CHEST

Socioeconomic Factors and Adherence to CPAP

The Population-Based Course of Disease in Patients Reported to the Swedish CPAP Oxygen and Ventilator Registry Study

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BACKGROUND: Early identification of poor adherence to CPAP treatment is of major clinical importance to optimize treatment outcomes in patients with OSA.

RESEARCH QUESTION: How do socioeconomic factors influence CPAP adherence?

STUDY DESIGN AND METHODS: Nationwide, population-based cohort study of patients with OSA receiving CPAP treatment reported to the Swedish quality registry Swedevox between 2010 and 2018 was cross-linked with individual socioeconomic data from Statistics Sweden. Socioeconomic factors associated with CPAP adherence were identified using a multivariate linear regression model, adjusted for age and sex.

RESULTS: In total, 20,521 patients were included: 70.7% men; mean age ± SD, 57.8 ± 12.2 years; BMI, 32.0 ± 6.1 kg/m^2; apnea-hypopnea index, 36.9 ± 22.1; Epworth Sleepiness Scale, 10.4 ± 5.0; and median nocturnal CPAP use, 355 min (interquartile range, 240-420 min). Adherence after 1.3 ± 0.8 years of CPAP use was significantly (all $P < .001$) associated with civil status (married vs unmarried: +20.5 min/night), education level (high, ≥ 13 years vs low, ≤ 9 years: +13.2 min/night), total household income (highest/third/second vs lowest quartile: +15.9 min/night, +10.4 min/night, and +6.1 min/night, respectively), and country of birth (born in Sweden with one native parent/born in Sweden with two native parents vs being born abroad: +29.0 min/night and +29.3 min/night, respectively).

INTERPRETATION: Civil status, educational level, household income, and foreign background predict CPAP adherence in a clinically significant manner and should be considered when treating OSA with CPAP.

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KEY WORDS: adherence; CPAP; OSA; socioeconomic factors

ABBREVIATIONS: AHI = apnea-hypopnea index; ESS = Epworth Sleepiness Scale

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Σχόλιο:

Η συμμόρφωση στη CPAP είναι γνωστό ότι έχει μεγάλη σημασία για την αποτελεσματικότητα της θεραπείας.

Η μελέτη αυτή από τη Σουηδία προσπαθεί να απαντήσει στο ερώτημα πώς οι κοινωνικοοικονομικοί παράγοντες μπορούν να επηρεάσουν τη συμμόρφωση στη CPAP ασθενών με αποφρακτική άπνοια του ύπνου.

Ενώ αρχικά εντάχθηκαν 65.803 άτομα τα οποία ελάμβαναν θεραπεία με CPAP σε αυτή τη μελέτη κοόρτης, η τελική ανάλυση συμπεριέλαβε 20.521 ασθενείς, ενώ ως συμμόρφωση στη CPAP θεωρήθηκε η χρήση για τουλάχιστον 4 ώρες. Οι παράγοντες που εξετάστηκαν σε σχέση με τη συμμόρφωση ήταν το μορφωτικό επίπεδο (με βάση τα έτη εκπαίδευσης), το βιοτικό επίπεδο (με βάση στοιχεία που αφορούσαν στο εισόδημα), το αν ο ασθενής ήταν παντρεμένος ή όχι και το αν ο ασθενής καταγόταν από τη Σουηδία ή ο ένας ή και οι δύο γονείς του ήταν μετανάστες.

Η μελέτη έδειξε ότι οι ασθενείς που ήταν παντρεμένοι, είχαν υψηλότερο μορφωτικό και βιοτικό επίπεδο και οι γονείς τους δεν ήταν μετανάστες εμφάνιζαν καλύτερη συμμόρφωση στη χρήση της CPAP. Το αποτέλεσμα αυτής της μελέτης μας δείχνει ότι θα ήταν ίσως σκόπιμη η πιο εντατική ενημέρωση και η πιο συχνή παρακολούθηση ασθενών με χαμηλότερο κοινωνικοοικονομικό επίπεδο και ασθενών οι οποίοι ζουν μόνοι τους.

