.** Investigate the relation between OSA and the prevalence of risk factors and comorbidities in women.

**Material and methods.** Retrospective analysis of women submitted to overnight polysomnography (PSG) at a Sleep Laboratory in a University Hospital between 2004 and 2013. Clinical reports were reviewed and pertinent clinical data retrieved, including Body Mass Index (BMI) and comorbidities. PSG allowed to divide in two groups, with or without OSA. Data analysis was executed by SPSS.

**Results.** A total of 403 women were enrolled in this study, 55.3% of which were diagnosed with OSA. OSA women were older, had higher BMI, more cardiovascular risk factors ( $p=0.000$ ) and a higher risk for overweight/obesity, diabetes, arterial hypertension and dyslipidemia ( $p<0.032$ ). Women without OSA had a higher risk for depression and/or anxiety. Stepwise multiple regression showed that age and BMI independently predicted OSA while depression and/or anxiety were negatively correlated with the risk of OSA.

**Conclusions.** Age and BMI were the two main independent risk factors for OSA and cardiovascular comorbidities as a whole were meaningfully associated with OSA in women. Psychiatric comorbidities such as depression and/or anxiety were relevant in women without OSA.

### P47

#### Adaptive servo-ventilation in patients with heart failure and Cheyne-Stokes respiration

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**Introduction.** The presence of obstructive sleep apnea and central sleep apnea with Cheyne-Stokes Respiration (CSR) was found to have great impact on the prognosis of patients with Heart Failure (HF).

**Objective.** To study the effectiveness of ASV in cardiac function and sleep-disordered breathing in patients with HF and CSR.

**Methods.** The sample consisted of 22 patients with HF evaluated with Polysomnography, diagnosed with CSR and compliant with ASV and optimal medical therapy for HF. As this is a retrospective study we used the clinical diaries to obtain parameters related to cardiac function and SDB. Analysis of parameters before and after ASV was performed.

**Results.** The sample had the following baseline characteristics: 74±8 years, class of the New York Heart Association of II and average left ventricular ejection fraction (LVEF) of 51.9±10.1%. After ASV treatment, the respiratory disorder index suffered a significant decrease of 36.7±20.1 to 11.8±8.9 ( $p<0.001$ ) and the %CSR of 32.4±26.3% to 3.3±9.8% ( $p=0.001$ ). The NYHA class was significantly decreased in 50% of patients ( $p=0.008$ ), LVEF increased from 54.9±10.1% to 56.1±10.6% ( $p=0.032$ ), and NT-proBNP values decreased from 4223.54±6979.8 pg/ml to 1311.6±1660.9 pg/ml ( $p=0.001$ ).

**Conclusions.** In our sample of patients, with HF and CSR, treatment with ASV therapy improved symptoms of HF and parameters related to cardiac function and SDB. These results demonstrate the need to consider the presence of obstructive and central events of the CSR type in order to initiate adequate treatment and improve cardiac function.

### P48

#### Clinical-functional effectiveness of auto-CPAP therapy in patients with combined pathology – BA+OSAHS

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**Aim.** To study the influence of auto-CPAP therapy on clinical symptoms and functional indices in BA patients with OSAHS.

**Materials and methods.** 20 BA patients [FEV<sub>1</sub>(68,0±3,3)%] with OSAHS [AHI – (33,6±5,6)] diagnosed by PSG, 7 female and 13 male, mean age (56,7±2,2) years with BMI (35,4±2,2) kg/m<sup>2</sup> were treated auto-CPAP therapy during 10 nights on the background of standard BA therapy. Patients were assessed with ACQ, Epworth Sleepiness Scale, bodyplethysmography [“Cardinal Health” (Germany)], 6-min walk test with BORG scale at baseline and after studied course of treatment.

**Results.** Addition of auto-CPAP therapy to the basic treatment in patients with BA+OSAHS led to early significant ( $p<0.05$ ) and clinically meaning (>0.5 points) decrease of clinical symptoms – ACQ changed from (1.7±0.1) till (0.9±0.1), daytime sleepiness – fell 2 times – from (15.2±0.8) till (8.1±0.8) points, ( $p<0.05$ ), increased morning PEF from (347±14) l/min till (354±15) l/min ( $p<0.05$ ) according diary, FEV<sub>1</sub> improved from (71.1±3.2) till (81.8±4.0)% pred. ( $p<0.05$ ), increased walking distance from (333.0±14.0) m till (349.7±13.3) m and decreased dyspnea from (2.2±0.2) till (1.5±0.2) points after end of treatment ( $p<0.05$ ).

**Conclusion.** addition of auto-CPAP therapy to the basic treatment in patients with BA+OSAHS improved clinical-functional indices: significant decreased of clinical symptoms, daytime sleepiness, improvement of morning PEF and bronchial airflow after course of studied therapy.

### P49

#### The effect of continuous positive airway pressure on respiratory infections in patients suffering from obstructive sleep apnoea

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**Introduction.** Continuous positive airway pressure (CPAP) is the standard treatment for obstructive sleep apnoea (OSA), with limited data about the prevalence of respiratory infections and microbial colonization in these patients.

**Aims and objectives.** The aim of this study is to determine if CPAP use is associated with respiratory infections and to identify the organisms that colonize or infect these patients.

**Method.** A prospective, case-controlled study in patients diagnosed with OSA was carried out. 137 patients were recruited, interviewed using a questionnaire and a nasal swab was taken from each patient. Patients using CPAP machines had swabs taken from masks and humidifiers.

**Results.** 66 (48.2%) patients received CPAP treatment with 60.6% of them having a heated humidifier. 78.8% were male, with the majority using a full face mask (63.6%). No significant difference was seen in the prevalence of rhinosinusitis, lower respiratory tract infections and hospital admissions between CPAP and non-CPAP treated patients. The presence of a humidifier did not influence the prevalence of infections. Commensal flora was predominantly cultured from nasal swabs from both patient groups. Coagulase Negative Staphylococci and Diphtheroids were the main organisms cultured from masks (23.4%) and humidifiers respectively.

**Conclusion.** This study shows that the use of CPAP, choice of mask and humidifier had no significant impact on the prevalence of infections and micro-organisms isolated. These results contrast with previous data suggesting that more research is needed to identify potential associations between respiratory infections, microbial colonization and CPAP use.

## P50

### Are there differences between patients with severe obstructive sleep apnea syndrome regarding sleepiness? Retrospective study

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**Introduction.** Epworth Sleepiness Scale (ESS) is evaluating excessive daytime sleepiness. Studies shown that ESS is associated with increased morbidity and mortality in obstructive sleep apnea (OSA).

**Aims.** To study the difference between patients with ESS $\geq$ 10 vs ESS $<$ 10 in a population with severe OSA (apnea-hypopnea index – AHI $\geq$ 30/h).

**Methods.** We studied 311 patients with severe OSA. After exclusion of other causes of somnolence (insomnia, COPD, asthma, GERD, restless leg, joint pain) we compared groups ESS $\geq$ 10 vs ESS

**Results.** ESS $\geq$ 10=174 patients (55.9%), ESS $<$ 10=137 (44.1%). Patients with ESS $\geq$ 10 are active smokers in a higher percent (36.9% vs 13.6%, p=0.041), have higher Fagerstrom score of nicotine dependence (5.2 $\pm$ 3.1 vs 2.7 $\pm$ 1.9, p=0.001), higher body mass index (35.3 $\pm$ 6.5 vs 33.7 $\pm$ 5.9, p=0.013), OSA symptoms non-related to somnolence in a higher percent – nightmares (37.4% vs 7.1%, p=0.004), nocturia (70.6% vs 25.6%, p=0.004), impotence (38.5% vs 9.3%, p=0.001) and more comorbidities (coronary heart disease, arterial hypertension, dyslipidemia; p $<$ 0.05). Although all patients had severe OSA, patients with ESS $\geq$ 10 had a higher AHI (63.9/h vs 54.7/h, p=0.001), higher desaturation index (66.4/h vs 56.5/h, p=0.001) and needed higher CPAP pressure to correct respiratory events (10.5 vs 9.7 cmH<sub>2</sub>O, p=0.002). ESS poorly correlated with Fagerstrom score (p=0.013, r=0.27) and CPAP value (p=0.001, r=0.27).

**Conclusions.** Severe OSA patients with ESS $\geq$ 10 appear to be a different phenotype, having more symptoms, more comorbidities, higher nicotine dependence and a more severe OSA syndrome.

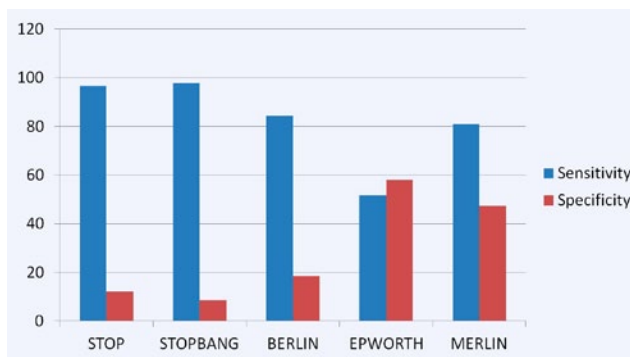
## P51

### Improving the identification of patients with obstructive sleep apnea: a new screening tool for high risk populations

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A number of validated questionnaires are routinely used to screen specific populations for obstructive sleep apnoea (OSA). These questionnaires depend on subjective questions which cannot be independently



**Fig. 1 | P51** ▲ Comparison of different scores in the prospective study

confirmed and result in high sensitivity and low specificity. The aim of the study was to identify independently verifiable and measurable risk factors and increase specificity to reduce healthcare cost.

A retrospective data collection of patients (n=164) attending for overnight sleep study SS was performed with results of STOP, STOPBang, Berlin and Epworth questionnaires as well as demographic and health related variables. Significant OSA was defined as an AHI $\geq$ 15. A new questionnaire was devised including the independently verifiable factors IVFs and data was prospectively collected from patients undergoing SS (n=147).

The retrospective analysis identified 8 IVFs as the most influential. Analysis of the prospective data resulted in a new scale (MERLIN) with a cut off of 3 based on the equation: OSA=(BMI $>$ 30<sup>2</sup>)+(Age $>$ 50)+(Male)+(neck $>$ 16)+(diabetes)+(alcohol $>$ 21unit/week). Sensitivity and the percentage missed cases was calculated for each screening tool: STOP 93% with 3% missed, STOP-Bang 95%; 1% missed, Berlin 88%; 4% missed, Epworth 56%; 15% missed, MERLIN 73%; 5% missed.

In a high risk patients referred for SS we IVFs associated with OSA. A new tool is described with the aim to maximise OSA identification while keeping costs down.

## P53

### A survey of the perception of obstructive sleep apnea by primary care physicians in Republic of Moldova

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**Background.** In clinical practice in Republic of Moldova, sleep disorders are often only rarely addressed or treated. Despite the high prevalence of sleep disorders in the general population and primary care setting, sleep complaints are under addressed by physicians.

**Aim.** The aim of this study was to explore knowledge related to obstructive sleep apnea diagnosis and management from family physicians.

**Methods.** The survey was taken by 97 primary care physicians. The questions on local epidemiology, management and treatment of obstructive sleep apnea were included in the study.

**Results.** One-half of patients mention symptoms of obstructive sleep apnea: snoring and daytime sleepiness to their primary care physicians. Our study shows that in the mean 96.3 $\pm$ 56.7 patients with systemic hypertension and body mass index (BMI)  $>$ 30 kg/m<sup>2</sup> are registered in each distinct of primary care physician (average number of general population for each distinct is 1500). There have been shown a limited level of knowledge of obstructive sleep apnea major risk factors (53%), complications (33%), diagnostic (26%) and treatment options (47%).

**Conclusion.** The primary care physicians from Republic of Moldova continue to report lack of awareness to obstructive sleep apnea. There is a strong need for adequate and efficient use of knowledge.

## P54

### Positive airway pressure (PAP) and adherence – a long-term follow-up study: the Icelandic Sleep Apnea Cohort (ISAC)

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**Introduction.** Most studies on PAP usage are short term and do not consider different characteristics of users and non-users in neither relation to early quitting or long-term use.

**Aims and objectives.** To follow well defined cohort for 5–9 years.

**Material and methods.** Included were 822 patients (665 males, 157 females) with moderate to severe OSA starting PAP at Landspítali University Hospital (LUH) from 2005–2010. Two years later 741 patients came for a follow-up and in October 2014 PAP usage status of all 822 patients was determined.

**Results.** 805 (97.9%) of the OSA patients were identified in LUH files. Mean follow-up time: 6.7±1.2 years. Of those, n=521 (65%) were using PAP. Long-term users had at baseline significantly higher BMI (34.1±5.6 vs. 32.4±5.6 kg/m<sup>2</sup>, p<0.0001), a higher apnea hypopnea index (AHI; 48.5±21.0 vs. 38.6±17.9 events/h, p<0.0001) and more sleepiness by the Epworth Sleepiness Scale (ESS, 12.3±5.0 vs. 11.3±5.0, p=0.03) than nonusers. Long-term PAP adherence was not related to smoking, gender, age, diabetes or cardiovascular diseases. Of the nonusers, 66 (23.5%) had returned the device within 3 months. Early quitters were less obese, had less severe OSA, reported less often symptoms of sleepiness and nocturnal sweetening and had fewer concomitant obstructive lung disease than those using PAP longer.

**Conclusion.** Two-thirds of moderate to severe OSA patients are regular PAP users after 7 years. Obesity, OSA severity, sleepiness and obstructive lung disease are all important determinant of long-term compliance but their significance varies depending on when the OSA patients quit using PAP.

## P55

### Effect of mandibular advancement device therapy on cognitive and psychomotor performance in obstructive sleep apnea

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**Background.** Obstructive sleep apnea (OSA) is common sleep-disordered breathing characterized by recurrent episodes of upper airway collapse during sleep with associated airflow obstruction, intermittent hypoxemia, sympathetic excitation and sleep fragmentation. Intermittent hypoxemia and sleep fragmentation may contribute to impaired cognitive and psychomotor performance.

**Aims.** The aim of this study was to determine the effect of the custom-made adjustable mandibular advancement device (MAD) on cognitive and psychomotor performance in patients with mild to moderate OSA.

**Methods.** A total of 15 patients with mild to moderate OSA were treated with custom-made adjustable MAD and they were followed-up after 1 year of therapy. Sleep studies were performed with and without the MAD. The patients were tested on three different tests of cognitive and psychomotor performance using computer-based system Complex Reaction-meter Drenovac (CRD series) at baseline and at the time of follow-up.

**Results.** The mean apnea-hypopnea index (AHI) decreased significantly from 22.9±5.9 at baseline, to 9.7±4.5 after 1 year of therapy (p<0.001). Total test solving time (TTST) on simple arithmetic operation test

was significantly shorter following MAD therapy (155.36±60.82 to 137.09±0.48 s, p=0.026) and reaction time to light signal position test (36.72±5.34 to 33.89±4.55 s, p=0.011). There was no significant change in TTST on arms/legs motor coordination test.

**Conclusions.** This study demonstrates significant improvements in some aspects of cognitive and psychomotor performance in mild to moderate OSA patients following MAD therapy.

## P57

### Predicting the apnea by non-linear analysis of EEG signal in patients with sleep apnea

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The aim of this study is predicting the apnea by non-linear analysis of EEG signal in patients with obstructive and central sleep apnea. The EEG signals were 8-h baseline recordings from the C4–A1 derivation with a resolution of 250 Hz. Non-linear analysis including detrended fluctuation analysis (DFA) and Sample Entropy were done for each 3 s after filtering the EOG and ECG noise by adaptive filters. The results show that the irregularity and fractal correlation parameters are starting to decrease before apnea. Compared with normal sleep, the fractal correlation and irregularity were significantly lower (p<0.05) during apnea especially for the stage I and II. Our results indicates that the complexity of EEG signals starts to decrease before apnea. It seems that there are special processes in brain causing apnea and we can use this analysis to predict the apnea before occurring.

## P58

### Non alcoholic fatty liver disease is an independent risk factor for inflammation in obstructive sleep apnea syndrome in obese Asian Indians

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**Introduction.** OSA has been estimated to affect 4–11% of the population. OSA and NAFLD are both strongly associated with obesity. We looked association between OSA and the NAFLD in obese Asian Indians.

**Material and methods.** 180 subjects 74 OSA with NAFLD (group 1), 35 OSA without NAFLD (group 2), 42 without OSA and with NAFLD (group 3) and 29 without OSA and without NAFLD (group 4) were evaluated. Degree of NAFLD was based on abdomen liver ultrasound and of OSA on overnight polysomnography. Clinical, anthropometric, body Fat (BF), %BF, biochemical and cytokines levels was measured in all subjects.

**Results.** Blood pressure, %BF, BF, serum triglyceride, cholesterol, alanine aminotransferase, IL-6, Hs-CRP and TNF- $\alpha$  was significantly higher in OSA and NAFLD group (p<0.05). Multi variable comparison showed that IL-6 (p=0.003) and TNF- $\alpha$  (p=0.005) was significantly higher in group 1 as compared group 2. IL-6 (p=0.005) and Hs-CRP (p=0.04) was significantly higher in group 2 as compared to group 3. IL-6 (p=0.001), Hs-CRP (p=0.002) and TNF- $\alpha$  (p=0.001) was significantly higher in group 1 as compared to group 4. Hs-CRP levels (p=0.006) was significant in group 2 as compared to group 4. Multivariable logistic regression showed that OSA was positively associated with the NAFLD [Odds ratio (OR), 95% confidence interval (CI): 3.12 (2.58–7.72), p=0.002].

**Conclusion.** NAFLD is an independent risk factor for OSA. NAFLD in patients with OSA is associated with significant increased in inflammation as assessed by levels of IL-6, TNF- $\alpha$  and Hs-CRP in Asian Indians in North India.

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**Effect of nasal continuous positive airway pressure (CPAP) therapy on sleep architecture in patients with sleep apnea**Aleksi Chikadze<sup>1</sup>, Lia Khuchua<sup>1</sup>, Josef Burduladze<sup>1</sup>, Tornike Chikadze<sup>1</sup>, Maia Jibladze<sup>1</sup>, Roman Shakarishvili<sup>1</sup><sup>1</sup>Sleep Disorders, P.Sarajishvili Institute of Neurology, Tbilisi, Georgia

**Introduction.** The goal of the research was to study the peculiarities of sleep architecture in patients with the SAS before CPAP therapy and at the background of CPAP.

**Materials and methods.** 25 patients with SAS were examined. In all patients was determined BMI and EDS by Epworth Sleepiness Scale scores (ESSS). For diagnostics of SAS a PSG was done. Nasal CPAP was applied by using Auto Adjust CPAP Machine.

**Results.** The patients have a high rate of sleep disorders. ESSS (20–22) and BMI 30–45. PSG has shown that the patients with OSA (22) and CSA (3) are characterized by significant decrease in sleep architecture, which results in full absence of the II stage of sleep, the increase of REM, frequent EEG and EMG awakenings, and by the fragmentation of sleep as a whole. Central sleep apnea was characterized by relatively low index of snoring (SI: 80–120) and relatively high indices of the saturation (SPo2) (87–93) in cases of OSA (SI>200), SPo2-(36–91). At the background of CPAP therapy the first significant effect was received after 2 h resulting in the regulation of respiration and snore index. The progressive increase of SPo2 was within the limits of 92–95%. Sleep architecture considerably changed, EEG and EMG awakenings sharply decreased, NREM stages increased, in rare cases when NREM3 stage was noted, sleep fragmentation significantly decreased.

**Conclusion.** Thus, SAS is characterized by significant disorder of sleep architecture. At the background of CPAP therapy a significant improvement of sleep architecture and the regulation of symptomocomplex characteristics of sleep apnea take place.