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RESEARCH ARTICLE

Journal of Sleep Research

High sleep fragmentation parallels poor subjective sleep quality during the third wave of the Covid-19 pandemic: An actigraphic study

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Summary

Studies on sleep during the Covid-19 pandemic have mostly been conducted during the first wave of contagion (spring 2020). To follow up on two Italian studies addressing subjective sleep features during the second wave (autumn 2020), here we assess sleep during the third wave (spring 2021) in a sample of healthy adults from Campania (Southern Italy). Actigraphic data (on 2 nights) and the Pittsburgh Sleep Quality Index were collected from 82 participants (40 F, mean age: 32.5 ± 11.5 years) from 11 March to 18 April 2021, when Campania was classified as a "red zone", i.e. it was subjected to strict restrictions, only slightly looser than those characterizing the first national lockdown (spring 2020). Although objective sleep duration and architecture appeared in the normal range, the presence of disrupted sleep was indexed by a relevant degree of sleep fragmentation (number of awakenings ≥ 1 min: 12.7 ± 6.12; number of awakenings ≥ 5 min: 3.04 ± 1.52), paralleled by poor subjective sleep quality (Pittsburgh Sleep Quality Index global score: 5.77 ± 2.58). These data suggest that the relevant subjective sleep impairments reported during the first wave could have relied on subtle sleep disruptions that were undetected by the few objective sleep studies from the same period. Taken together with sleep data on previous phases of the pandemic, our findings show that the detrimental effects on sleep determined by the initial pandemic outbreak have not abated across the subsequent waves of contagion, and highlight the need for interventions addressing sleep health in global emergencies.

KEYWORDS
actigraphy, Covid-19 pandemic, objective sleep quality, sleep schedules, subjective sleep quality

Σχόλιο : Το παραπάνω άρθρο , προερχόμενο από κέντρο της γειτονικής Νότιας Ιταλίας , συγκεντρώνοντας δεδομένα ακτιγραφίας αλλά και το ερωτηματολόγιου ποιότητας ύπνου Pittsburg Sleep Quality Index , μελετάει την επίδραση του 3ου κύματος της πανδημίας COVID (άνοιξη 2021) σε υγιείς ενήλικες και διαπιστώνει κατακερματισμό ύπνου(με αφυπνίσεις > 5min στο 12,7%) και φτωχή υποκειμενική ποιότητα ύπνου (PSQI score 5,77) . Αυτές οι επιβλαβείς επιδράσεις δεν έχουν βελτίωση συγκριτικά με τα προηγούμενα δύο κύματα (άνοιξη και φθινόπωρο 2020). Οι συγγραφείς υπογραμμίζουν πως δεν πρέπει να υποτιμώνται παρεμβάσεις που αφορούν την υγεία του ύπνου σε καταστάσεις παγκόσμιας έκτακτης ανάγκης σαν αυτή.

Γκιζοπούλου Ευαγγελία , Πνευμονολόγος

Getting More from the Sleep Recording

Walter T. McNicholas, MD, FERS

KEYWORDS

• Obstructive sleep apnea • Signal processing • Oximetry • Acoustic recording • Pulse transit time • Actigraphy • Biosensors

KEY POINTS

- Developments in signal processing facilitate the automated analysis of traditional signals such as oxygen saturation and electroencephalogram, which provides superior insight into physiology and pathophysiology compared to manual analysis.
- These developments have resulted in increasing recognition that the traditional measure of sleep-disordered breathing, the apnea-hypopnea index, is a poor predictor of disease significance.
- New approaches to the recording and analysis of traditional signals such as snoring and oxygen saturation facilitate ambulatory diagnosis of obstructive sleep apnea.
- Detailed insight into the characteristics of oxygen desaturation during sleep provides superior prediction of comorbidities than the apnea-hypopnea index.
- Derivatives of the electrocardiogram and pulse wave provide indirect data on sleep-disordered breathing that are suitable for ambulatory diagnosis.

INTRODUCTION

Sleep recordings have been a feature of clinical sleep practice for more than 4 decades, and full sleep laboratory recordings in the form of polysomnography (PSG) remain largely based on principles established in these early years. Sleep staging remains fundamentally based on the scoring rules established by Rechtschaffen and Kales in 1968,[1] and the scoring of sleep-disordered breathing (SDB) events is based on the so-called Chicago Criteria introduced in 1999, which also proposed a severity grading for obstructive sleep apnea (OSA) based on the frequency of apneas and hypopneas per hour of sleep (AHI).[2] However, developments in technology and signal analysis in more recent years offer considerable scope to expand and enhance the information that can be obtained from sleep studies, and advances in the understanding of mechanisms contributing to cardiometabolic comorbidities offer new insights regarding the most important sleep-related variables that contribute to these comorbidities.[3] There has been increasing interest among the sleep research community in exploring new and novel approaches to the diagnosis of sleep disorders, especially OSA, and there is increasing recognition that variables such as the AHI may not be the most important measure to quantify the severity of the disorder.[4]

The focus of this review is to explore how additional information may be obtained from signals obtained in traditional sleep recordings such as laboratory-based PSG and home-based sleep studies, as well as information from additional signals that do not form part of traditional sleep studies. The review will focus primarily on the assessment of patients with suspected OSA, as the high prevalence of this disorder, which affects up to one billion subjects worldwide,[5] makes it particularly relevant to explore novel approaches to the accurate and reliable diagnosis of this disorder in the ambulatory setting.[6]

Currently, disease severity is measured using AHI as determined from a sleep study. However, there is poor association between daytime

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symptoms such as excessive daytime sleepiness and the AHI,[7] and there is increasing evidence that cardiometabolic comorbidities may be more related to measures of oxygen desaturation during sleep than the AHI.[3] Thus, there is increasing interest in moving away from the AHI as the most important measure of OSA severity toward a more personalized approach to OSA diagnosis and treatment,[8] which considers individual risk factors, clinical history, and comorbid disease in the diagnosis and treatment of each patient with OSA.

INDIVIDUAL PATIENT PHENOTYPING

While overnight diagnostic sleep studies provide the core evidence of SDB in patients with suspected OSA, there is clear evidence that the sleep study alone does not provide sufficient evidence for the diagnosis of the clinical syndrome. This aspect has been recognized for many years,[9,10] and more recently, there is strong evidence that clusters of different clinical phenotypes can be identified among the broad population of patients presenting for assessment.[11] Furthermore, certain pathophysiological traits that are very common in OSA such as loss of nocturnal dipping of blood pressure (BP) have significant implications for the development of associated comorbidity.[12] Thus, whatever sleep study is used in the assessment of suspected OSA, the findings must be integrated into the overall assessment of the patient as regards clinical significance, and management should be linked to the underlying clinical and pathophysiological phenotypes where additional factors to the AHI such as acute systemic effects and associated relevant comorbidity are factored into the decision-making process.[8] A further consideration in the clinical assessment of OSA is the role of the AHI alone, referred to here in this context as SDB. Although the International Classification of Sleep Disorders refers to AHI $\geq$ 15 as sufficient for a diagnosis of OSA, this appears questionable in the context of this level of SDB being reported in up to 50% of a normal adult male population.[13]

DEVELOPMENTS IN THE ANALYSIS OF EXISTING SIGNALS

Core signals relevant to sleep and breathing disorders such as airflow, oxygen saturation, and cardiac variables have been included in sleep studies for decades, but developments in signal analysis have permitted enhanced and clinically relevant information to be obtained, which significantly adds to the diagnostic potential of the studies concerned. Furthermore, novel approaches to the analysis of these traditional signals may facilitate the use of limited diagnostic systems that may be especially useful in the ambulatory setting.