P60

**The effects of chronic morphine and subsequence GAL-160 administration on sleep architecture and EEG power density in rats**Francis Golder<sup>1</sup>, Ryan Gruber<sup>1</sup>, D Euan MacIntyre<sup>1</sup><sup>1</sup>Discovery, Galleon Pharmaceuticals, Horsham, USA

GAL-160 reverses the morphine-induced increase in CSA frequency during NREM sleep in rats (Gruber et al., 2014). Here, we measured the effects of morphine alone (G1, n=5) and morphine with GAL-160 (G2, n=6) on sleep architecture and EEG power density (PD) to determine if drug-induced sleep disturbances contributed to the effects of morphine and GAL-160 on CSA frequency. G1 rats received only morphine (0.6 mg/ml in their drinking water) for 14–21 days. G2 rats received morphine as per G1 and a single dose of GAL-160 (7 mg/kg, PO) and vehicle after 14 days on morphine. EEGs and EMGs were recorded (1 K/s, 0.5–30 Hz) between 9:30 am to 4:30 pm on two study days for both G1 (before morphine and at 14–21 days on morphine) and G2 rats (GAL-160 and vehicle dosing). Each 4-s epoch of EEG/EMG data were scored as wakefulness, NREM or REM using standard rodent scoring techniques. Sleep architecture was quantified as percent time in each sleep state, the number of bouts and epochs/hr, the mean bout and epoch length, and the arousal index. EEG PDs were measured using a 4-s window FFT. Compared to the drug-naïve state, morphine did not alter the quantity and architecture of NREM sleep but increased the PD of NREM sleep slow waves. Morphine increased the percent time awake, and decreased the percent time spent in REM, the number of REM bouts and epochs per hour, and the PD of the REM sleep theta band. Compared to the morphine-only state, GAL-160 caused no additional effects on sleep architecture and PD. Thus, the ability of GAL-160 to reverse morphine-induced CSA is not due to any GAL-160 mediated sleep disturbances.

**Thematic Poster Session “Paediatrics”**

P61

**Excess cases of narcolepsy in children and adolescents vaccinated with an AS03 adjuvanted pandemic influenza vaccine in Germany**Doris Oberle<sup>1</sup>, Ursula Drechsel-Bäuerle<sup>1</sup>, Brigitte Keller-Stanislawski<sup>1</sup><sup>1</sup>Pharmacovigilance, Paul-Ehrlich-Institut, Langen, Germany

**Introduction.** Recently published epidemiological studies associate an AS03 adjuvanted pandemic influenza vaccine (Pandemrix, GSK) with narcolepsy. The aim of this study was to investigate whether, in Germany, the number of narcolepsy cases following Pandemrix vaccination reported to the Paul-Ehrlich-Institut (PEI) under the age of 18 with symptoms onset within a time window of 16 weeks following immunization is higher than expected.

**Methods.** Individual case safety reports (ICSR) of narcolepsy following receipt of Pandemrix submitted to the Paul-Ehrlich-Institut (PEI) until July 2014 were reviewed and validated according to the criteria of the Brighton Collaboration's (BC) definition for narcolepsy. An observed versus expected (OvE) analysis was conducted based on confirmed narcolepsy cases and an age-specific background incidence rate using standardized morbidity ratio (SMR) methods.

**Results.** A total of 26 ICSR of suspected narcolepsy in AS03 adjuvanted pandemic influenza vaccinees were reported to the PEI. Sixteen children and adolescents (9 females, 7 males) met the BC criteria for narcolepsy (level 1: n=7, level 2: n=8, level 3: n=1). Two confirmed cases were excluded from further analysis because first symptoms had occurred prior to vaccination. Nine children and adolescents presented with symptoms of narcolepsy within 16 weeks after immunization. A significantly increased SMR for narcolepsy was found following administration of Pandemrix [SMR: 6.4 (95% CI 2.9–12.2)].

**Conclusions.** The OvE analysis revealed that German children and adolescents vaccinated with Pandemrix were at an increased risk to develop narcolepsy within 16 weeks after immunization.

P62

**Sleep breathing disorders in children with drug-resistant catastrophic epileptic encephalopathy**Anna Michela Gaeta<sup>1</sup>, Anna Annunziata<sup>1</sup>, Gianfranco Scotto Di Frega<sup>1</sup>, Giuseppe Fiorentino<sup>1</sup><sup>1</sup>Malattie, Fisiopatologia, Riabilitazione Respiratorie, A.O. dei Colli, Napoli, Italy

Sleep breathing disorders (SBD) induce a chronic modification of sleep architecture and a state of intermittent oxygen desaturation, resulting in poor control of seizures and excessive daytime sleepiness. This study is aimed to assess the presence of SBD in a cohort of children with medically refractory catastrophic epileptic encephalopathy.

The study group is composed 11 patients (9 males, 2 females), aged between 3 and 11 years. Patients with secondary seizure were excluded from the study. The 11 patients had Obstructive Sleep Apnoea Syndrome (OSAS). In particular, seven patients presented severe OSAS, two presented moderate OSAS and 2 patients were found to have mild OSAS. Nine subjects were referred for snoring or sleep-related breathing problems. The patients also presented alterations of the total time of sleep and of the sleep latency. Apnoea/hypopnea index and average oxygen saturation are negatively correlated with REM sleep percentage ( $p < 0.05$ ). Nadir oxygen saturation negatively correlates with the efficiency of sleep ( $p < 0.05$ ). Our study show that paediatric patients with drug-resistant epilepsy, cerebral palsy and mental retardation are frequently affected by OSAS. In addition, the severity of OSAS strongly influence the quality of sleep. Children with epilepsy report sleep deprivation as a significant seizures-precipitating factor. An improvement in seizure frequency is seen when the treatment of OSAS. Results support that the screening for SBD in the medically refractory epilepsy population and appropriate intervention strategies may lead to overall improved night oxygen saturation and seizure control.



P63

### Rhinitis: a risk factor for persistence of sleep disordered breathing in paediatric patients after adenotonsillectomy?

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**Background.** Sleep disordered breathing (SDB) is common in children and associated with several adverse outcomes. Adenotonsillar hypertrophy is the most commonly identified risk factor being adenotonsillectomy (AT) the treatment of choice. Recent studies show frequent persistence of symptoms on postsurgical follow-up, possibly associated with other risk factors.

**Aims and objectives.** The main goal was to analyse the rate of persisting symptoms in pediatric patients treated with AT. We also looked for clinical factors which might act as negative prognostic factors for symptoms persistence.

**Methods.** Retrospective study of pediatric patients referred to a tertiary hospital for SDB in 2012-2013. In patients submitted to AT we evaluated the persistence of symptoms through a telephone questionnaire applied to parents. We investigated demographic and clinical factors that could negatively affect the surgery outcome.

**Results.** 191 patients were included, 55% of which underwent AT. Telephone contact was possible in 86%. Median age was 5.8 yrs (0.6; 16.5), 56.2% male. The prevalence of obesity, rhinitis and craniofacial anomalies was 20%, 14% and 11%, respectively. Median age at surgery was 4.3 yrs (1.3; 17); median time to follow-up was 15.5 mths (interquartile range: 9.6–27.6). Persisting symptoms were reported in 32% and were more frequent in patients with rhinitis ( $p=0.019$ ). Sex, age at surgery, obesity and craniofacial anomalies did not correlate with symptoms persistence.

**Conclusion.** A significant number of patients have persisting symptoms at follow-up after AT. Rhinitis seems to be related to increased risk of persistent SDB. Data suggests need for long-term follow-up and management of associated comorbidities.

P64

### Declarative and non-declarative memory consolidation in children with sleep disorder breathing

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Healthy sleep is essential in children's cognitive, behavioral, and emotional development. However, remarkably little is known about the influence of sleep disorders on different memory processes in childhood. In the present study we examined the effect of sleep disorder on declarative and non-declarative memory consolidation by testing children with sleep-disordered breathing (SDB). We used a story recall task to measure declarative memory and Alternating Serial Reaction Time (ASRT) task to assess non-declarative memory. This task enables us to measure two aspects of non-declarative memory, namely general skill learning and sequence-specific learning. There were two sessions: a learning phase and a testing phase, separated by a 12-hour offline period with sleep. Our data showed that children with SDB exhibited a generally lower declarative memory performance both in the learning and testing phase, but the consolidation during the offline period was similar in the SDB and the control group. In addition, we observed association between snoring events and declarative memory performance. In the case of non-declarative memory, the SDB group showed intact learning as well as consolidation of both sequence-specific and general skills. These findings suggest that disruption of sleep has a differential effect on the different memory types (declarative vs. non-declarative) and stages (online vs. offline). Creating more sophisticated neuropsychological profiles about the cognitive dysfunctions could not only give us deeper insight into the effect of sleep on the developing

brain and memory functions, but also can help develop more effective methods of rehabilitation and treatment.

P65

### Comparison between parent reported usage and machine downloaded data of children on home long term non-invasive ventilation

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**Introduction.** Home long term non-invasive ventilation (NIV) is increasingly used to treat a range of paediatric conditions. Until recently our hospital has relied on parental reporting to assess NIV adherence as usage data was very limited or not available. However, newer machines can store data for subsequent download.

**Aim.** We hypothesised that parents over report adherence to NIV. We aimed to compare parent reported NIV usage with that from the machine downloads.

**Methods.** The parents of 51 children [29 (57%) male, 22 (43%) female, aged 1–16 (mean 9 yrs), including 22 (43%) with neuromuscular disease, 18 (35%) with obstructive sleep apnoea and 3 (6%) with central hypoventilation] on home NIV who were consecutively admitted to the Children's Sleep & Ventilation Unit from March to October 2014 for follow up sleep studies were asked to complete a questionnaire. Questions included how many nights their child had used the machine in the past week and number of hours used each night. Their responses were compared to the data from the machines.

**Results.** 11/51 (22%) of parents over reported whilst 2/51 (4%) under reported the number of nights their child had used NIV. Of the 8 children who had not used NIV at all the previous week, 6 parents reported they had not used NIV, 1 said they used it for 2 nights and 1 every night that week. The mean number of hours used per night correlated well with the number of hours NIV was reported to be used.

P66

### Environment in pediatric wards: sound, light and temperature

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**Introduction.** The relation between sleep and disease is particularly important in hospitalized children, affecting quality of life; there are several sleep disruptors that can lead to sleep deprivation, as a consequence of the disease or related to hospital environment.

**Aims.** To describe 24 hours patterns of sound (S), light (L) and temperature (T) levels at the bedside and at the hallways of pediatric wards; to verify its adequacy to World Health Organization recommendations.

**Methods.** S, L and T were measured in 5 pediatric wards for 3 days with appropriate equipment and assessed in 5-minute intervals. Three periods were considered: daytime, evening, night-time. Recommended values: maximum light 100 Lux (5 Lux at night), maximum sound 45 dB, temperature 20–24°C. Descriptive and comparative statistics were performed.

**Results.** In all wards the intensity of S was higher than desirable; during 84.6% of evaluated time the S intensity was above 45 dB (lower at night,  $p<0.001$ ). L intensity values were within desirable limits for 85.5% of evaluated time, being reduced at night ( $p<0.001$ ). The T was below 24°C during 78.1% of total time, without any value below 20°C (lower at night,  $p<0.003$ ). Values differed between wards ( $p<0.001$ ) and between room and hallway ( $p<0.001$ ).

**Conclusions.** The S and T in room and hallway were higher than recommended. The luminosity was adequate. The values were different between the 5 wards; it may be due to different levels of care, pathologies and ages, but it reveals absence of rules regarding environmental factors. Comprehensive studies are necessary to evaluate the discrepancy between real and recommended values and the impact of environmental variables on disease recovery.

#### P67

##### Psychiatric aspects and confounding factors in mothers of asthmatic children

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**Background.** Chronic conditions in children significantly influence the quality of life in the parents. Many people with chronic pulmonary conditions and their family members need psychiatric assistance.

**Materials and methods.** This was an observational cross-sectional analytic study with completion of questionnaire by participants. All mothers of asthmatic children presenting to pulmonary specialty clinic at Masih Daneshvari Hospital from 2011 to 2013 which included 182 individuals were included in the study with their agreement and after being ensured of privacy of information.

**Results.** Mean age of participants was 33±5 years and the average number of their children was 2±1. Number of participants with high scores in the disease range (≥2.5) were 17% for anxiety, 2% for obsessive compulsion, 15% for aggression and 15% for reference idea. Smoking had significant correlation with physical complaints.

#### P68

##### Long-term parental satisfaction with adenotonsillectomy – a population study

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This study reports the presence of sleep disordered breathing (SDB) symptoms among first graders. We evaluated the severity of symptoms and parental satisfaction in children who had undergone adenotonsillectomy (T&A) compared to children who never had T&A.

A population-based, cross-sectional study was conducted. Parent-reported questionnaire data including age, weight, height, BMI, history of T&A and SDB symptoms (snoring intensity, observed dyspneas, mouth breathing during sleep) were analyzed.

Of 3,580 eligible children, 2,504 (69.9%) returned questionnaires. 259 (10.3%) children had a history of T&A. Within this group, 76% of parents were still satisfied with their child's outcome after surgery. The satisfaction rate decreased from 88.9% in those who had surgery within 1 year to 71.3% in those who had surgery ≥3 years prior. Mean values of intensity for all analyzed SDB symptoms on a 5-point scale were significantly higher for children who had ever undergone T&A when compared to

those who never underwent surgery [eg, snoring (2.11 vs 1.87;  $p=0.0004$ ), dyspneas (1.64 vs 1.22;  $p<0.0001$ ) and mouth breathing during sleep (2.95 vs 2.58;  $p<0.0001$ )]. For those who had undergone T&A, 24% of caregivers were not satisfied with the surgical outcome and symptom intensity was highest (snoring=3.16, dyspneas=2.20, and mouth breathing=4.23) for these children.

Mean SDB symptom intensity was significantly higher in children who had undergone T&A when compared to those who had not. Elevated symptom intensity in those children whose caregivers were not satisfied after T&A suggests possible SDB recurrence and need for further evaluation.

#### P69

##### Snoring but not BMI influences the aggressive behavior and concentration problems in children

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Sleep-disordered breathing is an important risk factor for neurobehavioral impairment in children. This study was conducted to estimate the prevalence of sleep-disordered breathing in a population of first graders and to determine the association between behavior problems, body mass index (BMI) and snoring.

A population-based, cross-sectional study was conducted using a parent-reported questionnaire. The study evaluated 2,474 first-graders. Data including age, weight, height, BMI, snoring intensity, and problems with child behavior were analyzed.

Of 3,480 eligible children, 2,474 (71.1%) returned completed questionnaires. Of these, 72% were reported to be non-snorers, 28% snorers, and 6.4% habitual snorers. There was a positive linear association between behavior impairment and snoring severity measured on a 5-point scale, with highly significant differences between each of five snoring intensity groups ( $p<0.0001$ ). Compared to non-snorers, snorers in the normal-weight and overweight subgroups had significantly more aggressive behavior ( $p<0.0001$ ;  $p=0.002$ , respectively) and more concentration problems ( $p<0.0001$ ;  $p=0.03$ , respectively). There was no significant difference in aggressive behavior and concentration problems intensity in the screened groups of obese and normal subjects ( $p=0.70$ ;  $p=0.79$ , respectively). Behavior problems were positively associated with increasing snoring frequency. However, there were no differences in the prevalence of behavioral or concentration problems between obese and nonobese first-graders studied.

#### P70

##### Central apneas in childhood's obstructive sleep apnea syndrome

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**Introduction.** Here we try to explain the role of central apneas in children diagnosed of OSAS beginning with the age of 1 year. Our aim was to detect the prevalence of central sleep apnea, its associations, its behavior after surgical treatment in patients with OSAS.

**Methods.** We performed a retrospective study that included 771 children with OSAS. The period of inclusion was from 2003 to 2014. We included data of patients that underwent surgical treatment, tonsillectomy or adenoidectomy.

**Results.** We present the data of 771 patients with OSAS, from which 39.2% were girls and 60.8% were boys. The mean age was of 5.12 years (SD: 3.15). Only 12.1% of the cases were born prematurely. The mean value of CAI, that had a mean RDI of 12.91, was of 2.88 (SD: 4.25). The prevalence of CAI > 1 is 60.44%, maximum value 38.26. The mean value of CAI in the group of girls was of 4.77, and 3.87 respectively ( $p > 0.05$ ). We found a moderate, direct association between RDI and Central Apnea Index (CAI; Pearson: 0.477,  $p < 0.05$ ). When comparing the age with CAI, it resulted to be an inverse and weak relationship ( $p = 0.02$ ). We could evaluate the effect of the surgery on the CAI in 89 patients. We observed a significant loss of central apneas after the intervention with a  $p < 0.05$ .

**Conclusions.** Central sleep apnea is common in children with sleep disordered breathing, where the prevalence of prematurely born children is barely significant. The severity of CAI can be predicted by the severity of RDI, due to the direct moderate relation between the two variables and that could explain its maintenance in OSAS. Another proof of this fact is the disappearance of the central apneas after the surgery.

P71

### Difference between obstructive apnoe-hypopnoea indexes in REM versus NREM sleep stage in children

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**Introduction.** During the past decade paediatric obstructive sleep apnea (OSA) has become widely recognized as a frequent and relatively common disorder with potentially serious clinical implications in childhood and no exact association with adult OSA. The recent data report that there is also a relatively high frequency of residual OSA which could continue and develop in adult OSA.

**Aim.** The aim of our study was to compare and assess predictive factors in groups of paediatric OSA with the obstructive apnoe-hypopnoea index (AHI) in REM versus NREM sleep stage.

**Methods.** 94 children aged 3 to 15 years with clinical symptoms of OSA were enrolled in the study. All children underwent standard overnight polysomnography examination. 13 children were excluded due to AHI < 1 events/hour and 81 subjects with OSA were divided in REM and NREM OSA subgroups depending on the dominance of obstructive respiratory events during the sleep stages.

**Results.** Obstructive events were significantly higher in REM vs NREM sleep (median AHI REM 11.6 vs AHI NREM 6.6,  $p < 0.001$ ). In children with NREM OSA ( $n = 57$ ) were significantly higher median age (5.08 years, IQR 4.25–6.27 vs. 5.91 years, IQR 4.96–7.25,  $p < 0.05$ ), BMI (16.50, IQR 14.98–17.78 vs. 17.05, IQR 16.30–21.20,  $p < 0.05$ ) and frequency of obesity and on the otherwise in REM OSA was higher frequency of diagnosed ADHD (27 vs. 4,  $p < 0.05$ ). All other parameters were without significant difference between REM OSA and NREM OSA.

**Conclusion.** There are necessities of further clinical studies to confirm two subtypes of paediatric OSA and monitor the progression in adulthood.

Supported by Virtual and Simulation Tuition as a New Form of Education at JFM CU.

## Thematic Poster Session “Diagnostics”

P72

### Less obtrusive sensors for reliable detection of breathing pattern and heart function during sleep

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**Rationale.** Although polysomnography is an important diagnostic tool for sleep medicine, it is an uncomfortable and costly procedure. In order to reduce this burden, multiple low-level home monitoring systems have been developed. In this study we want to clinically evaluate some of these new, less obtrusive sensors.

**Objective.** To compare the apnea detection capability measured by less obtrusive sensors.

**Methods.** 29 patients (mean age  $63 \pm 18$  y) with respiratory problems are included in this trial for a one-night measurement. A new movement sensor (Sensotiss), a light cable embedded in the mattress, measures the breathing pattern by detecting changes in optical reflection. Heart function is measured by a wireless electrocardiogram (ECG) body patch with Bluetooth connection. As gold standard, a commercial polysomnography (Alice\_PDX, Respirationics) and 1 lead standard ECG (GI-MAC5500) are chosen.

**Results.** ECG and breathing pattern compared with gold standard are shown in Fig. 1.

**Conclusion.** Breathing pattern and ECG derived from the new sensors looks promising in detecting apneas, but requires a thorough understanding for comparison with the golden standard. In the future, computerized algorithms for apnea detection based on these new signals could be of great clinical value for both screening and diagnostic purposes.