ELECTROENCEPHALOGRAPHY AND SLEEP STAGING

Developments in electroencephalographic (EEG) recording technology have permitted the introduction of ambulatory EEG recordings, which may use a full EEG montage. This technology is not necessary in most clinical situations involved in the assessment of OSA, although some limited ear-based EEG recording systems have been developed that are easy to apply and may provide additional useful information in the ambulatory respiratory-sleep clinical setting.[14]

Specialized computer-based analysis of the EEG by techniques such as spectral analysis provides additional insight into sleep physiology and pathology beyond traditional sleep staging, but these are research-oriented and have little application in the clinical setting of respiratory sleep disorders.[15,16]

ACOUSTIC AND AIRFLOW DEVICES

Acoustic Devices

Although snoring is a common feature in patients with OSA, the symptom has limited value on its own in the assessment of OSA because of its weak relationship with the AHI.[17] Nonetheless, the detailed characteristics of snoring and, especially, the characteristic intermittent nature of snoring in patients with OSA provide potential diagnostic utility both alone and in combination with other signals. In this context, periods of apnea/hypopnea have quite different acoustic characteristics to nonapneic snoring. One such acoustic device is BresoDX (BresoTEC Inc, Toronto, Ontario, Canada), which is a portable device that consists of a lightweight face frame, which contains an embedded electronic module and microphone. Recorded sounds are continually stored and can subsequently be downloaded for analysis.[18,19] As might be expected, a characteristic cyclical intermittent pattern of snoring has the greatest predictive potential for the diagnosis of OSA. In one report of 135 subjects with suspected OSA, the calculated AHI using BresoDX showed a relatively good correlation with PSG and demonstrated a diagnostic accuracy ranging between 88.9% and 93.3% at AHI cutoffs of 5 to 15.[20] More recently, an over the counter small, wireless wearable patch has been developed

(Zansors, Arlington, VA), which estimates breathing patterns using an inbuilt microphone and includes an accelerometer to record movement. A pilot study of the device demonstrated 75% sensitivity and 71% specificity for detecting SDB compared to gold standard PSG.[21]

Airflow Devices

Devices that record airflow by nasal pressure recordings as a single measure have been developed as a more simple ambulatory diagnostic technique for OSA, and an example of such a device is the ApneaLink (Resmed, Sydney, Australia).[22] One report comparing the device with PSG showed a 73.1% sensitivity and 91% specificity for detecting an AHI greater than 15 in at-risk populations,[23] with similar results reported in other studies.[22,24]

OXIMETRY

Overnight oximetry has long been proposed as a simple and reasonably accurate technique for OSA diagnosis, especially in severe cases,[10,25] but has limited reliability in mild OSA where oxygen desaturations may be relatively minor. To be useful in the assessment of patients with OSA, arterial oxygen saturation (SpO2) recordings require a high sampling rate (>0.5 Hz) to ensure detection of the intermittent oxygen desaturations that are characteristic of the disorder. In clinical practice, several relevant variables may be obtained from the recordings, including the oxygen desaturation index (ODI), which is the number of desaturations per hour which drop $\geq$3% (ODI3) or $\geq$4% (ODI4) below the baseline level, and the cumulative time with an SpO2 below a predetermined level, usually 90% (T90). Additional information can be obtained from the SpO2 variability, referred to as the delta index.[26,27] In OSA, a "saw-tooth" pattern of recurring transient oxygen desaturations is seen, especially in severe cases, which provides a unique visual picture of the disorder. Simple indices such as the ODI may fail to capture all the important and potentially relevant pathophysiological characteristics[25] and novel strategies for the analysis of oximetry using automated techniques[28–30] to help maximize the diagnostic potential of SpO2 data. Furthermore, novel approaches to oxygen desaturation such as the hypoxic burden have been demonstrated to provide a superior prediction of cardiovascular morbidity and mortality than the AHI in large-population studies.[31]

Computer-assisted applications that provide automated signal processing facilitate the quantification of the frequency, duration, and severity of desaturations, which enhance the clinical assessment of OSA.[29,32–34] Some devices use smartphone-based technology or wearable applications as the receiver which may have potential for home screening to prioritize cases for more detailed investigation[35–37] and may also have a role in treatment follow-up.[38]

Oximetry and Apneas and Hypopneas per Hour of Sleep

The ODI may be used as an alternative to the AHI to quantify the number of respiratory events during the night but may underestimate the severity of OSA with potentially important clinical consequences[39,40] that may influence treatment decisions.[26] However, a more detailed analysis of the SpO2 signal with computer-assisted and machine learning algorithms improves the predictive ability[41–43] with a diagnostic accuracy of up to 96.7% reported. Furthermore, there is growing evidence that measures of oxygen desaturation are superior to AHI in the prediction of comorbidities including hypertension (HTN),[44] diabetes mellitus,[45] and heart failure.[46]

Oximetry may also have value in screening patients for OSA in certain comorbidities including stroke,[47] heart failure,[48] morbid obesity,[49,50] and chronic obstructive pulmonary disease (COPD).[51] In stroke, OSA is associated with diminished recovery and increased mortality.[52] In patients with congestive cardiac failure, overnight oximetry has a high sensitivity (97%) but poor specificity (32%) for SDB.[48] Oximetry performs better in patients with gross obesity with reports of up to 100% sensitivity and 93% specificity for SDB in ambulatory testing.[49] Oximetry has limited potential for the diagnosis of OSA in patients with COPD with low sensitivity (59%) and specificity (60%)[51] although performs better when combined with novel signal analysis technology.[53]

Cardiac Based Measures

Electrocardiograph (ECG) analysis: monitoring of heart rate variability (HRV), electrocardiograph morphology, and respiration

Monitoring of HRV by overnight ECG has long been recognized as a potential diagnostic tool in patients with SDB.[54] In standard PSG, a single-lead ECG is recorded to allow measurement of heart rate and rhythm. A special dedicated software program allows analysis of HRV[55] that can provide information relating to autonomic activity and may give added insight into sleep stages.[56] Further information can be obtained from fluctuations in the QRS amplitude that are a consequence of rib cage movements during respiration. The

combination of ECG-derived respiratory movement and sleep apnea–related HRV has the potential to be a useful screening tool for OSA[57] and has the added value of being available in a typical cardiology setting, which provides the potential for screening in this setting before referral to a sleep clinic.

Pulse transit time

The pulse transit time (PTT) is a variable that is derived from the ECG and the arterial pressure wave measured by a finger probe and has been reported to reflect inspiratory effort.[58] PTT measures the time taken for the arterial pulse wave to travel between the aortic valve (R wave on ECG) and the finger blood vessels as indicated by pulse oximetry. Pulse wave speed varies with arterial stiffness, which in turn is influenced by the BP level. PTT has been reported to give an indirect measure of both apnea and arousal.[58]

Peripheral arterial tonometry (the pulse wave as a measure)

Peripheral arterial tonometry (PAT) provides a detailed assessment of the pulse wave and is reported to be a relatively robust diagnostic screening method for OSA. The pulse wave amplitude is influenced by sympathetic tone, and arousals are also associated with a drop in pulse amplitude. Furthermore, the pulse rate also provides an indirect assessment of sleep stage.[59] WatchPAT (Itamar Medical, Caesarea, Israel) uses a proprietary algorithm combining PAT data, oxygen saturation, pulse rate, and actigraphy that generates an estimate of total sleep time and calculates an AHI.[60] WatchPAT has been evaluated in several studies with some, but not all, reports indicating the device to provide a reasonably accurate assessment of OSA.[59–61] A meta-analysis found a good correlation between sleep indices calculated by laboratory-based PSG and those obtained from a PAT device ($r = 0.889$),[62] thus supporting its use as a viable ambulatory diagnostic tool for OSA.

Blood pressure monitoring as a potential diagnostic tool

OSA is a recognized independent risk factor for systemic HTN, and obstructive apneas may lead to acute BP elevation during sleep,[12,63] which can result in a loss of the normal nocturnal dipping pattern of BP. A recent meta-analysis found that OSA is associated with a 1.5-fold increase in the prevalence of nondipping BP,[64] thus suggesting that ambulatory BP monitoring (ABPM) could serve as a surrogate marker for OSA. Support for this possibility comes from reports that nondipping nocturnal BP predicts OSA in subjects undergoing ABPM.[65] Furthermore, a recent report from this department indicated a high predictive value for moderate to severe OSA in unselected patients recruited from a HTN clinic who had a nondipping pattern of nocturnal BP on 24-hour ABPM.[66] These findings support the possibility that ABPM may be a useful biomarker for OSA, irrespective of the clinical index of suspicion for the disorder.