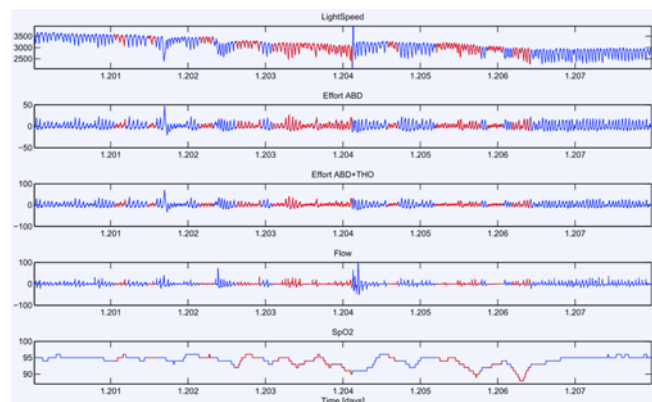


Fig. 1 | P72 ▲

P73

### Prevalence of obstructive sleep apnea syndrome in patients with acromegaly

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**Objective.** Acromegaly is often associated with obstructive sleep apnea syndrome (OSAS) with a prevalence of between 40 and 80%. The aim of the present study was to evaluate the prevalence of OSAS and identify clinical and sleep characteristics in patients with acromegaly.

**Methods.** A total of 28 acromegaly patients were included in this study prospective, cross-sectional study. Demographic data, anthropometric measurements and medical history were evaluated. Spirometry, chest x-ray, arterial blood gas analysis and full-night in-laboratory polysomnography were performed.

**Results.** Of the 28 patients (17 men, mean age  $48.7 \pm 10.1$  yrs), mean body mass index was  $32.4 \pm 4.3$  kg/m<sup>2</sup>, neck circumference was  $41.3 \pm 4.0$  cm and waist circumference was  $107.4 \pm 11.2$  cm. Twenty patients (72.4%) had comorbidities. Hypertension (50.0%), diabetes mellitus (42.9%), hypothyroidism (25.0%) and dyslipidemia (17.9%) were most frequent diseases. All patients reported snoring, whereas 20 (71.4%) had witnessed apnea and 13 (46.4%) had excessive daytime sleepiness. Epworth sleepiness score was  $10.7 \pm 6.0$  and 42.9% had a score  $>10$ . Twenty five patients (89.3%) were diagnosed as OSAS (RDI  $\geq 5$ /hr). Polysomnography results showed that mean RDI was  $38.8 \pm 28.1$ /h, nadir SpO<sub>2</sub>(%) was  $80.8 \pm 8.5$  and mean SpO<sub>2</sub>(%) was  $92.7 \pm 4.1$ . A total of 21 patients were deemed to be candidates for positive airway pressure (PAP) treatment.

**Conclusions.** Our results confirm a high prevalence of OSAS (89.3%) in patients with acromegaly and provide evidence that the majority of patients are candidates for treatment with PAP. Therefore, newly diagnosed all acromegaly patients should be investigated in terms of OSAS.

#### P74

##### Effect of semi-recumbent position on severity of obstructive sleep apnea syndrome in patients with heart failure

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Overnight rostral leg fluid displacement in heart failure (HF) patients is related to the high prevalence and severity of obstructive sleep apnea syndrome (OSAS). We hypothesized that rostral fluid shift will decrease in semi-recumbent (45-degree elevated) position, and evaluated the effect of lying in semi-recumbent position on severity of sleep apnea in HF patients with OSAS.

In this prospective study, demographic, anthropometric characteristics and medical history of 30 consecutive HF patients with OSAS were recorded. Polysomnography was performed while patients lying flat and then in a semi-recumbent position within one week.

Out of 30 patients (26 men, mean age  $54.7 \pm 10.2$ ), 16 patients (53.3%) were obese and 29 (96.7%) had co-morbidities other than HF. Mean apnea-hypopnea index was  $30.8 \pm 20.7$  events/h while lying flat and decreased to  $17.8 \pm 12.1$  events/h in semi-recumbent position ( $p < 0.0001$ ). Similarly, oxygen desaturation index decreased from  $22.3 \pm 19.8$  to  $12.7 \pm 11.5$  events/h ( $p < 0.0001$ ), and mean nocturnal oxygen saturation (SpO<sub>2</sub>) ( $p = 0.050$ ) and lowest SpO<sub>2</sub> ( $p = 0.004$ ) were improved in semi-recumbent position. The percentages of stage N<sub>3</sub> and REM sleep increased with semi-recumbent sleeping but not significantly, whereas N<sub>2</sub> sleep decreased from 47.0% to 39.6% compared to lying flat ( $p = 0.015$ ).

The present findings support that the severity of OSAS decreased significantly in semi-recumbent position in patients with HF. Therefore, semi-recumbent sleeping may be a promising therapeutic option in the management of HF related sleep apnea.

#### P75

##### Validity and predictive value of the ApneaLink™ in the identification of sleep apnea in patients with stable chronic heart failure

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**Background.** Sleep apnea is an important comorbidity in heart failure (HF) with a large impact on quality of life and prognosis. However, diagnosing sleep apnea based on clinical parameters is difficult and polysomnography, considered as the gold standard, is not widely available. Therefore, we aimed to assess the validity of the ApneaLink™ as a screening tool for the identification of sleep apnea in a population with stable HF and to assess the predictive value of the ApneaLink™ compared to known clinical risk factors.

**Methods.** 100 patients with stable HF had simultaneous recordings of home-based polysomnography (PSG) and the ApneaLink™. Intraclass correlation (ICC), sensitivity and specificity were calculated for PSG versus ApneaLink™. A Bland and Altman plot and receiver operator curves were constructed. Logistic regression analyses were performed to assess the predictive value of the ApneaLink™ compared to known clinical risk factors.

**Results.** 90 valid ApneaLink™ measurements were obtained. There was high agreement between the ApneaLink™ and PSG (ICC = 0.85). The optimal threshold was for apnea-hypopnea index  $\geq 15$ /h (area under the curve (AUC) 0.94). Sensitivity and specificity were high with 92.9% and 91.9%, respectively. The ApneaLink™ ( $\chi^2 = 66.74$ ,  $p < 0.001$ ) was correctly classifying 92% of the patients and explained 60% of the variance in having sleep apnea.

**Conclusion.** The ApneaLink™ can help specialists in identifying patients at risk of having sleep apnea besides the known clinical risk factors. ApneaLink™ is a useful screening tool to exclude the presence of sleep apnea and only refer high risk HF patients for a more extensive PSG.

#### P76

##### Which is the ideal tool to assess atherosclerosis risk in obstructive sleep apnea? Intima media thickness (IMT) or mean platelet volume (MPV)

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**Background.** Obstructive sleep apnea (OSA) is associated with atherosclerotic cardiovascular diseases (CVD). Mean platelet volume (MPV) is a new parameter associated with atherothrombosis. In this study we aimed to evaluate the relationship between MPV and carotid intima-media thickness (IMT) in patients with OSA.

**Methods.** One hundred five subjects evaluated for OSA underwent overnight polysomnography. Patients with cardiac disease or atherosclerotic risk factors and other chronic diseases were excluded from the study. Fifty subjects were included. Carotid IMT was measured with ultrasonography. Venous blood samples were obtained for biochemical tests and MPV measurement. Subjects were divided into three groups according to OSA severity: 1- control subjects: apnea-hypopnea index (AHI)  $< 5$ , 2-patients with mild to moderate OSA (AHI: 5–30), 3-severe OSA (AHI  $> 30$ ).





P80

**Cardiac remodeling in mild and severe obstructive sleep apnea**Yuriy Feshchenko<sup>1</sup>, Kseniia Nazarenko<sup>1</sup><sup>1</sup>Pulmonology, National Institute of Phthysiology and Pulmonology named after F.G. Yanovskiy AMS of Ukraine, Kiev, Ukraine

**Introduction.** The effect of obstructive sleep apnea (OSA) on cardiovascular system proved in many studies, but cardiovascular pathology in patients with OSA of different severity studied less.

**Aim.** To study cardiac remodeling and hemodynamic in patients with mild and severe OSA.

**Material and methods.** 15 mild OSA patients [respiratory disturbance index (RDI) 5–15 (polysomnography)] (I group), age 48.9±3.0 years, 30 severe OSA patients (RDI≥16) age 49.0±2.74 years (II group). Left ventricular hypertrophy (LVH) was defined by left ventricular mass index (LVMI) (male >115 g/m<sup>2</sup>, female >95 g/m<sup>2</sup>) (echo-Doppler). Pulmonary artery hypertension (PAH) was defined by pulmonary artery systolic pressure (PASP) >30 mmHg.

**Results.** LVH was defined in 24% and 55% in I and II groups respectively. PAH was detected in 12 and 21% in I and II groups respectively. Left ventricular wall thickness (LVWT) was 0.98±0.06 cm in I group and 1.14±0.05 cm in II group (p<0.05); interventricular septal wall thickness (ISWT) was 1.04±0.07 cm and 1.2±0.05 cm in I and II groups respectively (p<0.05). Transmitral E/A ratio was 1.37±0.17 and 1.07±0.07 in I and II groups (p<0.05). Isovolumic relaxation time (IVRT) was 86.0±5.33 and 97±3.69 in I and II groups (p<0.05).

**Conclusions.** Our results demonstrate high prevalence of LVH and PAH in patients with OSA, especially in severe OSA. Severe OSA negatively affected the LVH and diastolic left ventricular function.

P81

**Sleepiness scale evaluation of OSAS in determining the severity of the disease role**Sibel Ayik<sup>1</sup>, Zeynep Zeren Ucar<sup>2</sup>, Serdar Kalemci<sup>3</sup>, Galip Akhan<sup>4</sup>

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**Introduction.** The correlation of level of disease found in the clinical studies done up to date for the patients admitted with the prediagnosis of Obstructive Sleep Apnea Syndrome (OSAS) evaluated by Epworth Sleepiness Scale (ESS) and Berlin Sleep Questionnaire Score (BSQS) was weak. We aimed to evaluate the relationship between EUS and BUS and nocturnal hypoxia parameters.

**Material and methods.** OSAS Ambulatory sleep test device (Watchpat; Itamar Med Ltd., Israel) attached to the wrist which uses noninvasive fingertip probe for detecting signals of changes in automatic nervous system for sleep test for the OSAS patients who underwent an overnight home sleep test. Berlin sleep questionnaire, Epworth sleep questionnaire and sleep disorders overall evaluation form in patients with 48 questions was used evaluating the symptoms of these cases. 15–80 years old (48.59±12.35), 127 females, 203 males, 330 patients were included in this study.

**Results.** There was correlation among total all night AHI, ODI, RDI (p<0.0001, KK: 0.218, p<0.0001 KK: 0.225, and p<0.0001 KK: 0.226) with BSS. There was correlation among total all night AHI, ODI, RDI (p<0.0001, KK: 0.374, p<0.0001 KK: 0.360, and p<0.0001 KK: 0.364). There was a strong correlation between ESS and BSQS (p<0.0001 KK: 0.464). Also there was statistically significant correlation between the minimum oxyhemoglobin saturation, average oxyhemoglobin saturation and oxyhemoglobin saturation below 90% of the time as nocturnal hypoxia index and BSS and BSQS.

**Conclusion.** As a result of this study it was observed that the severity of OSAS severity and nocturnal hypoxia is correlated with indicators of ESS and BSQS.

P82

**Screening for sleep apnea in patients with cardiovascular diseases via overnight pulse oximetry in outpatient clinic**Anastasiya Tikhova<sup>1</sup>, Roman Buzunov<sup>1</sup>, Alexander Popov<sup>2</sup>

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**Introduction.** The incidence of sleep apnea (SA) in patients with cardiovascular diseases is high (30–50%) and requires a simple and effective screening method. The purpose of the current study was to evaluate the usability of screening for SA via overnight pulse oximetry (OPO) in patients with cardiovascular diseases in outpatient clinic.

**Methods.** Data were obtained from patients who visited the cardiologist in outpatient department between 16.05.14 and 25.08.14. OPO was assigned to the subjects with a high pre-test probability of SA, based on the following diagnoses in patient's chart: arterial hypertension, ischemic heart disease, atrial fibrillation, sleep-related arrhythmias, chronic heart failure. The evaluation of SA was carried out with PulseOx 7500 device (SPO Medical, Israel) with subsequent automated processing of the records performed by software VitaScore.

**Results.** A total of 315 patients were analyzed, 283 (89.9%) of them met inclusion criteria. SA was already detected in 2 (0.63%) subjects at the time of appointment. OPO was performed in 203 patients (71.7% of the inclusion group). Desaturation index (ID) >15 per hour was detected in 99 patients (48.8%), ID≥30 per hour – in 40 (9.7%), which corresponds to moderate and severe SA respectively. Thereby with the implementation of screening for SA via OPO, the detectability of SA became 49.5 times greater.

**Conclusions.** The study confirms high prevalence of SA in patients with cardiovascular diseases. Screening for SA using OPO in outpatient clinic significantly improves the detection of the disorder, and helps to form group of patients for referral to a sleep study.

P83

**Effect of CPAP therapy on pulmonary artery pressure in OSA patients**Luci Suliman<sup>1</sup>, Abdelrazik Maty<sup>2</sup>

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**Background.** There has been uncertainty until recently as to whether OSA, is sufficient to cause persistent daytime pulmonary hypertension and right ventricular dysfunction.

**Objectives.** The aim of this study, were to investigate whether OSA by itself without any other cardiac or lung disease can lead to pulmonary hypertension, and to assess the effect of CPAP therapy on pulmonary artery pressure.

**Subjects and methods.** The study was performed on fifty-four OSA patients with AHI>5 and without any heart or lung diseases. The selected patients were classified according to AHI into two groups: I) Severe OSA and Non severe OSA patient. And also were classified according to pulmonary artery pressure measurement into two groups: a) OSA patients with pulmonary hypertension and b) OSA patients without pulmonary hypertension. All patients were subjected to thorough history taking including Epworth sleepiness scale and Berlin questionnaire, calculation of BMI, pulmonary function tests, polysomnography, echocardiography and CPAP therapy.

**Results.** PH was present in (44.4%) of OSA patients. There were significant higher PASP and mPAP in severe OSA patients. There were significant reduction in both MPAP & PASP after 6 months of CPAP treatment (p=0.007, 0.005 respectively) with reduction after 6 months of CPAP therapy in both mPAP, PASP.

**Conclusion.** OSA is associated with of pulmonary hypertension which increased with its severity, Improvement of pulmonary hypertension through controlling OSA by CPAP therapy signify that OSA play a crucial role in pathogenesis of pulmonary hypertension.

## P84

### Sleep characteristics and the risk of obstructive sleep apnoea syndrome in commercial bus drivers

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**Introduction.** Inadequate sleep quality and quantity can lead to excessive daytime sleepiness and increase risk of traffic accidents.

**Objective.** This cross-sectional study aimed to identify self-reported sleep quality and quantity, prevalence of excessive sleepiness, risk of obstructive sleep apnoea syndrome (OSAS), drowsy driving and traffic accidents in a sample of commercial bus drivers.

**Methods.** Eighty-nine drivers in two bus depots in Belgrade, Serbia were interviewed using a generic questionnaire (demographics, driving and sleep characteristics, traffic accidents in the last year), Pittsburgh Sleep Quality Index (PSQI $\geq 5$  was indicative), Epworth sleepiness scale (ESS $\geq 10$  was indicative), Berlin (positive in 2/3 categories = high risk) and STOP-BANG questionnaire (3/more positive answers = high risk). Anthropometric measurements (weight, height, neck, waist and hip circumference) were performed.

**Results.** All drivers were male; mean age 42 years, mean Body mass index (BMI) was 27.5, 69.7% were overweight (BMI $\geq 25$ ), 48.3% had neck circumference  $\geq 40$  cm. Average driving experience was 16.1 years, 50.69 hours per week. Mean sleep duration was 6.9 hours, 32% slept less than 6 hours a day. Sleepiness while driving was reported by 36% of drivers, and 15.1% had traffic accidents. Mean ESS score was 4.11, ESS $\geq 10$  had 8% of drivers. Mean PSQI score was 2.57, PSQI $\geq 5$  had 9% of drivers. Berlin questionnaire revealed high risk of OSAS in 12.6%, STOP BANG in 49.4% of the participants.

**Conclusion.** Prevalence of impaired sleep, excessive sleepiness and risk of OSAS in this sample of bus drivers is similar to findings in other studies and demands further investigation.

## P85

### The relationship between cardiometabolic disorders and obstructive sleep apnoea syndrome

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Nowadays, obstructive sleep apnea (OSA) is considered a cardio-metabolic disorder. The purpose of this study was to evaluate the prediction of arterial hypertension and presence of diabetes mellitus between patients with OSA. We examined the records of 302 patients referring to our Sleep Laboratory Center, between 2011 and 2013, to have nocturnal cardio-respiratory polygraphy for the evaluation of OSA. Including criteria was cut-off value of  $\geq 15$  events/h according to the AHI. 195 patients (64.56%) had severe OSA ( $\geq 30$  events/h); 189 patients (62.57%) had hypertension and 135 (44.70%) had diabetes mellitus. Univariate analysis for categorical data has found statistical significance for ischemic cardiopathy (p<0.01); snoring (p=0.03); restless sleep (p=0.02). Receiver operating characteristics (ROC) analysis reveals statistical significance for age (p<0.01, AUC=0.69), neck circumference (p<0.01, AUC=0.67), abdominal circumference (p<0.01, AUC=0.70), BMI (p<0.01, AUC=0.70), glycemia (p<0.01, AUC=0.59), medium O<sub>2</sub> saturation (p<0.01, AUC=0.70), oxygen desaturation index (p<0.01, AUC=0.63) and ESS (p=0.03, AUC=0.59). Multivariate analysis on logistic model retains body mass index and neck circumference. We found a statistically significant association between diabetes mellitus and OSA severity (p=0.037). Type 2 diabetes mellitus is frequent between patients with obstructive sleep apnea, especially in moderate and severe forms of OSA. Regarding arterial hypertension, an increase of BMI by 1 kg/m<sup>2</sup> would entail the risk of hypertension by 2.6%; an increase of 1 cm neck circumference would entail the risk of hypertension by 0.8%.

## P86

### Obstructive sleep apnea in patients referred for bariatric surgery

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**Background.** Obese patients are often offered bariatric surgery as a method to lose weight. They are also more prone to have obstructive sleep apnea (OSA), and they pose, if they have OSA, higher perioperative risk. The aim of our study was to determine the frequency of OSA in patients referred to bariatric surgery.

**Methods.** In this retrospective study we analyzed medical records of all patients that were referred to our Laboratory for sleep disordered breathing University Clinic Golnik, from Department of abdominal surgery University Medical Centre Ljubljana in years 2011–2014. Patients were divided in two groups: patients without OSA and those with OSA [apnea-hypopnea index (AHI) $> 5$ ].

**Results.** 35 patients were referred, 29 women (83%), age 46 $\pm$ 10 years, body mass index (BMI) 43 $\pm$ 7 kg/m<sup>2</sup>, neck circumference (NC) 42 $\pm$ 5 cm, Epworth sleepiness scale (ESS) 6 $\pm$ 3, AHI 11 $\pm$ 12, oxygen desaturation index (ODI) 19 $\pm$ 21. Arterial hypertension (AH) was present in 23 (66%) and diabetes mellitus in 12 (34%) of patients. 17 (49%) patients had AHI $> 5$ , 10 (29%) had AHI $> 15$ , 4 (11%) had AHI $> 30$ , 3 (9%) patients meet criteria for obesity hypoventilation syndrome. Patients with OSA had more often AH (82% vs. 50%, p=0.047), were older (50 $\pm$ 8 vs. 43 $\pm$ 10, p=0.031), had higher NC (44 $\pm$ 5 vs. 40 $\pm$ 3, p=0.04) and lower pO<sub>2</sub> (9.5 $\pm$ 1.6 vs. 11.0 $\pm$ 1.0, p=0.008). No statistical difference was observed when we compared different OSA subgroups between each other.

**Conclusions.** Our cohort of patients consisted mainly of morbidly obese middle-aged women. Half of the patients had OSA. Those patients were older, had more often AH, higher NC, and lower pO<sub>2</sub>.

## P87

### A simplified model of screening obstructive sleep apnoea in elderly population

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**Background.** Due to increasing demand for sleep services, there is a growing interest in simplified models to detect obstructive sleep apnea (OSA). Previous studies have developed screening models for primary care in middle aged population but there is no data obtained in older population. AIM. To identify predictive characteristics that could be used in a screening model for severe OSA (AHI $> 30$ ) in elderly population.