Limitations of ABPM with a pneumatic cuff include the possibility that cuff inflation causes arousal and that the device is unable to track rapid changes in BP associated with individual apneas.[67,68] Such limitations may be overcome by continuous measurement of BP by finger photoplethysmography, which uses a small cuff fitted to the finger that provides a continuous measurement. This device provides beat-by-beat pressure measurements and gives an indication of BP variability, which is typically increased in OSA.[69] A novel smart-watch, CareUp (Farasha Labs, Paris, France), has been developed that gives a continuous estimation of BP[70] and has been validated in a study of 44 subjects.[67] This simple device may provide an additional method for home BP monitoring, which could be a promising screening method for OSA, although further research of this technique is required before being accepted into clinical practice.

ACTIGRAPHY

Sleep is associated with reduced body motion compared to wakefulness, and lack of body movement is widely used as a surrogate marker for sleep. Actigraphy is the most widely used method, and typically uses an accelerometer that is either a stand-alone device or built into a wristwatch. Actigraphy can be used to estimate daily sleep-wake cycles, which can be clinically useful in the evaluation of many sleep disorders. Actigraphy has been formally evaluated by the American Academy of Sleep Medicine and recognized as a valid research tool in sleep[71] and, more recently, as an alternative to PSG for prolonged monitoring of sleep quality.[72] Several reviews[73–75] have indicated that actigraphy can provide clinically useful information about sleep in the natural environment, which may assist in clinical decision-making. However, actigraphy is not reliable in distinguishing different sleep stages and has poor specificity.[76] In comparison with PSG, actigraphy overestimates total sleep time and underestimates time spent awake.[77] Actigraphy provides an indirect signal relating to body motion, which implies that estimation of sleep stages is only derived from an assessment of how body motion changes during different sleep stages, and is likely

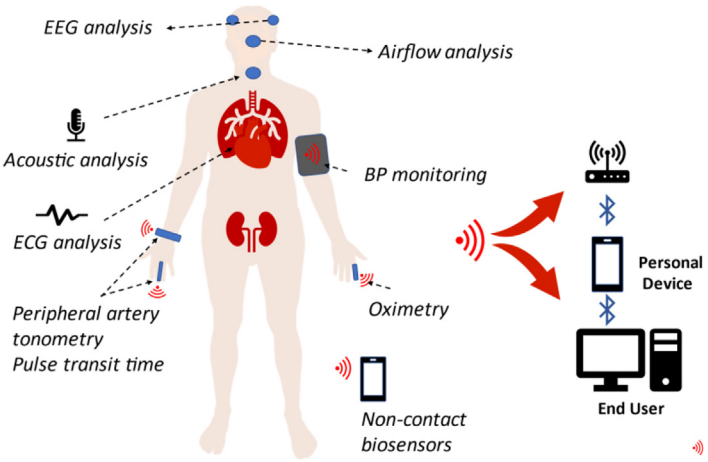

Fig. 1. Potential physiologic signals for the diagnosis and monitoring of OSA. Signals can be fed wirelessly or via Bluetooth to a router or smartphone and then uploaded to a secured database, whereby end users may access and review the data. BP, blood pressure; ECG, electrocardiogram; EEG, electroencephalogram.

to be of limited accuracy in this determination. However, with improving technology, the role of actigraphy as a screening tool will likely increase and be included in ambulatory diagnostic systems for OSA where accurate measures of sleep staging are not generally required.

Wireless Systems – Biosensors in Obstructive Sleep Apnea

Wireless monitoring systems have been in clinical use for several decades, and an early example involved pressure-sensitive foils placed over the mattress, which provided measures of sleep, heart rate, and respiration.[78] Wireless devices have greatly improved over subsequent years and benefit from developments in digital technology that are used in signal acquisition and processing.