**Methods.** 116 patients aged over 65 years with suspected OSA in which full PSG was performed were retrospectively analyzed. Univariate and multivariate logistic regression models were performed to identify variables predictive of severe OSA (IAH $> 30$ ). The model was tested with the Hosmer-Lemeshow test and ROC curves were constructed for the ability to predict severe OSA using significant variables derived from logistic regression model.

**Results.** In the univariate analysis, the variables significantly associated with severe OSA were: male gender [OR 2.03 (CI 0.92–4.50), p=0.080], neck circumference [OR 1.19 (CI 1.06–1.33), p=0.003], waist circumference [OR 1.06 (CI 1.02–1.10), p=0.004], snoring [OR 3.96 (CI 0.89–17.56), p=0.070] and 3% ODI [OR 1.25 (CI 1.14–1.37), p<0.001]. Among these, male gender [OR 6.42 (CI 1.31–31.36), p=0.022] and 3% ODI [OR 1.27 (CI 1.14–1.41), p<0.001] were independently associated with severe OSA in the multivariate analysis. A cut off of 0.85 was chosen to maximize the overall diagnostic accuracy of the model, obtaining the following predictive values: sensitivity 82%, specificity 100%, PPV 100%, and NPV 73%.



**Conclusion.** Male gender and high 3%ODI levels predict severe OSA in a population over 65 years old.

#### P88

##### Accuracy of obstructive sleep apnea screening questionnaires on Brazilian population

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**Introduction.** Obstructive sleep apnea (OSA) cause significant increase in morbidity and mortality. The golden standard for diagnosis is the polysomnography exam, but due to its high complexity, elevated cost and low availability, clinical evaluation with the application of screening questionnaires like the STOP BANG (SB) and the Berlin Questionnaire (BQ) are important for the diagnosis and triage of OSA.

**Objective.** To calculate the accuracy of the BQ and SB on the diagnosis of OSA.

**Methods.** Cross-sectional study carried out on an adult outpatient voluntary population on Gafree e Guinle University Hospital. Patients were submitted to clinical evaluation, BQ, SB and to a full night polysomnography in laboratory.

**Results.** Forty-eight patients were studied, 62.5% were male. The study's age average was 45.6 years old. Twelve patients had an AHI of less than 5, 16 had mild OSA, 9 had moderate OSA and 11 had severe OSA. The BQ had a sensitivity of 83.3% and a specificity of 25% for OSA diagnosis. A higher AHI did not significantly increased the positivity of the BQ ( $p=0.26$ ). The SB had a sensitivity of 94.4% and a specificity of 58.3% for OSA diagnosis. A higher AHI caused a significant increase in the positivity of the SB ( $p=0.00$ ; Tab. 1).

Tab. 1   P88 Sensitivity of the BQ and SB on OSA diagnosis grouped by OSA severity		
	OSA Severity	Sensitivity
BQ	Mild	81.25%
	Moderate	77.77%
	Severe	90.90%
	Total	83.33%
SB	Mild	87.50%
	Moderate	100%
	Severe	100%
	Total	94.44%

**Conclusion.** Both questionnaires were equally easy to apply, but the SB had a higher sensitivity and specificity for OSA diagnosis and was more effective on the identification of the more severe cases, resulting on a better OSA screening tool in our population.

#### P89

##### Obstructive sleep Apnea in patients submitted to ambulatory blood pressure monitoring: preliminary data

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Studies demonstrated that high percentage of patients with OSA have arterial systemic hypertension and OSA is considered as a possible cause for refractory hypertension. To identify the risk of OSA in patients subjected

to ambulatory blood pressure monitoring (ABPM) through questionnaires, a cross-sectional study on adult outpatient population subjected to ABPM were performed. Normal values for arterial blood pressure were defined by mean systolic and diastolic blood pressures lower than 130 and 80 in the 24-hour period, 135 and 85 during vigil and 120 and 70 during sleep. Nocturnal decrease in blood pressure (ND) was considered absent if equal to zero, decreased if between 0 and 10% and preserved if higher than 10%. Refractory hypertension was considered if the patient had blood pressure values higher than the upper limits while using three or more antihypertensives with at least one diuretic included. A total of 30 patients were included in the study so far, with a mean age of 63.1 years and 40% males. 70% of the population studied was found to have a high risk for OSA. A high risk for OSA resulted on higher means for blood arterial systolic and diastolic pressures in the vigil periods (133 and 79), in the 24 hour period (131 and 77) and also while sleeping (122 and 71) when compared to the low risk for OSA group that had mean pressures for the 24 hour period equal to 125 and 73, for the vigil period 126 and 75 and for the sleeping period 119 and 67. All refractory hypertension patients tested positive on. This is an indicative of the necessity of the polysomnography exam, especially because several studies revealed a decrease on blood pressure and cardiovascular risk with adequate OSA treatment.

#### P90

##### Sleep quality through overnight standard polysomnography in patients with cerebral palsy

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Cerebral palsy (CP) is a term employed to define non progressive neuromotor disorders caused by damage to the immature or developing brain. This progressive condition compromises quality of life and can lead to serious health problems and even death. Neuromuscular impairment places CP patients at risk for sleep disorders and/or obstructive sleep apnea (OSA).

According to our knowledge, any study was addressed to the prevalence of OSA in adults with CP. We aim to evaluate the sleep by standard overnight polysomnography (PSG) in adult patients with CP. This study involved 21 patients with spastic diparetic CP (11 female), mean age  $28.4 \pm 5.4$ , mean neck circumference  $37.8 \pm 2.55$  and mean BMI  $24.2 \pm 2.78$ . The sample was classified using the Gross Motor Functional Classification Scale (GMFCS). The inclusion criteria were spastic diparetic CP, partially preserved cognitive function. The exclusion criteria were previous orthodontic or orthopedic treatment of the jaws or therapies to reduce spasticity (botulin toxin) in the six months prior to the study. It was observed a decrease of TTS, a higher heart rate, considerable decrease in NREM<sub>3</sub> and REM stages and OSA. OSA was observed in 11 patients (52%) with a mean IAH  $11.68 \pm 6.6$ . This is one of the first studies that evaluated the sleep through PSG with adults CP patients. Previous investigations have employed questionnaires to determine the prevalence of sleep disorders in children with CP and report that the most common problems are initiating and maintaining sleep (24.3%), sleep breathing disorders (14.5%) and snoring (36.1%). The sleep of patients evaluated in this study was of poor quality.



P91

### Validation of the Watch PAT 200 (Itamar Medical Ltd.) as a diagnostic procedure for detection of sleep disordered breathing (SDB) in patients with heart failure

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**Introduction.** This study examines the validation of a portable device using a peripheral arterial tonometry – the Watch PAT 200 – as a measurement of SDB in patients with heart failure, especially in patients with heart failure with normal ejection fraction (HFNEF). A high prevalence (about 70%) of SDB in patients with heart failure is known. While 40% of HFNEF patients are suffering from obstructive sleep apnea (OSA), 30% are diagnosed with central sleep apnea (CSA).

**Methods.** For validation of the Watch PAT, 20 patients with HFNEF are investigated. Measurements are additionally performed within a scheduled polysomnographic examination (PSG) on the cardiologic ward of the Charité Berlin. The Watch PAT is used in the diagnostic night and the therapy night. The data of both measurements (PSG and Watch PAT) will be analyzed and compared in reference to specific types of SDB. Thus, it shall be shown that the Watch PAT can detect therapy evoked changes in apnea-hypopnea-index (AHI), oxygen-desaturation-index (ODI) and oxygen saturations.

**Results.** At this point 10 patients with HFNEF are examined. All of them are diagnosed with SDB, detected by both PSG and Watch PAT. In particular, seven patients had primarily OSA, while three patients had primarily shown CSA. This was only detected by PSG.

**Conclusion.** So far it seems likely that the Watch PAT can detect SDB in patients with HFNEF but it is not able to distinguish between OSA and CSA. Furthermore, it shall be investigated if the Watch PAT can detect SDB in patients with heart failure with reduced ejection fraction. Additionally, it shall be analyzed if haemodynamic changes under therapy can be seen in the raw data.

P92

### Polysomnographic data, sleep quality, sleepiness and co-morbidities in patients with REM-related obstructive sleep apnea

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**Purpose.** To determine differences in polysomnographic values, sleep quality, sleep-related symptoms and co-morbidities between the patients suffering from REM-related OSA and controls suffering from OSA equally distributed in REM and non-REM.

**Methods.** From the Split Sleep Medicine Center data pool of 500 patients with polysomnography (PSG) recordings, 38 patients with REM-related OSA were recruited, and 38 case control patients with non-REM OSA were identified when adjusted for age, gender, BMI and AHI. REM-related OSA was defined as follows: AHI $\geq$ 5, AHI(REM)/AHI(NREM) $\geq$ 2, and REM $>$ 30 min. Whole-night PSG studies were performed on all patients using the Alice 5LE, and they responded to STOP, STOP-BANG, Berlin questionnaire, Epworth Sleepiness Scale, Stanford Sleepiness Scale and Pittsburgh sleep quality index.

**Results.** Patients with REM-related OSA were no different compared with controls on PSG data except they had greater snoring time (136.0 $\pm$ 130.8 vs. 68.0 $\pm$ 57.9 minutes,  $p<$ 0.014). Arterial hypertension was more frequent in REM-related OSA group in comparison to control (18/35 vs. 10/38,  $p=$ 0.027), and there was a tendency that they were less sleepy during the day in comparison to control on ESS score (6.4 $\pm$ 5.3 vs. 7.8 $\pm$ 4.8,  $p=$ 0.224), and SSS score (2.6 $\pm$ 1.4 vs. 3.1 $\pm$ 1.3,  $p=$ 0.099).

**Conclusion.** There were no significant differences between patients with REM-related OSA and control patients in objective data from sleep studies, but they had prolonged period of snoring. Subjective data indicated a tendency toward less pronounced sleepiness and more frequent co-existence of arterial hypertension in patients with REM-related OSA.

P93

### Effects of neuromuscular electrical stimulation on the masticatory muscles and physiologic sleep variables in adults with cerebral palsy: a novel therapy approach

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Cerebral palsy (CP) is a term employed to define a group of non-progressive neuromotor disorders caused by damage to the immature or developing brain, with consequent limitations regarding movement and posture. CP may impair oral pharynx muscular tonus leading to a compromised mastication and to sleep disorders (e.g. obstructive sleep apnea). 15 adults with CP underwent bilateral masseter and temporalis neuromuscular electrical stimulation (NMES) therapy and its effect over masticatory muscle and sleep variables were evaluated through electromyography (EMG) and polysomnography (PSG), respectively, prior and post 2 months of NMES therapy. EMG consisted of 3 tests in different position: rest, mouth opening and maximum clenching effort (MCE). The EMG values in the resting position were 100% higher prior to therapy for all muscles analyzed ( $p<$ 0.05); mean mouth opening rose from 38.0 $\pm$ 8.0 to 44.0 $\pm$ 10.0 cm ( $p=$ 0.03) and MCE was significantly only for right masseter. PSG shown that AHI improved from 7.1/h to 1.7/h ( $p<$ 0.05), total sleep time improved from 185 min to 250 min ( $p=$ 0.04) and minimal SaO<sub>2</sub> improved from 83.6 $\pm$ 3.0 to 86.4 $\pm$ 4.0 ( $p=$ 0.04). NMES performed over a two-month period led to an increase in the electrical activity of the masticatory muscles at rest, opening and during isometric contraction and improved sleep variables, including the elimination of sleep apnea events in CP patients. This may be a novel therapy non-invasive option for this population. Further studies are needed.

P94

### Pulmonary function and obstructive sleep apnoea syndrome in commercial drivers

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**Introduction.** There are limited and conflicting data on the association of pulmonary function and obstructive sleep apnoea syndrome (OSAS).

**Aim.** Identify the relation of pulmonary function parameters with polysomnographic characteristics in a sample of commercial drivers screened for presence of OSAS.

**Methods.** Dynamic spirometry and full night polysomnography (PSG, type I or type III) were performed in a sample of one hundred commercial bus and truck drivers in Belgrade, Serbia.

**Results.** All drivers were male, mean age 43.5 years, 75.8% overweight (body mass index, BMI $>$ 25), 46 active and 20 ex-smokers. 25% reported respiratory diseases in personal history, but only 10% used medications. Pulmonary function tests were normal in 86% of participants, 4% had obstructive and 2% restrictive changes. Obstructive sleep apnoea was diagnosed in 58% of drivers, with mean apnoea-hypopnoea index (AHI) 19.7/h. When controlled for age, smoking and BMI, partial correlation analysis showed that both FEV<sub>1</sub>% and FVC% were significantly correlated to mean AHI in REM sleep, mean oxygen saturation in REM, as well as to minimal oxygen saturation during sleep. FEV<sub>1</sub>% was also significantly correlated to mean oxygen saturation during NREM sleep ( $p=$ 0.297,  $p<$ 0.05). None of the tested spirometry parameters showed significant correlation to diagnosis or severity of OSAS.

**Conclusion.** Pulmonary function tests cannot effectively predict the presence of obstructive sleep apnoea syndrome, but may detect associated respiratory disorders, which are of major importance for treatment and prognosis in OSAS patients.

## Thematic Poster Session "Insomnia and Narcolepsy"

P95

## Leg thermal therapy improved sleep structure as well as hemodynamics in patients with chronic heart failure

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**Background.** Insomnia is highly prevalent in patients with chronic heart failure (CHF), and affects their prognosis and quality of life (QOL). Systemic thermal therapy (STT) improved hemodynamics in CHF patients via vasodilation. Also, rising body temperature might improve their sleep. However, STT cannot be easily applied as a home therapy as for its specific and bulky facility. To make a practical home complementary therapy, we developed topical warming, leg thermal therapy (LTT), which heats only lower extremities. The aim of this study was to assess the effects of LTT on hemodynamics and sleep structure in CHF patients.

**Methods.** Eighteen inpatients with stable CHF (age: 55±12 years, male: 15, NYHA II–III) received LTT (heating at 45°C for 15 minutes followed by 30 minutes insulation) for 3 consecutive nights. Before and after the intervention, we evaluated vascular endothelial function indexed by flow mediated vasodilation response (%FMD), cardiac load, suggested by plasma brain natriuretic peptide (BNP) level, and sleep structure by polysomnography. Data was analyzed using Wilcoxon signed-rank test.

**Results.** Three nights consecutive LTT significantly improved %FMD ( $p<0.01$ ) and BNP ( $p<0.05$ ) in CHF patients. Moreover, LTT significantly decreased sleep stage N<sub>1</sub> ( $p<0.05$ ), and increased sleep stage N<sub>2</sub> ( $p<0.05$ ) without altering parameters on sleep disordered breathing.

**Conclusions.** Three nights LTT improved sleep structure as well as hemodynamics in the CHF patients without any adverse events. These results suggest that LTT have the potential to be an effective adjuvant home therapy to improve cardiac load, prognosis and QOL for CHF patients.

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## Insomnia in adults with asthma: results from the Norwegian HUNT 3 study

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**Introduction.** The literature shows contradictory results on the relationships between asthma symptoms and insomnia in adults.

**Objectives.** The main objective of the study was to assess the prevalence of insomnia in persons with asthma, and to investigate the impact of asthma symptoms on insomnia, controlling for possible confounding factors such as age, sex, marital status, smoking, anxiety and depression.

**Methods.** Participants from a large population based cohort from a county in Norway (HUNT 3), with a self-reported diagnose of asthma (N=1,342) were included in the analyses. Median age of participants was 54 years ranging from 19.5 to 91. Two thirds of the participants were women (n=830).

**Results.** According to the DSM-V criteria, 10.1% of those with asthma had insomnia. Logistic regression analyses showed that the risk of insomnia was halved in males compared to females (OR 0.54, CI 0.43–0.84). Persons more than 50 years of age had less insomnia than those in the younger age category. Other factors predicting insomnia were asthma symptoms during activity (OR 2.0, CI 1.2–3.5), frequent asthma symptoms during the day (OR 1.86, CI 1.2–2.78), anxiety (2.6, CI 1.65–4.10), and depression (2.58, CI 1.52–4.38). Evaluating current health status as bad was strongly related to higher risk of insomnia (OR 2.56, CI 1.6–4.0). P-values for all the above presented ORs were  $p<0.01$  and thus highly statistically significant.

**Conclusion.** Insomnia is more common in persons with asthma compared to the normal population. Findings suggest that frequent asthma symptoms, as well as anxiety and depression, strongly increase the probability of suffering from insomnia.

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## Quality of sleep in a 45- to 69-year-old population in Russia

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**Purpose.** To examine characteristics of the quality of sleeping of a 45- to 69-year-old population in Russia/Siberia.

**Methods.** Under the screening of the WHO program "POST MONICA-psychosocial" (2003–2005 yr.) random representative sample of man (n=1770) and women (n=2401) aged 45–69 years were surveyed in Novosibirsk. The sleep disturbances were studied via test Jenkins Sleep Questionnaire (JSQ).

**Results.** The sleep quality in the study population showed that men stated more often than women that they did not have or rarely had anxious thoughts while falling asleep (59% in men vs. 52% in women); they did not have any disturbing dreams or had them for less than three nights per month (68% in men vs. 65% in women); they had sound sleep (47% in men vs. 45% in women); and they were able to get a good night's rest via the regular sleep (63% in men vs. 59% in women)  $p<0.0000$ .

**Conclusions.** In the 45- to 69-year-old population in Russia, high prevalence of sleep disturbances in the categories of sleep quality was associated with high prevalence of psychosocial factors.

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## Sleep drunkenness with hypersomnia: diagnosis and treatment of circadian rhythmicity in 14 severely affected patients

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**Background.** Sleep drunkenness with hypersomnia (SDH) is a very disabling, often misjudged disorder with unknown etiology. Treatment is often unsuccessful. We studied circadian rhythmicity in severe SDH patients.

**Methods.** 24-hours melatonin curves, sleep architecture, co-morbidity and treatment results were assessed in 14 patients with severe SDH. Mean (SD) age 14 (8.4) yr. Patients received melatonin, 5 hours before dim light melatonin onset (DLMO). If necessary morning light treatment was added. Melatonin dose started with 1 mg and if necessary increased with 1 mg weekly until effect was seen. Maximum 5 mg. When melatonin was ineffective, methylphenidate 10 mg in the morning was started; in case of side effects patients received 100 mg modafinil.

**Results.** DLMO was normal in 6 patients and delayed in 8; in one patient with normal DLMO and in 7 with delayed DLMO morning salivary melatonin levels were elevated. Sleep architecture was normal in 8 patients. In 2 patients REM sleep was absent. ADHD, depression, Asperger, panic

disorder, foetal alcohol syndrome, history of alcohol abus and severe lack of self-confidence were co-morbidities. In five patients sleep drunkenness and hypersomnia decreased with melatonin, bright light treatment or chronotherapy. Four did respond poorly. One responded good on methylphenidate or modafinil. Five patients did not improve at all. two of them, living alone remained to be wakened up by a health care person who came at the patients home to wake them up.

**Conclusion.** In patients with SDH circadian rhythmicity and co-morbidity should be assessed and adequately treated. If necessary, methylphenidate or modafinil could be considered.

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### Multiple Sleep Latency Testing in adults in Europe: 9 year follow-up

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**Background.** Variability in the interpretation of Multiple Sleep Latency Test (MSLT) guidelines may affect the diagnosis and treatment of patients with central hypersomnolence. In this study we assessed in progress the adoption and conformity to guidelines published in 2005.

**Methods.** The same questionnaire based on the 2005 MSLT guidelines was sent to the same sleep centres in 2005, 2009 and 2013.

**Results.** 49 adult laboratories performing MSLT returned the questionnaire in 2005 and 2009 and 15 in 2005, 2009 and 2013. An increasing number of centers performed PSG before MSLT, whereas the limited use of sleep diaries and urinary drug screening did not change over 9 years. There were some variations in set-up and instructions across centres over time but no significant alterations in practice. Fewer centers performed pre-test calibrations ( $p=0.03$ ) over the years. Sleep onset and REM latency scoring did not change. Significant alterations in defining abnormal /normal daytime sleepiness were not found over years.