Radio frequency waves, which are similar to radar technology, can detect small body movements, such as those produced by respiration, which may facilitate the assessment of sleep and wakefulness and of SDB. SleepMinder (ResMed Sensor Technologies, Dublin, Ireland) is a noncontact device that estimates the severity of SDB using a multichannel biomotion sensor and an integrated analysis software program.[79] The device has been shown to correlate well with PSG in the determination of AHI[80] and sleep efficiency[81] during controlled laboratory settings. More recently, the device has been reported to be a useful screening tool in the detection of moderate and severe OSA, although having poor accuracy in the setting of mild OSA.[82]

Actigraphy has been incorporated into many smartphone applications that estimate sleep quality, and additional signals relevant to the assessment of SDB may be obtained from audio and oximetry recordings that have been incorporated into many wearable recording systems, which may also include monitoring of heart rate.[83] Given their wide availability, relatively low cost, and ease of use, smartphones and wearable devices may provide a valuable screening opportunity for the detection of OSA and other sleep disorders,[84,85] which may also help prioritize patients that require more detailed investigation. Finally, technological advances in telemedicine may strengthen interdepartmental collaboration to improve the overall care of OSA patients.[86]

SUMMARY

Developments in signal technology and analysis provide novel approaches to the assessment of patients suspected of OSA, which range from enhanced analysis of traditional signals to novel signal technologies that provide surrogate markers of OSA. The potential range of novel approaches to the assessment of OSA is illustrated in Fig. 1.

CLINICS CARE POINTS

- When examining the oximetry tracing for features consistent with OSA, ensure that the technology of the recording device has a sufficiently high sampling rate to detect the characteristic fluctuations in oxygen saturation.
- While snoring does not directly relate to OSA, short gaps during prolonged periods of snoring provide an indirect indication of upper airway obstruction.

- The absence of nocturnal dipping of blood pressure is a potential surrogate marker of OSA and is especially important as this represents a cardiovascular comorbidity.

DISCLOSURE

The author has nothing to disclose.

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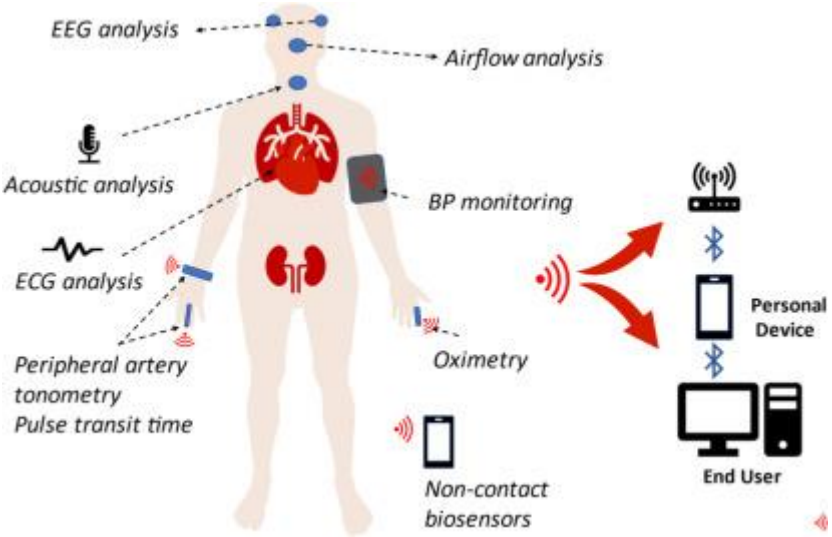
Σχόλιο:

ΑΞΙΟΠΟΙΩΝΤΑΣ ΣΤΟ ΜΕΓΙΣΤΟ ΤΗΝ ΚΑΤΑΓΡΑΦΗ ΥΠΝΟΥ

Στην παρούσα ανασκόπηση, από τον διάσημο καθηγητή Walter McNicholas, παρουσιάζονται τα τεχνολογικά επιτεύγματα ανάκτησης σήματος και η διαφορετική πιθανή προσέγγιση που παρέχει η χρήση του καθενός από αυτά ως εργαλείο, στον ειδικό ιατρό ύπνου κατά την εκτίμηση ασθενών με πιθανό υπνοαπνοϊκό σύνδρομο και διαφορετικούς φαινοτύπους.