**Conclusions.** After 9 years of revised guidelines, variations across centres still occurred. However, there has been a move towards aligning practice.

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### A case report: daytime sleepiness in an adult patient with cystic fibrosis

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**Introduction.** A 21-year-old male patient who had been diagnosed cystic fibrosis (CF) for 5 years, applied to our clinic for complaints including fever, cough and sputum, requiring hospitalization. During the treatment, the hospital crew has noticed an excessive daytime sleepiness (EDS), which leads serious performance decrements in the patient. His medication was not containing any drug affecting sleep. When inquired, patient suffered from EDS and his history was including interesting details such as failed examinations because of dropping asleep during the tests; hypnagogic hallucinations and neck weakness producing head drop after laughing. These complaints existed during the last two years.

**Results.** ESS of the patient was 14. When we evaluated subjective sleep quality using the PSQI, he showed poor quality of sleep. Full-night in-laboratory polysomnography revealed an AHI of 0.8/hour. His MSLT showed an average sleep latency of 0 minute and sleep onset REM periods (SOREMP) were found 3 out of 5 naps. There was also a SOREMP on the preceding nocturnal PSG. Thus, total SOREMPs of patient were 4. He was diagnosed with narcolepsy type 1 and was started on modafinil.

**Conclusion.** It is a well-known entity that CF patients commonly encounter daytime sleepiness beside the poor sleep quality. Poor sleep

quality is found correlated with the severity of pulmonary involvement in the studies. There was no previous study describing narcolepsy accompanied by CF. In our case, an observation of EDS supported by a deep anamnestic investigation lead to narcolepsy diagnosis via appropriate diagnostic procedures. As a result, sleep-disordered breathing should be investigated in CF patients with high clinical suspicion.

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### A good sleep makes you younger by the day

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**Background.** Insomnia has become a global epidemic. It's considered to be the major health related problem for many people across the world.

**Objectives.** I have studied how today's world of modern technology is encouraging people to work late nights and the presence of electronic devices like Wi-Fi routers, laptops, tablets and mobile devices within the bedrooms or homes and the lack of physical activity have become the primary cause of reduced sleep and disrupting sleep.

**Methods.** Being an IT support person I was troubleshooting my life for over 30 years to live a healthy life by following safety guidelines of mobile use, avoiding all types of electronic devices into the bedroom, having cable based internet and home network instead of Wi-Fi router. Along with physical activity, improving eating habits, reducing stress, and ceasing tobacco and alcohol use. Since indoor air pollution is dangerous to health, placing some interior plants has improved the air quality. Encouraged and supported 342 members to follow the similar lifestyle from past 13 months.

**Results.** A simple 1-hour early morning walk, by adopting proposed life style changes and early bed in the night could improve the quality of sleep. Of the 342 members we could see 92% of members reporting deep sleep of eight to nine hours daily. 6% of members who adopted the lifestyle changes but couldn't indulge in any physical activity have reported four to six hour sleep. 2% of members reported six to seven hours of good sleep by following the guidelines.

**Conclusions.** From past 33 years I never seen a doctor for any reason and living a healthy life. A good sleep and a breath of fresh air can really improve the quality of living by adding few more healthy years to our life.

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### Sleep, pulmonary function and quality of life in congenital myasthenia gravis: a case report of two siblings

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**Background.** Patients with Congenital Myasthenia Gravis (CMG) is characterized by clinical feature of fatigable weakness, and your response to treatment vary according to the molecular mechanism resulting from the genetic defect. The generalized muscle weakness also compromises the muscles of the oropharyngeal region, predisposing an individual to obstruction of the upper airways, especially during sleep. The aim of this study is to describe the clinical profile, pulmonary function, sleep architecture, and quality of life of two siblings with CMG.

**Case Report.** Patient 1, 52-year-old, Caucasian woman, was diagnosed with CMG at 5 years of age. Her initial symptoms were ptosis, hypotonia, generalized muscle weakness, and difficulty feeding, sucking, and swallowing. The patient underwent two thymectomy procedures and two hospitalizations due to deterioration of her clinical condition but did not require invasive mechanical ventilation. The patient remained active despite moderate physical limitations. Patient 2, 62-year-old, was diagnosed with CMG at 12 years of age with the same initial symptoms

as his sister. The patient underwent a thymectomy and four admissions as a consequence of the disease, requiring invasive ventilatory support in the last two years. He maintained an active life with considerable physical limitations due to generalized muscle weakness.

**Conclusions.** We observed that patients with CMG have impaired pulmonary function, reduced maximal ventilatory pressures, and changes in sleep architecture that are directly correlated with disease progression.

**Keywords.** Congenital myasthenia gravis, Sleep disorders, Pulmonary function, Sleep apnea, Quality of life

## Thematic Poster Session "OSA and Central Sleep Apnoea II"

### P103

#### Comparison on signs related to sleep disordered breathing among adult people with down syndrome between two different races, Japanese and Scottish

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**Introduction.** It is well known that people with Down syndrome (DS) tend to have sleep disordered breathing (SDB) because of their anatomical characteristics such as mid facial hypoplasia. Though many studies reported racial differences in the prevalence of SDB since the craniofacial structure differs among different races, the racial impact on SDB in DS people has not been elucidated. The aim of this study was to assess the racial differences on SDB between Scottish (S-DS) and Japanese (J-DS) DS adults.

**Methods.** To assess the racial impacts on SDB, we surveyed the demographics and the symptoms of SDB, i.e. snoring and apnoea, via questionnaires. We collected 268 and 525 replies from the S-DS (age 32±11 years, male 147) and the J-DS (age 25±8 years, male 288), respectively. We analyzed those data using Chi-square test and logistic regression analysis.

**Results.** The S-DS reported apnoea more often than the J-DS (44.5 vs 31.9%,  $p < 0.05$ ) although the prevalence of snore did not significantly differ (S-DS=83.1%, J-DS=79.4%). In the S-DS, aging was significantly and negatively related to apnoea ( $p < 0.01$ ). In the J-DS, however, male reported apnoea more often ( $p < 0.05$ ), and the obese and young did snoring (Body mass index  $p < 0.01$ ; Age  $p < 0.01$ ). The S-DS reported apnoea more often than the J-DS even after adjusted for age, sex and BMI ( $p < 0.05$ ), but the prevalence of snore did not show significant difference.

**Conclusions.** Although the people with DS similarly had SDB symptoms regardless of race, apnoea was observed more in the S-DS than the J-DS. The early evaluation and treatment of SDB is necessary in both countries.

### P104

#### Efficacy of home single-channel nasal pressure for recommending CPAP treatment

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**Introduction.** Home single-channel nasal pressure (HNP) may be an alternative to polysomnography (PSG) for obstructive sleep apnea (OSA) diagnosis but no cost studies have yet been carried out. Automatic scoring is simpler but generally less effective than manual scoring.

**Objectives.** To determine the diagnostic efficacy and cost of both scorings (automatic and manual) compared with PSG.

**Methods.** We included suspected OSA patients in a multicenter study. They were randomized to home and hospital protocols. We constructed Receiver Operating Characteristic (ROC) curves for both scorings. Diagnostic efficacy was explored for several HNP AHI cut-off points and costs were calculated for equally effective alternatives.

**Results.** Of 787 randomized patients, 752 underwent HNP. Manual scoring produced better ROC curves than automatic for AHI.

**Conclusion.** HNP is a cheaper alternative than PSG for OSA diagnosis. HNP with manual scoring seems to have better diagnostic accuracy and a lower cost than automatic scoring for patients with low AHI levels, although automatic scoring has similar diagnostic accuracy and cost than manual scoring for intermediate and high AHI levels. Therefore, automatic scoring can be appropriate used although diagnostic efficacy could improve if we carried out manual scoring on patients with AHI < 15.

### P105

#### Baclofen-induced central sleep apnoea

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**Background.** Impact of Baclofen (B) a GABA-B receptor agonist treatment of alcohol use disorder (AUD) on sleep breathing disorders are still debated.

**Case Report.** A 61-year-old patient with AUD treated by B (up to 350 mg/d) referred for suspicion of sleep apnoea syndrome (SAS) following 3 motorcycle accidents due to sleepiness. We performed polysomnography (PSG) in 3 separate conditions: at baseline, with B (200 mg/d), After B withdrawal and following B (100 mg/d) reintroduction (automedication) on constant positive airway pressure (CPAP).



**Results.** The PSGs showed a severe central SAS (CSAS, AHI 81.6/h) with B treatment (Tab. 1, Fig. 1). After B withdrawal there was a shift to typical obstructive SAS (OSAS, AHI 43.9/h) and the patient was initiated on CPAP treatment. After B reintroduction (automedication) a significant central component was again evidenced (AHI 61.6/h).

**Conclusions.** This is the first clear demonstration using a withdrawal-reintroduction design of a baclofen induced central sleep apnea.

Tab. 1   P105 Sleep studies			
Sleep study (min)	B (200 mg/d), Alcohol 4–6 U/d	Alcohol 14–16 U/d	B (100 mg/d), Alcohol 6–7 U/d, cPAP (10 cmH <sub>2</sub> O)
Sleep duration	485.5	539.5	531.5
Sleep efficacy (%)	86.3	88.8	89.1
N1 Sleep Latency	5.4	11.6	0.5
REM Sleep Latency	243.3	114.5	113.0
<b>Respiration (/h)</b>			
Obstructive apnoea	0.0	0.3	0.0
Obstructive hypopnoea	10.6	39.5	19.2
Central apnoea	69.7	3.9	42.1
Central hypopnoea	1.0	0.0	0.3
IAH	81.6	43.9	61.6
ODI	81.2	24.4	40.6
PLM	8.2	7.8	4.1

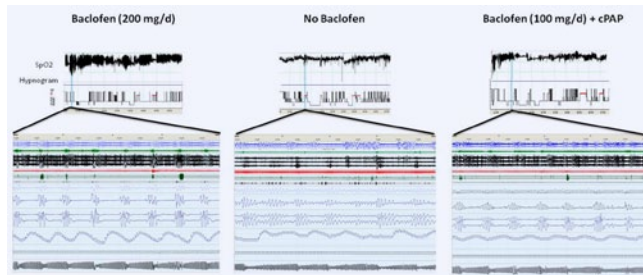


Fig. 1 | P105 ▲

#### P106

**Impact of a mandibular repositioning device (MRD) on blood pressure in obstructive sleep apnea (OSA) patients noncompliant with continuous positive airway pressure (CPAP)**

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**Aims.** ORCADES, a French prospective multicenter cohort study is evaluating the benefits of a custom-made MRD over 5 years in OSA pts non-compliant with CPAP. Interim data are presented at 3-month follow-up.

**Methods.** Sleep data, symptoms, BP, quality of life, side effects and MRD compliance are evaluated in OSA pts fitted with a CAD/CAM MRD

(Narval CC™). Patient was hypertensive (HTN) if office systolic and/or diastolic BP were respectively  $\geq 140$  and  $\geq 90$  mmHg.

**Results.** 77 HTN and 222 non-HTN pts treated with MRD were analysed. Sex ratio (75% male), age ( $53 \pm 11$  y) and mean AHI ( $29 \pm 15$ /h) were similar in both groups. In HTN group, body mass index was higher and nadir SpO<sub>2</sub> was lower. MRD treatment success (reduction of  $\geq 50\%$  in baseline AHI) was higher in non-HTN group (84% vs. 66%,  $p=0.0012$ ). Improvement in oxygen saturation, symptoms or quality of life was equivalent in both groups with no weight change. In HTN group, SBP and DBP were reduced significantly (Tab. 1) and BP was normalized in 59% of pts. Only 8% of pts stopped MRD due to side effects and mean usage was similar in both groups (6.7 hours/night).

**Conclusion.** Custom-made CAD/CAM MRD is effective in OSA pts noncompliant with CPAP with additional benefits on blood pressure.

Tab. 1   P106					
Group	BP	Baseline	3 month FU $\Delta$	P value	
HTN	SBP, mmHg	140.3 $\pm$ 7.8	133.3 $\pm$ 12.0	-7.6 $\pm$ 12.7	<0.0001
NON-HTN	SBP, mmHg	122.3 $\pm$ 9.0	123.5 $\pm$ 13.2	1.5 $\pm$ 12.8	NS
HTN	DBP, mmHg	88.6 $\pm$ 8.0	81.8 $\pm$ 9.1	-6.8 $\pm$ 10.2	<0.0001
NON-HTN	DBP, mmHg	74.1 $\pm$ 7.6	75.4 $\pm$ 9.7	1.5 $\pm$ 10.4	NS

#### P107

**Adherence to CPAP treatment in Slovenia**

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**Background.** Good adherence to CPAP treatment in patients with obstructive sleep apnea (OSA) is crucial for achieving clinical benefits and can be determined from CPAP machines software. We aimed to assess adherence and factors related to adherence with CPAP treatment in Slovenian patients.

**Methods.** We retrospectively analyzed medical records including machine software data from patients coming to our outpatient office for evaluation after 6 months of CPAP treatment from July to September 2014. Patients were divided in two groups: adherent (use of CPAP for at least 4 hours/night on more than 70% of days) and non-adherent group.

**Results.** 106 patients were eligible for analysis, 22 (21%) of them were women, age  $57 \pm 6$  years, body mass index (BMI)  $38 \pm 9$ , 76 (72%) used autoCPAP, 81 (77%) used nasal mask, mean CPAP usage was 5 h 14 min  $\pm$  2 h 14 min and 75 (71%) of patients used CPAP for at least 4 h/night on at least 70% of nights. Adherent group had higher initial apnea-hypopnea index (AHI;  $53 \pm 24$  vs.  $38 \pm 26$ ,  $p=0.009$ ), lower initial mean oxygen saturation ( $88 \pm 6\%$  vs.  $91 \pm 3\%$ ,  $p=0.001$ ), higher BMI ( $39 \pm 9$  vs.  $35 \pm 8$ ,  $p=0.04$ ), less often had mask problems (19% vs. 54%,  $p=0.005$ ), less often had problems with tolerating pressures (12% vs. 32%,  $p=0.013$ ). In multivariate logistic regression adjusted for age, initial AHI, type of mask, type of CPAP machine (auto of fixed), initial BMI, only initial AHI predicted good adherence (OR 1.03, CI 1.004–1.049).

**Conclusion.** In our cohort of patients, adherence to treatment with CPAP was fairly good. Adherent group had higher BMI, higher initial AHI, lower mean oxygen saturation, less mask and pressure tolerance problems. Only initial AHI predicted good adherence to CPAP treatment.

## P108

**Effect of concomitant asthma and obstructive sleep apnea on lung function in non-obese subjects**

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**Introduction.** In bronchial asthma (BA) associated with obstructive sleep apnea (OSA) changes in lung function are usually suggested to be related to obesity. The aim of the present study was to assess airway resistance and diffusing capacity for carbon monoxide (CO) in non-obese asthmatics with OSA.

**Methods.** 54 BA patients (mean age 39.6±1.48) with Body-Mass Index (BMI) <30 were enrolled in the study. OSA was assessed by overnight cardiorespiratory monitoring. Each patient underwent whole-body plethysmography and lung CO diffusing capacity measurement to determine airway resistance (Raw) and diffusion parameters (TLCO, KCO).

**Results.** Out of 54 asthmatics 15% who had OSA were distributed to Group I. Group II included patients without OSA. Mean BMI was 24.3±0.45 and did not differ significantly between the groups. KCO was found to be relatively increased in asthmatics with OSA (97 (88; 101) vs. 74 (67; 98), p=0.01). Expiratory, inspiratory and total Raw parameters were negatively correlated with mean overnight oxygen saturation (r=-0.27, r=-0.49, r=-0.37, respectively, p<0.01). Positive correlations were revealed for TLCO and KCO with AHI (r=0.29 and r=0.28, respectively, p<0.05).

**Conclusions.** Despite the fact we failed to demonstrate difference in airway resistance depending on the presence of OSA, we found diffusion of CO was significantly higher in OSA what may suggest its link with the degree of BA-associated changes in lung parenchyma. Another finding consisted in influence of airway resistance on overnight blood oxygenation. Persistently increased airway tone predisposed affected subjects to hypoxia, thereby promoting longer and more profound desaturation episodes.

## P109

**The effect of positive airway pressure therapy on serum insulin-like growth factor-1 and cognitive functions in patients with obstructive sleep apnea patients**

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Due to hypoxia and sleep fragmentation hormone secretion, cognitive function may adversely affected in obstructive sleep apnea syndrome (OSAS). Cognitive impairment is common among OSAS patients. In this study, we aimed to investigate the effect of continuous positive airway pressure (CPAP) therapy on serum insulin-like growth factor-1 (IGF-1) levels and cognitive functions in patients with OSAS. Thirty-three patients with newly diagnosed OSAS and 17 healthy-control subjects enrolled. Epworth Sleep Scale and mini-mental-state examination (MMSE) were performed to evaluate cognitive function in all cases after PSG. Blood samples were taken at the end of the PSG in the morning and the same procedures were repeated 3 months after starting CPAP treatment. Before CPAP therapy, OSAS group mean MMSE score was 23.5±3.6, serum mean IGF-1 level was 79.1±36.1 ng/ml both which significantly low compared to control group (mean MMSE score= 28.1±1.4, serum mean IGF-1 level= 147.1±49.1 ng/ml; p=0.0001 and p<0.0001, respectively). The three months after CPAP treatment, we found a signifi-

ficant improvement in MMSE and IGF-1 levels (MMSE score =26.5±2.8, serum mean IGF-1 level =129.1±58.2; p=0.0001 and p=0.0001, respectively). Whereas, baseline and third month measurements for IGF-1 levels and MMSE scores were not significantly changed. The results showed that effective CPAP therapy in OSAS patients has significant improvement in cognitive functions and IGF-1 even in a short time therapy.

## P110

**Estimation of lung functions and assessment of risk of developing obstructive sleep apnoea in wind instrument players**

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**Introduction.** Obstructive sleep apnoea is a condition characterized by floppiness of the upper airway. A few studies have shown decreased incidence of snoring and sleep apnoea in wind instrument players probably due to an increased tone of respiratory muscles.

**Aims and objectives.** To perform the lung function tests in wind instrument players and to assess the risk of developing Obstructive sleep apnoea in them using the Berlin questionnaire.

**Methodology.** The study was performed in 64 subjects in test group and 65 subjects in control group. Test subjects belonged to high resistance wind instrument category and controls included subjects who did not play any form of wind instrument and singers were also excluded. Based on Berlin questionnaire subjects were divided into high or low risk. Lung functions were evaluated and statistical analysis was done using student t test and chi square test.

**Results.** There was no difference in MVV values (p=0.63) between the tests and controls. More number of test group subjects belonged to the low risk group as compared to the controls (p=0.000\*) according to the Berlin scores. Pearson's correlation showed no association between MVV and Berlin score (r=0.062, p=0.63).

**Conclusion.** There is no association between improved lung functions and reduced risk of developing OSA. At the same time OSA risk is reduced in wind instrument players as a result of increased tone of upper airway muscles. Hence wind instrument playing may be considered as an option to reduce the risk or treat obstruction in sleep apnoea.

## P111

**Sleep apnea syndrome in Transylvania**

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**Introduction.** Obstructive sleep apnea syndrome(OSAS) is a disease with a growing prevalence.

**Methods.** We present a study that took place from 01.2014 to 08.2014, in the Pneumology Clinic "Leon Daniello" Cluj-Napoca. Inclusion criteria were: loud snoring; excessive daytime sleepiness; recurrent nocturnal awakenings; most of them obese with short neck. Exclusion criteria were: inconsistent, abandonment study participation. 24 patients met the inclusion criteria, aged 19-81 years, most of the urban environment. Demographic, social, clinical data were collected. Polysomnography was done, patients with apnea hypopnea index (AHI) more than 5 represented the study group. Biological samples; chest radiography; functional respiratory specimens; cardiology consult; otorhinolaryngology consult were conducted. There were several methods of treatment: home O<sub>2</sub>, continuous positive airway pressure (CPAP), bi-level positive airway pressure (BiPAP), surgery in the otorhinolaryngology field. Of the 24 patients included, 92% were men, the majority in the age group:

40–60 years. Depending on body mass index, 33% were morbidly obese. Regarding the Epworth scale, 7 patients met a score over 18.

**Results.** Of the 24 patients, 20 were diagnosed with OSAS, 65% with severe form-AHI over 30. The biggest apnea index was 86, the minimum O<sub>2</sub> saturation 44%. Depending on treatment, 50% received CPAP therapy, 12% in whom CPAP therapy was not effective used BiPAP; the remaining patients underwent surgery. 8% of all refused treatment.

**Conclusion.** Correct diagnosis, treatment of OSAS lowers the risk of morbidity and mortality.

## P112

### MicroRNA biomarker profiling for detection of favorable blood pressure responders to CPAP in patients with resistant hypertension and OSA: the HIPARCO-Score

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**Background.** In RH patients with OSA, CPAP leads to reduction in 24-h mean blood pressure (BP). The BP response to CPAP use is variable. MicroRNAs (miRNA) play a role in cardiovascular (CV) disease. We hypothesized that differential miRNA expression in RH patients with OSA being treated with CPAP may identify BP response.

**Aim.** In OSA patients with RH undergoing CPAP treatment to identify miRNA candidate related to BP response.

**Methods.** 41 male OSA patients with RH assessed before and after 3 months of CPAP treatment (>4.5 hours/night). Response to CPAP was defined as BP changes >4.5 mmHg. 20 exhibited a reduction in mean BP [mean ± SD, 11.5±5 mmHg; Responder Group (RG)] and in 21 patients, showed a change of -1.5±4.7 mmHg [Non-responder Group (NRG)]. miRNAs expression profiling of CV system-focused miRNA was per-

formed using custom array (Qiagen). A logistic regression model was fitted to identify the miRNAs that predict the BP response.

**Results.** 3 miRNAs provided a discriminatory predictive model of RG and NRG. The AUC was 0.91, with 95% CI (0.82, 0.99). The analysis of these 3 miRNAs enabled generation of a score for estimates of the probability for favorable BP response to CPAP treatment (Fig. 1).

**Conclusions.** A singular cluster of CV system functional miRNAs appears to specifically differentiate between OSA patients with RH whose BP favorably responds to CPAP and those who do not. The HIPARCO-Score is an easy to use and highly clinical practice predictive tool for the identification of favorable BP responders to CPAP among patients with RH and OSA.

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## P113

### Assessing the prevalence of undiagnosed obstructive sleep apnoea (OSA) in an acute medical admissions unit in the UK

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**Introduction.** OSA is often undiagnosed with an impact on quality of life and morbidity. We present preliminary results of a prospective study to assess the prevalence of undiagnosed OSA on the acute medical take in a UK secondary care hospital.

**Methods.** We recruited medical patients 30 to 75 years of age admitted acutely for a variety of medical emergencies. If patients had two or more symptoms of sleep apnoea (snoring, witnessed apnoea, increased daytimes somnolence/tiredness and trouble concentrating), an Epworth Sleepiness score (ESS) was done.

**Results.** 93 patients (42 male and 51 female) were recruited. 45 (48%) had a BMI more than 30. 50 patients (54%) had significant co-morbidities; 19% were diabetic, 44% had hypertension and 5% known ischaemic heart disease. 51 patients (55%) had more than 2 symptoms and completed the ESS. In all 20 patients (39% of those with symptoms and 22% of all those studied) scored >11 on the ESS. The mean ESS in those with a score >11 was 14.8.

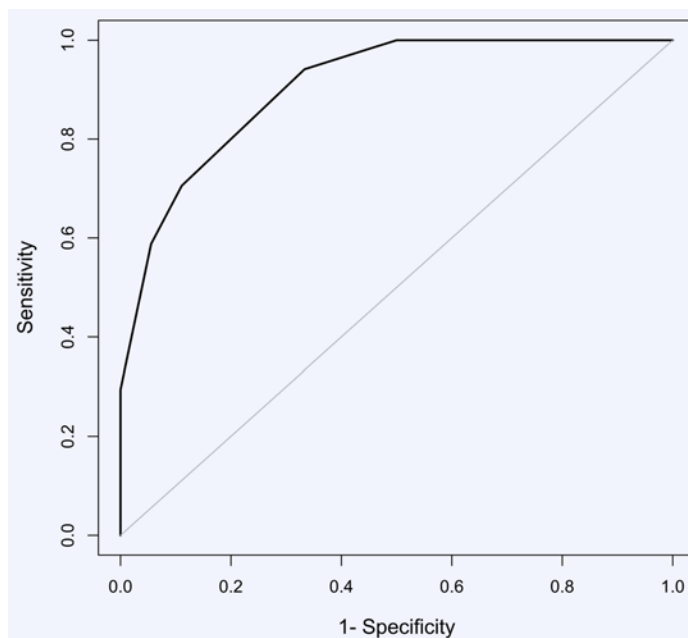


Figure 1A: HIPARCO-Score ROC curve (AUC=0.91, 95% IC (0.82,0.99))

HIPARCO-Score	% favorable BP responders to CPAP (observed)	% favorable BP response to CPAP (predicted)
0	0%	3.8%
1	25%	14.3%
2	50%	46.6%
3	67%	78.8%
4	80%	84.8%
5	100%	96.7%
6	100%	99.2%

Figure 1B: HIPARCO-Score predictive tool for identification of favorable BP response to CPAP treatment

HIPARCO-Score (Obtained)	Sensitivity (%)	Specificity (%)
From 1 to 6	100%	50%
From 2 to 6	94.1%	66.7%
From 3 to 6	70.6%	88.9%
From 4 to 6	58.8%	94.4%
From 5 to 6	29.4%	100%

Figure 1C: Sensitivity and specificity of the analysis of HIPARCO-Score



**Discussion.** Although a number of conditions can cause hypersomnolence, an ESS  $>11$  with symptoms suggestive of upper airway obstruction has a high likelihood of OSA. OSA has a detrimental impact on underlying medical conditions. Risk factors such as hypertension and diabetes are routinely queried and treated when present. Our study suggests a high likelihood of OSA in patients admitted to hospital. We propose further studies to investigate those with symptoms and indeed screening questionnaires to estimate the true prevalence of OSA in this population presenting acutely to hospital as treating OSA has significant medical and health economic benefits.

#### P114

##### Profile of patients with sleep disturbances: day time sleepiness index

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**Introduction.** Sleep is a physiological state. It is a neurophysiological subject to alterations influenced by illnesses. In excessive day time sleepiness (EDS), the increase of the tendency of sleeping in inappropriate circumstances and places occur.

**Objective.** To perform the epidemiologic survey of patients with sleep disturbances.

**Methods.** Retrospective, exploratory, descriptive and quantitative research. Approved by the Research Ethics Committee, no687/286. The research was done at a sleep clinic, located at Vale do Paraiba/Sao Paulo/Brazil. The data is composed by 421 patient's assisted in the period of January/December 2013. Epworth Questionnaires<sup>®</sup> of identification of the sample of sleepiness were utilized.

**Results.** Male predominant (56.77%), majority between 41 and 60 years (51.78%). The major complaints of sleep disturbances: (93.10%) related to snoring, (60.67%) apnea. Major symptoms (56.53%), low energy and (53.92%) diminished memory and focus. Referring to (EDS) (56.53%) present with excessive sleepiness, especially between the ages of 41 and 50 years old (58.04%) e males (60.25%). Polysomnography presents results related to apnea/hypopnea: 136 (32.30%) normal/65 (47.79%). Present with EDS; 108 (25.65%) severe/77 (71.30%) present (EDS); 99 (23.52%) slight/59 (59.60%) present with EDS; and 78 (18.53%) moderate/37 (47.44%) present with EDS. Of those that mentioned snoring (57.80%) and apnea (54.15%) present with EDS. There was a positive relationship between apnea/hypopnea and EDS (p-value 0.0008).

**Conclusion.** In conclusion there was a prevalence of EDS, especially between ages 41 and 60 years old and the males.

#### P115

##### Optimal time for a controlled titration study in patients with obstructive sleep apnea syndrome treated with non-invasive mechanical ventilation

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**Introduction.** The pressure requirements for patients with obstructive sleep apnea syndrome (OSAS) who use a positive airway pressure (PAP) device may change over time for various reasons.

**Aims.** In this study, we aimed to determine the optimal time for a controlled titration study and its associated factors in patients with OSAS using a PAP device.

**Methods.** We retrospectively identified 82 patients diagnosed with OSAS who used a PAP device and underwent a second PAP titration study for control purposes at our sleep center. We compared pressures and BMI (body mass index) values after both titration tests.

**Results.** The mean period between the first and second titration studies was  $21.4 \pm 17$  (range, 3–74) months. The patients were divided into three groups according to the pressure changes following the controlled titration study: those with elevated, unchanged, and decreased PAP pressure. The BMI calculated following both studies increased significantly in the group with elevated pressure ( $p < 0.001$ ), decreased significantly in the group with decreased pressure ( $p < 0.001$ ), and no significant difference was observed in the group with unchanged pressure ( $p = 0.235$ ). A positive correlation was found between the change in BMI and the change in Cpap, Ipap, and Epap values following both titration tests ( $p < 0.001$ ,  $r = 0.898$ ;  $p < 0.001$ ,  $r = 0.884$ ;  $p < 0.001$ ,  $r = 0.896$ , respectively).

**Conclusions.** The results show that weight changes in patients with OSAS receiving PAP therapy during follow-up can be accompanied by pressure changes in the device, suggesting the need for a controlled titration test.

#### P116

##### Sleep apnea and periodic leg movements in the first year after spinalcord injury

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**Background.** Sleep disturbances are frequently reported by patients with spinal cord injury (SCI). Studies have shown an increased incidence of sleep-disordered breathing (SDB) and periodic leg movements during sleep (PLMS) in people with stable long-term SCI.

**Methods.** This was a prospective observational study in order to evaluate the features and possible predisposing factors of SDB and PLMS in a heterogenic population of consecutive SCI patients admitted at the Spinal Unit of the Niguarda Hospital within the first year after injury. Each patient underwent a clinical assessment, full polysomnography and arterial blood gas analysis before and immediately after sleep. Multiple logistic regressions were applied in order to evaluate factors associated with SDB and PLMS.

**Results.** Thirty-five (15 tetraplegic and 20 paraplegic) patients were enrolled. Nine patients (25.7%) had an obstructive SDB and 10 (28.6%) had PLMS. The frequency of SDB was higher in tetraplegic with respect to paraplegic patients (Wald statistic: 7.71;  $p = 0.0055$ ), whereas PLMS were significantly more frequent in patients with an incomplete motor lesion than in subjects with a complete motor lesion (Wald statistic: 6.14;  $p = 0.013$ ). Conclusion. This study confirms a high frequency of SDB and PLMS in SCI patients in the first year following injury. Independently from possible sub-acute and chronic clinical variables, the level and the completeness of the spinal cord lesion are the main factors associated respectively with an early development of SDB and PLMS.

#### P117

##### Gender differences in a large sleep apnea population visiting a sleep clinic in Greece

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**Background.** Obstructive sleep apnea syndrome (OSA) is underdiagnosed in women raising the concern that women manifest OSA differently. The aim of the present study was to characterise sex differences in an OSA population visiting a sleep clinic in Greece.

**Methods.** A total of 1842 subjects, 74.9% males and 25.1% females, aged  $52 \pm 14$  yrs were examined. Measurements of BMI, neck, waist and hip



circumference, Epworth Sleepiness Scale (ESS), STOP BANG score and sleep study were obtained in all subjects.

**Results.** OSA was diagnosed in 81% of the sample, 13.5% having mild OSA (AHI 5–15/h), 18.8% having moderate OSA (AHI 15–30/h) and 48.5% having severe OSA (AHI>30/h). 29.5% of patients with mild OSA, 26.4% of patients with moderate and 20% with severe OSA were female. Women were older (age  $p<0.001$ ) and heavier (BMI  $p<0.001$ ) than men suffering from OSA with lower waist to hip ratio ( $p<0.001$ ). More women suffered from diabetes ( $p<0.001$ ), GERD ( $p<0.001$ ) and hypothyroidism ( $p<0.001$ ). Most men reported snoring ( $p=0.013$ ) and apneas ( $p<0.001$ ), whereas women complained for bad mood during the day, fatigue, headaches and nightmares ( $p<0.001$ ). Men had higher AHI ( $p<0.001$ ), oxygen desaturation index (ODI;  $p<0.001$ ), STOP BANG ( $p=0.005$ ) and pack-years ( $p<0.001$ ). Blood pressure and ESS did not differ significantly between males and females. Comparison of females with and without OSA revealed significant differences in anthropometric (age, BMI, waist to hip ratio), blood pressure, ESS, STOP BANG, AHI and ODI.

**Conclusions.** Females report the cardinal symptoms of OSA less frequently, they are older and heavier than men with OSA and have less severe syndrome.

### P118

#### Lung injury as assessed by Krebs Yon Den Lundgen-6 biomarker in patients with obstructive sleep apnea

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**Introduction.** Obstructive sleep apnea (OSA) is characterized by upper airway obstruction along with varying degrees of gas exchange alteration causing oxidative stress, which contributes to endothelial dysfunction and cell injury in lung. The injurious effect of oxidative stress in the lungs of patients with OSA has not been fully elucidated. We hypothesized that lung injury biomarkers may have an association with OSA. We looked for correlation, if any, with serum Krebs yon den Lundgen-6 (KL-6) in Asian Indian OSA subjects.

**Methods.** 200 subjects (132 male, 68 female) with suspected sleep disorders were recruited. After taking informed written consent, all subjects underwent overnight full-montage digital Polysomnography (Alice-5 sleep diagnostic system, USA). Serum KL-6 levels were evaluated by sandwich enzyme linked immune sorbent assay (ELISA). OSA was diagnosed if AHI was >5.0 per hour.

**Results.** 100 subjects (78 male, 22 female) were diagnosed with OSA and 100 subjects (54 male, 46 female) did not have OSA. Mean age and BMI was 55.0 year, 32.0 kg/m<sup>2</sup> in subject with OSA and 42.0 year 29.0 kg/m<sup>2</sup> in subjects without OSA ( $p$  value, 0.0019) respectively. Mean serum KL-6 levels was significantly elevated in subject with OSA 69.0 (26–322) ng/ml as compared to subjects without OSA 48.5 (5–266) ng/ml. Wilcoxon rank sum test  $p<0.0003$ .

**Conclusion.** lung injury specific biomarker KL-6 is significantly elevated in OSA. These findings suggest that epithelial and endothelial cell injury in the lung may be present in the OSA. This may cause increased alveolar wall permeability in lung.

### P119

#### CPAP treatment increases serum vitamin D levels in male obstructive sleep apnea patients

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**Study objective.** Recent studies report a link between obstructive sleep apnea (OSA) syndrome, low vitamin D levels and high parathormone (PTH) concentrations. The aim of the present study is to evaluate the effect of seven-night continuous positive airway pressure (CPAP) therapy on serum vitamin D, PTH and calcium levels in patients with severe OSA syndrome.

**Methods.** We dosed serum vitamin D, PTH and calcium levels at baseline from control subjects and severe OSA patients (Apnea-Hypopnea Index >30/h). Moreover, OSA patients subdivided in responders (OSA-R, mean residual AHI<5/h with a CPAP usage >4h/night) and not-responders (OSA-nR, mean residual AHI>5/h) underwent a final morning blood sample after seven-night CPAP therapy.

**Results.** We enrolled ninety OSA patients into the study (65 OSA-R and 25 OSA-nR) compared to 32 control subjects. At baseline we found lower vitamin D and higher PTH levels in OSA group compared to controls. After a seven-night CPAP therapy, male OSA-R patients showed a significant increase in vitamin D levels. Conversely, female OSA-R patients did not show the increase of vitamin D levels. Furthermore, OSA-nR subjects did not show modifications of serum markers after nCPAP-therapy.

**Conclusions.** The present study confirms that OSA patients suffer from low vitamin D and high PTH levels. However, the finding that short-term CPAP therapy is able to promote the recovery of vitamin D status in male but not in female OSA patients may be probably owing to the evidences that post-menopausal women are often affected by a sexual hormone-mediated impaired homeostasis of vitamin D.

## Thematic Poster Session

### „Quality of life, Devices and Other Therapies“

### P120

#### Sleep deprivation and its consequences on house officers and postgraduate trainees

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**Objective.** To determine sleep deprivation and its consequences on doctors in tertiary care hospitals.

**Methods.** The cross-sectional study was conducted from February to May 2012 and comprised house officers and postgraduate trainees at 4 public and 1 private tertiary care hospitals in Karachi. The subjects were posted in wards, out-patient departments and emergencies. A proforma was designed with questions about duration of duty hours, sleep deprivation and its effects on quality of performance, and presence of anxiety, depression, medical errors, frequent cold and infections, accidents, weight changes, and insomnia. Duration of 1 hour was given to fill the proforma. SPSS 20 was used for data analysis.

**Results.** The study comprised 364 subjects: 187 (51.37%) house officers and 177 (48.62%) postgraduate trainees. There were 274 (75.27%) females and 90 (24.72%) males. Of those who admitted to being sleep deprived (287; 78.84%), also complained of generalised weakness and poor performance ( $n=115$ ; 40%), anxiety ( $n=110$ ; 38%), frequent cold and infections ( $n=107$ ; 37%), personality changes ( $n=93$ ; 32%), depression ( $n=86$ ; 30%), risk of accidents ( $n=68$ ; 23.7%), medical errors ( $n=58$ ; 20%) and insomnia ( $n=52$ ; 18%).

**Conclusion.** Having to spend 80–90 hours per week in hospitals causes sleep deprivation and negative work performance among doctors. Also, there is anxiety, depression and risk of accidents in their personal lives.

#### P121

##### **Sleep duration is increased but not physical activity in somnolent moderate to severe obstructive sleep apnea patients treated by continuous positive airway pressure**

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**Introduction.** Obstructive sleep apnea syndrome (OSA) is associated with deteriorated sleep, decreased quality of life and low physical activity. With treatment, sleep quality is improved and we can expect, consecutively, a reduction in time spent sleeping.

**Aim.** This study aims to assess the changes in sleep duration and quality in moderate to severe somnolent OSA patients before and after treatment by continuous positive airway pressure (CPAP). As secondary aims, changes in physical activity (PA) and quality of life (QoL) have been evaluated.

**Methods.** In this prospective multicentric study, patients were evaluated by 5-days actigraphy and QoL questionnaire before and 3 months after CPAP initiation. 150 obese and somnolent OSA patients were enrolled.

**Results.** Somnolence was improved with CPAP (Epworth sleepiness scale score decreased from  $14 \pm 3$  to  $9 \pm 5$ ,  $p < 0.001$ ). Time spent sleeping increased significantly under CPAP, from  $358 \pm 106$  to  $387 \pm 89$  min ( $p < 0.001$ ). QoL was severely impaired in all domains at baseline, and was improved after treatment. PA did not change under CPAP. Low PA was correlated with OSA severity ( $p = 0.02$ ) and with nighttime oxygen desaturation ( $p = 0.02$ ).

**Conclusion.** In this study, we have shown for the first time in a large series that sleep time is increased with CPAP treatment in moderate to severe somnolent OSA patients. Short sleep time seems to be associated with OSA severity. Hypothesis explaining this phenomenon could be a protective mechanism in OSA, avoiding hazards related to sleep state in this pathology, but underlying mechanisms need to be further studied.

#### P122

##### **Pneumotoning (oropharyngeal and pulmonary exercises, electrical stimulation and manual therapy) to improve the CPAP compliance in patients with obstructive sleep apnea-hypopnea. A pilot study**

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**Introduction.** The most appropriate treatment for severe obstructive sleep apnea-hypopnea (OSAH) is the continuous positive airway pressure (CPAP). The problem is that 30% of patients do not use CPAP treatment. One of the intolerances is the high positive pressure of the CPAP. This means that there is a great collapsibility of the upper airway (UA).

**Aim.** To increase the compliance of the CPAP by performing pneumotoning therapy (PNT). PNT tries to improve the UA patency through: oropharyngeal musculature toning exercises, electrical stimulation, pulmonary exercises and manual therapy.

**Methods.** Patients ( $n = 34$ ) were randomized in two groups with opaque envelopes. The intervention group underwent CPAP and PNT, the control group only CPAP. We compare the final data with U Mann Whitney for continuous variable and Chi-square for nominal variable. Baseline data of the groups were homogeneous in gender, age, body mass index, snoring, apnea-hypopnea index, cumulative percentage time at  $SaO_2 < 90\%$ , smoking habits, Epworth Scale, Sleep Apnea Quality of Life Index (SAQLI), Atenas insomnia test and CPAP pressure.

**Results.** There is a statistical difference in compliance (100% in intervention group vs 65% in the control,  $p = 0.01$ ), the improvement of SAQLI ( $p = 0.05$ ) and the subjective tolerance of CPAP measured with Visual Analogical Scale ( $p = 0.02$ ).

**Conclusion.** PNT is worth being more studied because it could be an interesting adjunct treatment in severe OSAH to improve CPAP compliance.

#### P123

##### **Influence of auto-CPAP therapy on life quality in patients with BA combined with OSAHS**

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**Aim.** To assess the efficacy of auto CPAP therapy on life quality in patients with BA combined with OSAHS.

**Materials and methods.** 20 BA patients [ $FEV_1(68,0 \pm 3,3)\%$  with OSAHS [ $AHI - (33,6 \pm 5,6)$ ] diagnosed by polysomnography, 7 female and 13 male, mean age ( $56,7 \pm 2,2$ ) years with BMI ( $35,4 \pm 2,2$ ) kg/m<sup>2</sup> were treated auto-CPAP therapy during 10 nights on the background of standard BA therapy. Patients were assessed with ACQ, Epworth Sleepiness Scale, body plethysmography ("Cardinal Health", Germany), 6-min walk test with BORG scale (physical tolerability), quality of life questionnaire (SGRQ) at baseline and after studied course of treatment.

**Results.** After studied course symptoms component (frequency and severity) score decreased from ( $66,4 \pm 3,8$ ) to ( $49,0 \pm 3,1$ ), activities that cause or are limited by breathlessness – decreased from ( $44,0 \pm 3,7$ ) to ( $25,8 \pm 4,1$ ) and impact components (social functioning, psychological disturbances resulting from airways disease) – from ( $44,0 \pm 3,7$ ) to ( $22,9 \pm 2,2$ ). All domains changed significantly ( $p < 0.05$ ) and according minimal clinically important difference – it was very efficacious treatment ( $\geq 12$ , ERJ 2002 Mar, 19(3):398–404).

**Conclusion.** addition of auto CPAP therapy in patients with combined pathology – BA+OSAHS clinically meaning and statistically significant improve life quality.

#### P124

##### **Influence of auto-CPAP therapy on polysomnography indices in patients with bronchial asthma and obstructive sleep apnea/hypopnea syndrome**

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**Aim.** To study the influence of auto-CPAP therapy on PSG indices in patients with asthma and OSAHS.

**Materials and methods.** 20 BA patients [ $FEV_1(68,0 \pm 3,3)\%$  with OSAHS [ $AHI - (33,6 \pm 5,6)$ ] diagnosed by PSG, 7 female and 13 male, mean age ( $56,7 \pm 2,2$ ) years were treated auto-CPAP therapy during 10 nights on the background of standard BA therapy. Patients were assessed with PSG ("SomnoStar Pro", "Cardinal Health", Germany) at baseline, after 10 days observation, after 1st night of auto-CPAP therapy and after studied course of treatment.

**Results.** At baseline all patients had abnormal PSG data: IAH ( $33,6 \pm 5,6$ )/h and ID ( $47,3 \pm 5,8$ )/h; decreased REM stage ( $13,7 \pm 3,5\%$ ), mean  $SpO_2$  ( $87,9 \pm 1,6\%$ ), min  $SpO_2$  ( $72,8 \pm 2,7\%$ ). Deep sleep stages (3rd and 4th) were also decreased. After first 10 days, when patients continued

their basic therapy observation PSG sings didn't change. After 1st night of treatment with auto CPAP therapy was noted decrease of IAH – to (6,9±2,5)/h and ID – to (17,8±4,2) vs baseline; increased mean SpO<sub>2</sub> to (91,4±1,3) and min SpO<sub>2</sub> to (82,4±2,3; p<0,05) accordingly vs baseline. After 10 nights of treatment by auto-CPAP therapy we found positive dynamics of PSG data, but they were not statistically significant vs first night of auto-CPAP therapy.

**Conclusion.** Use of auto-CPAP therapy in addition to basic treatment in patients with combined pathology – BA and OSAHS increased AHI, index desaturation, mean and min SpO<sub>2</sub> after the first night vs baseline.

## P125

### Effectiveness of home single-channel nasal pressure for sleep apnea diagnosis

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**Introduction.** Home single-channel nasal pressure (HNP) may be an alternative to polysomnography (PSG) for obstructive sleep apnea (OSA) diagnosis but no cost studies have yet been carried out. Automatic scoring is simpler but generally less effective than manual scoring.

**Objectives.** To determine the diagnostic efficacy and cost of both scorings (automatic and manual) compared with PSG.

**Methods.** We included suspected OSA patients in a multicenter study. They were randomized to home and hospital protocols. We constructed Receiver Operating Characteristic (ROC) curves for both scorings. Diagnostic efficacy was explored for several HNP AHI cut-off points and costs were calculated for equally effective alternatives.

**Results.** Of 787 randomized patients, 752 underwent HNP. Manual scoring produced better ROC curves than automatic for AHI

**Conclusion.** HNP is a cheaper alternative than PSG for OSA diagnosis. HNP with manual scoring seems to have better diagnostic accuracy and a lower cost than automatic scoring for patients with low AHI levels, although automatic scoring has similar diagnostic accuracy and cost than manual scoring for intermediate and high AHI levels. Therefore, automatic scoring can be appropriate used although diagnostic efficacy could improve if we carried out manual scoring on patients with AHI<15.

## P126

### Brain stimulation over the dorsolateral prefrontal cortex triggers sleep-dependent memory consolidation

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The beneficial role of sleep in declarative memory consolidation is widely accepted; the role of sleep in non-declarative memory consolidation, however, is debated. Here we aimed to explore how sleep contributes to non-declarative memory consolidation by a direct manipulation of the involvement of specific brain regions in memory formation. Healthy, young adults performed an implicit sequence learning task and

simultaneously received anodal (excitatory) transcranial direct current stimulation (tDCS) to the right or left dorsolateral prefrontal cortex (DLPFC) (real stimulation groups) or sham stimulation (placebo group). Memory performance was tested 12 hours later. Half of each group had sleep between the two sessions (PM-AM design), the other half of each group had an awake period during the 12-h delay (AM-PM design). Analysis of memory performance revealed an interaction between stimulation and sleep. Greater engagement of the left DLPFC led to better memory consolidation only if the delay period did not contain sleep, while greater engagement of the right DLPFC led to better memory consolidation only if the delay period contained sleep. These results highlight a functional hemispheric asymmetry of the DLPFCs in non-declarative memory consolidation; moreover, these processes are differentially affected by sleep. This cognition-sleep interaction has important implications not only for healthy populations, but also for sleep disorders. A better understanding of the effect of sleep on memory consolidation can help in designing more accurate diagnostic tools and more efficient rehabilitation programs in order to overcome memory deficits in sleep disorders.

## P127

### Inter-rater reliability in polygraphy scoring: quality control in a sleep support service

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**Aims.** To measure and maintain acceptable inter-rater reliability in scoring of sleep polygraphy studies.

**Methods.** The Sleep Support Service (previously known as MOST) offers scoring of polygraphy studies to clinical partners, using either partner's "in-house" or AASM [1] scoring criteria. Since Feb 2013, all internal MOST scorers and an external scorer (AC) score a monthly polygraphy for quality-control (QC) purposes, with scorers' individual apnoea + hypopnoea index (AHI) expected to lie within ±15% of the group average AHI. Each monthly exercise is scored blind of others' results using a) "in-house" criteria (respiratory events associated with a 4% desaturation) and b) AASM criteria. QC is promoted and maintained through individual and team training and study review at meetings.

**Results.** Individual scorers' and the group's mean AHI are shown for (top) "in-house" and (bottom) AASM scoring criteria (Fig. 1). Inter-scorer AHI values lay within ±15% of the mean except when AHI<10. In-house and AASM criteria yielded, in some cases, substantially different AHIs.

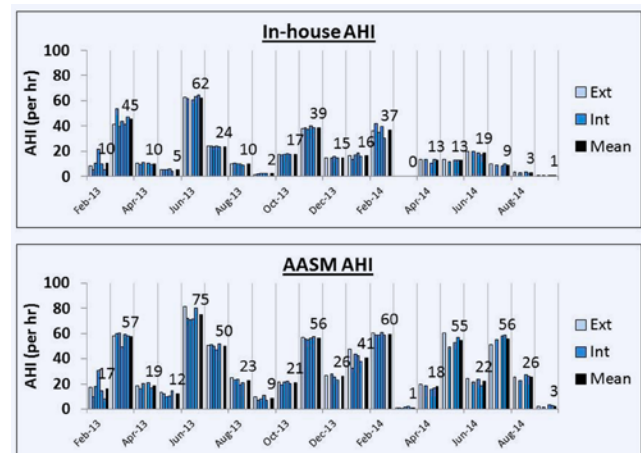


Fig. 1 | P127 ▲ Scorers' AHIs over time and by scoring criteria



**Conclusions.** QC promoted and maintained inter-rater reliability in polygraphy scoring within scorers and against an external scorer. Comparison of two separate scoring criteria systems shows sometimes large differences in outcome of AHI severity.

**References**

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**P128**

**Effect of modafinil and armodafinil on excessive daytime sleepiness in patients with obstructive sleep apnea: a systematic review and meta-analysis**

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**Background.** Obstructive sleep apnea (OSA) is a condition marked by upper airway obstruction that is associated with nocturnal hypoxemia, excessive daytime sleepiness (EDS), and sympathetic hyperactivation. It is associated with impaired quality of life, and other cardiovascular diseases. Modafinil, and the R-enantiomer, armodafinil, are wakefulness promoting agents known to be effective in ameliorating sleepiness in patients with OSA.

**Objective.** To assess efficacy of modafinil and armodafinil on EDS in patients with OSA.

**Methods.** We performed a systematic review and meta-analysis of published randomized controlled trials (RCTs) that evaluated the efficacy of modafinil and armodafinil on EDS. Electronic databases, including PubMed, EMBASE, and Cochrane Central Register of Controlled Trials, were searched for articles on OSA published before November 2014.

**Results.** We identified 11 RCTs of modafinil involving 880 patients and 3 RCTs of armodafinil involving 900 patients. The meta-analysis showed significant improvement on Epworth Sleepiness Scale. The pooled mean difference of modafinil and armodafinil was -2.96 (95% confidence interval [CI]: -3.73 to -2.19) and -2.63 (95% CI: -3.4 to -1.85), respectively. The sleep latency of maintenance of wakefulness test also significantly prolonged under modafinil and armodafinil with pooled mean difference of 2.51 (95% CI 1.5-3.52) and 2.71 (0.04-5.37) separately.

**Conclusion.** Our review indicated that both modafinil and armodafinil significantly improved subjective and objective daytime sleepiness. Thus, these medications may be recommended to patients with OSA, especially those with EDS.

**P129**

**A telephone questionnaire to assess self reported CPAP compliance in moderate to severe OSA patients. Usefulness and accuracy**

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**Introduction.** Several studies show a dose response effect of CPAP in obstructive sleep apnea (OSA). In our sleep program CPAP treatment is mainly provided for free. It is important to assess compliance accepted as at least 4/h night, 5 days a week.

**Objective.** To evaluate usefulness and accuracy of a telephone questionnaire to assess CPAP compliance in moderate to severe OSA.

**Methods.** Subjects with OSA diagnosis (AHI $\geq$ 15) were identified from sleep laboratory records and were asked to answer a telephone questionnaire. Information recalled: CPAP prescription and acceptance, machine provider, clinical response and self reported CPAP compliance. In a subgroup of patients compliance was checked by h/use from the machine.

**Results.** 220 OSA patients answered the questionnaire, 128 (58%) women, mean age 58.6 $\pm$ 10.5 years, AHI 43.4 $\pm$ 23.5. CPAP prescribed in 172 (78%), refusals 17 (9.8%) and no CPAP access 22 (12.7%). Treatment conducted in 134 (61%) provided by Hospital 114 (85%), 10 (4.9%) abando-

ned treatment, 109 (81%) at least one year of treatment, 132 (98%) self reported compliance  $\geq$ 4 h use (6.88 $\pm$ 0.6 nights/week, 6.65  $\pm$ 1.54 hours/night) Changes in symptoms: less somnolence 125 (93%), more activity 129 (96%), reduced snoring 132 (98%). 71 (71,6%) followed up by sleep physician and respiratory technician. In 91 patients data on h/use recorded by machine showed  $\geq$ 4 h/night in 85% of patients.

**Conclusions.** A simple telephone questionnaire applied to CPAP patients shows optimal clinical response to treatment as well as relatively accurate information on compliance to therapy. It can be an alternative minimal follow up for patients not attending clinics.

**P130**

**Are anxiety and depression predictive factors of CPAP treatment adherence in OSAS patients?**

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**Introduction.** CPAP is gold standard treatment for severe OSAS patients but treatment adherence remains an issue for physicians.

**Methods.** We investigated if anxiety and depression are predictive factors of poor treatment adherence. We calculated an anxiety feature and a depression score with Spielberger anxiety feature-state inventory (STAI form Y-B) and BDI scale for each OSAS patient who started a CPAP treatment in our center with systematic 6 months follow-up. 418 peoples have been included between January 2012 and October 2014. 100 (23%) had stopped treatment during this period. In the ongoing treatment group (318), 99 have been excluded of the study (31%): 74 (74,7%) haven't yet realized 6 months follow-up, 3 (3%) refuse to participate and 22 (22,3%) haven't correctly completed the questionnaires (Fig. 1).

**Results.** Anxiety feature scale results isolate 5 groups: no anxiety (21), mild anxiety (77), moderate anxiety (73), high anxiety (36) and extreme anxiety (12). The 6 months mean adherence is respectively 6,3; 5,7; 5,5; 6,1 and 5 hours/night. Multiple linear regression analysis doesn't found significant statistical difference between the groups (F=1.821203; p=0.125824).

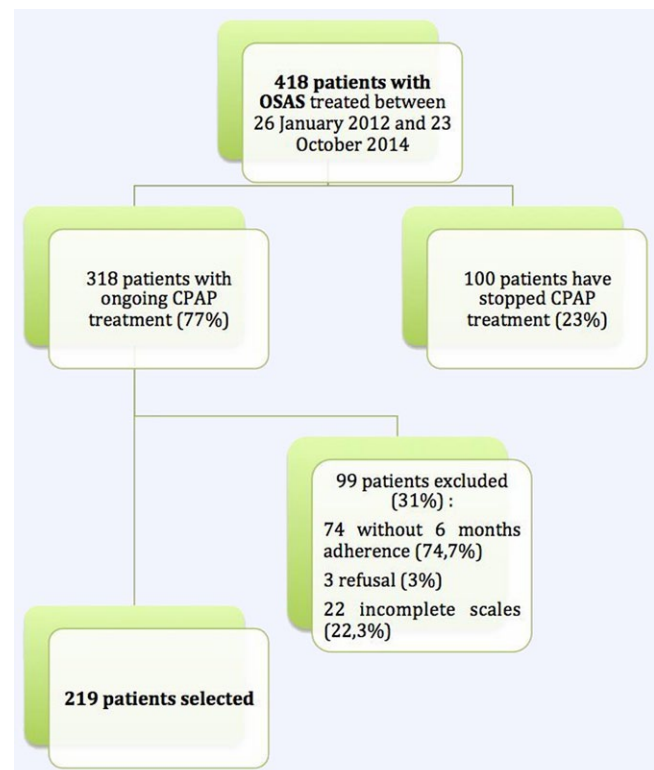


Fig. 1 | P130 Study design



	No anxiety	Mild anxiety	Moderate anxiety	Severe anxiety	Very severe anxiety	p	No depression	Mild depression	Moderate to severe depression	p
<b>Number</b>	21	77	73	36	12		150	45	24	
<b>%</b>	9,6	35,2	33,3	30,1	5,5		68,5	20,5	11	
<b>Age</b>	60,6	61,1	58,3	58,5	58,8		59,7	58,7	58,5	
<b>BMI</b>	31,3	32,9	33,5	33,1	34,9		32,6	33,9	34,8	
<b>A-H index</b>	41,1	44,6	47,3	47,3	51,5		44,7	48,7	48,8	
<b>Arousal index</b>	36,8	39,2	41,4	42,3	43,7		39,6	42,6	42	
<b>ESS</b>	8,8	8,9	10,3	10,3	12		9,2	10,7	11,8	
<b>A-H index under CPAP</b>	5,3	4,6	4,7	3,6	4,1		4,5	4,9	3,6	
<b>Arousal index under CPAP</b>	9,2	8,3	8,8	7,8	9,3		8,7	8,2	8	
<b>CPAP pressure</b>	10,2	11,1	11,3	11,1	10,6		11,1	11	10,8	
<b>6 months adherence</b>	6,3	5,7	5,5	6,1	5	0,1258	5,7	5,8	5,6	0,8922
<b>EES at 6 months follow-up</b>	4,8	5,8	6,3	5,9	8,8		5,8	6,3	7,3	

Fig. 2 | P130 ▲ Study cohort characteristics

**Conclusion.** BDI scale results identified 69 patients with depression. They are classified in mild (45) and moderate to severe (24). The 6 months mean adherence is respectively 5,8 and 5,6 hours/night. In the group of patients without depression (150), the 6 months mean adherence is 5,7 hours per night. Multiple linear regression analysis doesn't found significant statistical difference between the three groups ( $F=0.114108$ ;  $p=0.892215$ ; Fig. 2). Anxiety and depression are not predictive factors of poor adherence to CPAP treatment.

### P131

#### Bench test comparing two automatic CPAP algorithms for treating obstructive sleep apnea

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**Introduction.** Automatic positive airway pressure (PAP) devices adjust the delivered pressure to the degree of airway patency in patients with obstructive sleep apnea (OSA), aiming to normalise patient's breathing with the lowest possible pressure. Whereas some patients require significant PAP delivered in a short time, others may only require modest pressures.

**Aim.** To compare a recent mode "Response" implemented in ResMed AutoSet device to slow down pressure changes and to keep the overall average pressure lower than the standard mode in the same device.

**Methods.** Algorithms performance was assessed in the bench using a servo-controlled simulated OSA patient (Rigau J, Chest 2006). For a 4-h test we measured: normalisation of breathing, time to reach pressure which normalised breathing (TPNorm), mean PAP applied (Pmean), maximum PAP (Pmax) and residual obstructive events.

**Results.** Both modes were able to overcome obstructive events and flow limitation. TPNorm was similar for both modes ( $\approx 3,5$  min). Pmean was 14.6 and 13.5 cmH<sub>2</sub>O for standard AutoSet and Response modes, respectively. Pmax was 17.9 and 15.6 cmH<sub>2</sub>O, respectively. Residual events were the same for both modes (4 event/h). The behaviour of the two modes was very similar at pressures below 10 cmH<sub>2</sub>O. At higher pressures, Response mode increased pressure more slowly and reached a lower pressure than standard AutoSet.

**Conclusion.** The Response mode could be a useful alternative for patients who struggle with high automatic PAP or are disturbed by pressure changes during the night. However, patient studies are required to confirm our findings in this bench study.

Financial Source: Partially supported by ResMed.

### P132

#### Comparison of polysomnography test results with demographic characteristics of the patients researched in terms of sleep breathing disorders, a retrospective study

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We retrospectively evaluated the polysomnography (PSG) results and the basic demographic characteristics of our cases. The records of 226 patients were analyzed retrospectively. Patients were divided into 3 groups according to their ages; young adults (age 18–44), middle aged (age 45–65), elder aged (age >65). 210 of the patients were women and 205 were men with a general mean age of  $38 \pm 12.6$  (min: 18, max: 80). Sleep stages distribution of the cases was observed as 2.28% N1, 52.39% N2, 17.44% N3, 13.61% REM. 71 patients (31.4%) had not OSAS with apnea-hypopnea index (AHI) values less than 5 (AHI < 5.0). These cases were evaluated as simple snoring. The remaining 155 patients (68.6%) with AHI  $\geq 5$  were diagnosed with OSAS. 60 cases (26.5%) were diagnosed with mild OSAS (AHI = 5–15), 44 (19.4%) with moderate OSAS (AHI = 15–30) and 51 (22.5%) with severe OSAS (AHI  $\geq 30$ ). The average age of patients was 36.47 in simple snoring group, 38.26 in mild OSAS group, 39.45 in moderate OSAS group and 38.29 in severe OSAS group. In terms of the AHI distribution by the age groups, the average AHI was 20.16 in young adults, 17.76 in middle-aged group and 24.37 in elder aged group. There was no significant statistically differences between groups ( $p > 0.05$ ).

### P133

#### The role of FRI to predict treatment outcome after mandibular advancement in OSA patients

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**Introduction.** Previous work by our group showed that the severity of OSA correlates with the morphology of the patient's upper airway (UA) lumen and skull. Treatment response is affected by gender, baseline OSA severity and UA shape and morphologic changes do correlate with changes in OSA severity. In spite of such correlations no single parameter was reported that is able to predict the outcome of a given treatment. This work aims to develop and test a binomial linear model to predict treatment response to mandibular advancement (MA) in a large population of OSA patients.

**Material and methods.** 77 OSA patients were (83% M;  $47.4 \pm 11.5$  years;  $AHI = 21.0 \pm 11.2$ ) treated with MA (protrusion = 75% of the maximal MA). The following data was used for the analysis: 1) from PSG: OSA severity (AHI-ODI), 2) from functional respiratory imaging: UA collapsibility (without or with MA), change in UA volume and resistance, move-

ment of mandible and hyoid bone. Treatment was considered positive if  $\Delta\text{AHI} \geq 50\%$ , or if post-MA  $\text{AHI} < 5$ . A binomial generalized linear (bgl) model was made to predict response by aforementioned parameters. Fitted response values  $\geq 0.5$  were considered to result in a positive response.

**Results.** The success rate in terms of AHI of the MA treatment was 47%. The fitted bgl model was significantly ( $p < 0.05$ ) predicting treatment outcome (positive predictive value=0.82; negative predictive value=0.81; accuracy=0.82; sensitivity=0.78; specificity=0.85)

**Conclusion.** A combination of OSA severity, gender, UA collapsibility, and the lumen and skeletal response to mandibular advancement can be used to predict the outcome of MA treatment with an accuracy above 80%.

### P134

#### Impact of a new mask on patient's willingness to remain on PAP therapy

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**Introduction.** Compliance to positive airway pressure (PAP) therapy remains an issue, with many patients withdrawing entirely from treatment.

**Aims.** We investigated whether patients who were wishing to withdraw from PAP therapy would continue with treatment after trialling a new pillows mask (AirFit P10, ResMed Ltd, Sydney).

**Methods.** A pilot mask program was introduced into a large German Homecare Company. Patients who phoned the Homecare Company wishing to withdraw from PAP therapy, and who cited mask related issues as one of the reasons for discontinuation, were offered a two week trial of a new mask. Patients who agreed to the program were posted the mask, along with a consent form and questionnaire. Patients were then phoned by Homecare staff after one and two weeks to determine their therapy status and their desire to continue with therapy.

**Results.** During the pilot program 54 patients phoned the Homecare Company wishing to withdraw from PAP therapy. All patients were offered a trial of the new mask. 43 agreed to the trial and 11 declined. Participants were predominately male (69%), with an average age of  $59.8 \pm 11.45$ . PAP modes were: 56% CPAP; 37% APAP; 4% bi-level; and 4% ASV. During the two week trial 8 patients dropped out of the program and 2 patients were lost to follow up. At the completion of the trial 33 out of the 54 patients (61%) decided to continue with PAP therapy using the new mask.

**Conclusion.** This pilot program demonstrates that PAP patients who are at the point of withdrawing from therapy can be converted to staying on treatment with a change of equipment.

### P135

#### Sleep habits and excessive daytime sleepiness among medical students and its relationship with their academic performance

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**Background.** Medical students due to clinical and academic demands are at increased risk for sleep disorders especially excessive daytime sleepiness (EDS) and sleep habits can be one of the cause for EDS, that may lead to learning impediments.

**Objective.** To determine the frequency of excessive daytime sleepiness and sleep habits among medical students of Khyber Medical College and its relationship with their academic performance.

**Methods.** This was a cross-sectional self-administered questionnaire based study among medical students, using systematic sampling technique. Epworth sleepiness scale (ESS) was used to assess EDS. Questions regarding sleep habits were asked. Percentage of last professional exam score was taken as academic performance.

**Results.** Out of 173 respondents, 68% were male, 61% boarders and 92% single. Mean age of the study sample was  $22.5 \pm 1.4$  years. Mean percentage score of students was  $65.8 \pm 5.4$ . 38% slept for 8 hours or more during night with 55% having midday naps. Smoking, bedtime coffee and night-time internet use was reported by 20, 23 and 67% of the respondents. Mean ESS score of the study population was  $9.7 \pm 3.8$ , with 40% suffering from EDS at ESS cut-off point 10. Statistically significant ( $p \leq 0.05$ ) negative correlation with Pearson's  $r = -0.554$  was found between ESS and academic scores. Difference in the mean academic scores of EDS and non-EDS groups were 5.8% with  $p \leq 0.05$ , obtained via independent t-test.

**Conclusion.** Excessive daytime sleepiness was a common sleep disorder among medical students. There was a decrease in academic performance of medical students with increasing excessive daytime sleepiness.

### P136

#### Effectiveness of classical VS vibratory positional therapy. A crossover pilot study

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Positional sleep apnea (POSA) is defined as obstructive sleep apnea whose apnea hypopnea index (AHI) is twice on their back then in other position. Over the years, several strategies have been tested in aiding avoidance of supine sleep with variable results. In positional therapy devices can be parted into two major classes. The first one includes tools which derive from the tennis ball's technique. The other category includes devices that vibrate when the patient is supine. The aim of our study is to compare these two types of devices in reducing AHI and the time spent in the supine position in POSA's patients. Ten male patients ( $54.1 \pm 13.7$  years) with body mass index ( $28.6 \pm 4.2$  kg/m<sup>2</sup>), Epworth's scale (ESS)  $4 \pm 2.9$  points, diagnosed with POSA (ICSD-3 AASM) AHI  $19.3 \pm 10$ , supine AHI  $51.4 \pm 17.5$  performed by portable home-based cardiorespiratory monitoring (CRM). Patients were given notice to employ both the vibrating device (Night Shift™) and a pillow that forces the lateral decubitus. After the one-week trial was carried out a CRM in which we register AHI, supine AHI, oxygen desaturation index (ODI), supine ODI, average oxygen saturation (SaO<sub>2</sub>), average minimum SaO<sub>2</sub>, SaO<sub>2</sub> nadir, time spent below SaO<sub>2</sub> of 90%, time spent in supine position. The statistical analysis was conducted on with non parametric method (Wilcoxon test  $p < 0.05$ ). Vibration therapy has significantly reduced AHI and the time spent in supine position, besides all the other parameters are improved, except ESS and average SaO<sub>2</sub>. The classical treatment gave only an amelioration in SaO<sub>2</sub> parameters. Vibratory therapy can be an effective way of treatment in patients with POSA.

### P137

#### Evaluation the risk and level of information about obstructive sleep apnea syndrome to drivers – a pilot study in Cluj-Napoca area, Romania

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**Introduction.** Obstructive sleep apnea (OSA) is the most common medical disorder that causes excessive daytime sleepiness. Undiagnosed and untreated OSAS increases the risk of road accidents by up to 7 times.

**Methods.** We conducted an observational descriptive study using the Modified Stop Bang questionnaire for assessing the risk factors for OSA and to assess the level of knowledge and to test the opinion regarding OSA at 468 drivers. 88.22% were aged between 18 and 50 years, 73.79% were male. Half were normal weight, 40.22% were overweight, and obe-

sity had 8.80% of I and II degree. Half of the respondents say that they have the neck circumference greater than 40 cm, more than two-fifths of them claim that they snore moderately, hard and very hard.

**Results.** More than half of the total of 98 subjects, who invoke moderate, hard and very hard felt sleepiness and fatigue during the day, have a high body mass index, are overweight or obese of I and II degree. Over a fifth of the respondents who say that their neck circumference is greater than 40 cm, confirmed the presence of daytime sleepiness and fatigue. Only 28.33% responders have knowledge about OSA. Only a share of 4.71% of the respondents say that they have been tested for OSA. There is a statistically significant correlation between the presence of risk factors for OSA, daytime sleepiness and need for knowledge and diagnosis for disease ( $p < 0.01$ ,  $p < 0.001$ ).

**Conclusion.** The study reveals the need felt and expressed by the respondents on enhancing the medical education on the symptoms, the signs and the treatment of OSAS to reduce the number of car accidents that occur in the case of people with this condition.

### P138

#### The prevalence of obstructive sleep apnea syndrome in coal miners and its relation with occupational accidents

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**Introduction.** Mining accidents continue to cause disabilities and deaths despite the advances in technology and preventive measures. Obstructive sleep apnea syndrome (OSAS) predisposes occupational accidents due to the tendency to sleep and impaired concentration.

**Aims.** The aim of the present study was to evaluate the prevalence of OSAS and its relation to occupational accidents in coal miners.

**Methods.** Among 2330 miners who worked in Zonguldak coal mines, 92 underground miners were included in the study, who sustained work-related occupational accident caused by the individual factors at least once in their working life. A survey was conducted using a questionnaire and face-to-face interview technique to assess OSAS symptoms and the number of work-related accidents. A total of 28 subjects, who were found to be at risk for OSAS and/or who sustained more than one occupational accident, underwent a polysomnography (PSG) test.

**Results.** According to the survey results, 62% of the cases snored, 29.3% had apnea, and 57.6% had excessive daytime sleepiness (EDS). Of 28 subjects, who underwent PSG, 24 scored  $\geq 5$  on the apnea hypopnea index (AHI). The prevalence of OSAS was found to be 27.3% in the study population. There was a significant correlation between AHI and the number of occupational accidents ( $r = 0.69$ ,  $p < 0.001$ ).

**Conclusions.** The present study showed the relationship between mining accidents and OSAS in coal miners who exhibit a higher prevalence of OSAS compared to general population.

### P139

#### APAP – adverse effects and interface comfort

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**Introduction.** Mask comfort and adverse effects (AE) are a crucial determinant for APAP adherence and efficacy.

**Objective.** Identify and evaluate AE of 3 oronasal and 6 nasal masks in patients on APAP therapy.

**Methods.** The study included 86 patients diagnosed with Obstructive Sleep Apnea (OSA) at Hospital São João (Porto, Portugal) who met the criteria for APAP therapy. A questionnaire based on several AE reported in the literature was developed. Visual analogue scales were used to determine patient comfort levels (1–10). Patients filled in the questionnaire in 3 different moments after therapy initiation: Baseline (0.77 months), Follow-up 1 (F1; 1.85 months) and Follow-up 2 (F2; 7.71 months).

**Results.** 33 of the 86 patients have switched masks due to discomfort or leaks. 50% used oronasal mask, 45.3% nasal mask and 4.7% nasal pillows. No statistical differences were found between therapy adherence. Statistical differences were found between Baseline comfort and F1 comfort ( $6.4 \pm 2.1$  vs.  $7.5 \pm 2.4$ ;  $p = 0.001^*$ ), but no statistical differences were found between F1 and F2 ( $p = 0.73$ ). No statistical differences were found comparing mask type and comfort average. The AE complaining percentage at the 3 moments was respectively: dryness of the oropharynx (73.2%, 68.4%, 66.7%), ocular irritation (28.0%, 28.9%, 35.2%), nasal obstruction (40.2%, 42.1%, 16.7%), rhinorrhea (28.0%; 25.0%; 13%), aerophagia (24.4%; 40.8%; 35.2%), claustrophobia (22.0%; 14.5%; 22.2%).

**Conclusion.** The therapy comfort increased significantly comparing F1 and F2, showing the importance of the education and monitoring by an expert team, during the first months. More studies are needed to verify the effect of time and education in adverse effects according to the interface type.

### P140

#### Anthropometric measures and snoring intensity in patients with obstructive apnea

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**Introduction.** Due to the applicability and low cost, questionnaires and scores are valuable tools for diagnosis and screening of obstructive sleep apnea (OSA) which is present in 9% to 24% of the general population.

**Objectives.** To establish the relationship between the intensity of snoring and anthropometric measures with OSA severity according to AHI.

**Methods.** Consecutive 63 adult patients, from both genders, at the Gaffrée and Guinle University Hospital at Rio de Janeiro, Brazil, submitted to a full night polysomnography and answered the Stanford subjective snoring classification (SSS), had their cervical (CC), abdominal (AC) and BMI measured.

**Results.** The sample consists mostly of men aged 50 to 59 years (38%). 70% of the patients were diagnosed with OSA (34.1% mild OSA; 36.3% moderate OSA; 29.5% severe OSA). Of these, 88% were classified according to SSS as “high snoring”, “very intense snoring” or “the partner leaves the room”. 50% of the patients with mild snoring, were diagnosed with severe OSA, such as 27.3% of those who had the snoring classified as “the partner leaves the room”, were diagnosed with mild OSA. The patients with OSA presented altered anthropometric measures at physical exam especially the AC, above the cut-off in 68% of men ( $>94$  cm) and 81.8% of women ( $>80$  cm); and the BMI was altered in 85.8% (40.9% overweight; 31.8% obese class I; 13.6% obese class II). The CC  $>40$  cm, found in 55.5% was not enough to suggest the diagnosis of OSA, while the absence of snoring was a good predictor to exclude moderate and severe OSA, since 100% of this group was diagnosed with mild OSA.

P141

**Comparison of CPAP treatment versus surgery on health related life quality in moderate OSAS patients**Zubeyde Ayturk<sup>1</sup>, Cigdem Ozdilekcan<sup>2</sup>, Deniz Kizilirmak<sup>1</sup>, Kadriye Serife Ugur<sup>3</sup>, Safiye Ozvurmaz<sup>5</sup>, Duygu Ozo<sup>4</sup>

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**Introduction.** Obstructive sleep apnea syndrome (OSAS) is characterized by repetitive hypoxaemia and arousals leading to daytime excessive sleepiness. The main therapeutic approach for this syndrome is either continuous positive airway pressure (CPAP) treatment or surgery.

**Aim.** The aim of this study was to compare the influence of these two treatment modalities on health related life quality (HRLQ). Symptomatic 50 male and 11 female patients aged between 18 and 73 years, with moderate OSAS according to polysomnographic findings were included in the study. 30 patients who used CPAP therapy regularly for three months and 31 patients who accepted nasal surgery were completed the study and filled questionnaires (Beck depression and SF-36 quality of life scales) at the beginning and at the end of the study. There were no difference according to polysomnographic findings, Beck depression score and short form Health Survey (SF-36) at the beginning of the study. After treatment Beck depression scale decreased significantly in both groups. On the other hand only vitality (power to live), general health perceptions and pain decreased significantly in SF-36 in CPAP group. There was a significant improvement for Beck depression scale in both treatment modality, however in group receiving CPAP treatment was ( $p < 0.001$ ) significant when compared with surgery group ( $p = 0.02$ ).

**Conclusions.** OSAS is a disorder with impairment of sleep quality and architecture that causes decreased life quality and elevated depression rates. Both surgical and CPAP treatment significantly improves symptoms of depression while statistically higher improvement rates occur among CPAP group.

P142

**The role of sleep in the consolidation of emotional stories**Médhi Gilson<sup>1</sup>, Alice Bodart<sup>1,2</sup>, Gaétane Deliens<sup>1</sup>, Philippe Peigneux<sup>1</sup>

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**Introduction.** The impact of sleep on declarative memory is well established but its role for the consolidation of emotional memories and the processing of emotions remains unclear.

**Methods.** In this study, we investigated the influence of sleep, especially rapid eye movement (REM) sleep, on the consolidation of emotional stories. After being slightly restricted of sleep, 24 participants learned a neutral or a sad story in the morning, and were then assigned to either a short (45 minutes) or a long nap (90 minutes). After the nap, they had to recall the story based on structured questions, while mood and emotional states were assessed via questionnaires (Self-Assessment Manikin, SAM) and skin conductance measurements (SCL).

**Results.** As expected, REM sleep was more abundant in the long ( $19.5 \pm 11$  minutes) than in the short nap ( $2.8 \pm 6$  minutes,  $p < 0.0001$ ). Results failed to disclose nap-duration related differences for the recall of the sad and the neutral story. However, the performances in retrieval for the sad story were positively correlated with REM sleep density ( $r = 0.64$ ;  $p = 0.0496$ ). For the sad story, mood improved (SAM,  $p = 0.002$ ) and arousal increased (SAM,  $p = 0.05$ ) after a long but not a short nap. Unexpectedly, SCL increased after a long nap for the sad story.

**Conclusion.** These results are partially in agreement with the Sleep to Forget and Sleep to Remember (SFSR) proposal (Van der Helm & Walker, 2009) that REM sleep promotes emotional memory consolidation while in parallel reduces its affective envelope. Indeed, our results support the hypothesis of a specific role of REM sleep in these processes of emotional memory consolidation, but we unexpectedly found an increase in emotional reactivity after a nap rich in REM sleep.



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## Zielsetzung der Zeitschrift

Auf der Basis von aktuellen, klinisch relevanten Forschungsergebnissen befasst sich die Somnologie mit der Ätiologie, Pathophysiologie, Differentialdiagnostik und Therapie der verschiedenen Schlafstörungen.

Eine wissenschaftlich hochqualifizierte Analyse der verschiedenen Ursachen von Schlafstörungen erfordert die Kooperation einer Vielzahl von medizinischen Fachdisziplinen. Durch die Zusammenarbeit von Vertretern aus den Bereichen der Epidemiologie, Humangenetik, HNO, Mund-, Kiefer- und Gesichtschirurgie, Innere Medizin, Pneumologie, Kardiologie, Gastroenterologie, Neurologie, Neurophysiologie, Physiologie, Psychologie, Pädiatrie und Pharmakologie erfüllt die Somnologie die multidisziplinären Anforderungen der Schlafforschung und Schlafmedizin.

Besonderes Augenmerk liegt hierbei auf methodischen Neuerungen der Biomedizinischen Technik.

Neben experimentellen und klinischen Originalarbeiten und Brief Reports werden Reviews sowie Empfehlungen, Positionspapiere und Leitlinien der DGSM publiziert. Regelmäßig erscheinende Schwerpunktthemen und die Rubriken „Aus der Praxis“ und „Klinische Pfade“ erfüllen den Aus- und Weiterbildungsanspruch dieser Zeitschrift und der beteiligten Fachgesellschaften.

### Review

Alle Artikel der Zeitschrift Somnologie unterliegen einem Reviewprozess.

### Erklärung von Helsinki

Alle eingereichten Manuskripte, die Ergebnisse von Studien an Probanden oder Patienten enthalten, müssen den ethischen Standards der Erklärung von Helsinki entsprechen.

### Abstract publiziert in/Indiziert in:

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## Aims and Scope

Based on current, clinically relevant research results, the journal Somnologie focuses on the etiology, pathophysiology, differential diagnostics and treatment of various sleep disorders.

A scientific, comprehensive analysis of the various causes of sleep disorders requires the cooperation of several branches of medicine. Through the collaboration of specialists in the areas of epidemiology, human genetics, ENT, OMF, internal medicine, pneumology, cardiology, gastroenterology, neurology, neurophysiology, physiology, psychology, pediatrics, and pharmacology, Somnologie fulfills the multidisciplinary requirements of sleep research and sleep medicine.

Special attention is paid to methodological innovations of biomedical engineering. In addition to experimental and original clinical articles, reviews, case reports, recommendations and guidelines are published. Focus issues and the sections „From daily practice“ and „Clinical pathways“ fulfill the continuing education requirements of this journal and the involved professional societies.