Τα επιτεύγματα αυτά χρησιμοποιούν τεχνολογίες που κυμαίνονται από ενισχυμένη ανάλυση παραδοσιακών παραμέτρων σήματος έως νέες τεχνολογίες σήματος και δεδομένων που υποκαθιστούν ή αναπληρώνουν άλλους δείκτες, ήδη καθιερωμένους στην καθημερινή πρακτική.



Παρατίθενται και αναλύονται, επίσης, τα χαρακτηριστικά και τα πλεονεκτήματα των διαφόρων συσκευών, από τα καταγραφικά ήχου-ροής και τα οξύμετρα, στους ηλεκτροκαρδιογράφους [και πώς άλλο καταγραφικό παρέχει πληροφορίες για τη διακύμανση της καρδιακής συχότητας (HRV), άλλο για τη μορφολογία του ΗΚΓ ή τον χρόνο μετάβασης καρδιακών παλμών (PTT), άλλο για την περιφερική αρτηριακή τονομετρία (PAT)] και στα καταγραφικά πίεσης (με την παρακολούθηση της αρτηριακής πίεσης και την υποσχόμενη μέθοδο της δακτυλικής φωτοπληθυσμογραφίας) και τους ακτιγράφους.

Αναφορά γίνεται, τέλος, σε νέα, υποσχόμενα ασύρματα συστήματα και βιοαισθητήρες, που χρησιμοποιούν την τεχνολογία των κυμάτων ραδιοσυχνοτήτων, όμοια με την τεχνολογία των ραντάρ και, μέσω πολυκάναλων αισθητήρων βιοκίνησης και ενσωματωμένων προγραμμάτων ανάλυσης δεδομένων, μπορούν να ανιχνεύσουν ελάχιστες σωματικές κινήσεις, όπως αυτές που παράγονται κατά την αναπνοή και, εμμέσως, να διευκολύνουν την εκτίμηση της εγρήγορσης, του ύπνου και των διαταραχών αυτού.

Οποιοδήποτε σύστημα μελέτης ύπνου και αν χρησιμοποιηθεί, τα αποτελέσματα πρέπει να συνεκτιμώνται με το ιστορικό και τη γενική κλινική εικόνα του ασθενούς και η διαχείριση θα πρέπει να συνδέεται με τους υποκείμενους κλινικούς και παθοφυσιολογικούς φαινοτύπους και τις ενδεχόμενες συννοσηρότητες ή κινδύνους. Επιπρόσθετα με τον δείκτη AHI λοιπόν, άλλες ανιχνεύσιμες παράμετροι μπορούν και πρέπει να χρησιμοποιούνται και να συμμετέχουν στη διαδικασία της λήψης απόφασης για το είδος της θεραπείας.

Επιλογή άρθρου - Σχολιασμός: Άγης Δέρβας

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SCIENTIFIC INVESTIGATIONS

Obstructive sleep apnea and COVID-19 clinical outcomes during hospitalization: a cohort study

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Study Objectives: Obstructive sleep apnea (OSA) is an extremely common sleep disorder. A potential association between OSA and coronavirus disease 2019 (COVID-19) severity has been proposed on the basis of similar comorbid medical conditions associated with both OSA and COVID-19.

Methods: We performed a retrospective review of 1,738 patients who were hospitalized with COVID-19 between March and October of 2020. Patients were classified based on the presence or absence of OSA diagnosis based upon the *International Classification of Diseases* (ICD; codes G47.33 and U07.1 for OSA and COVID-19, respectively). Other data were collected, including demographics, body mass index, and comorbid conditions. COVID-19 severity was compared between groups using the quick COVID-19 severity index.

Results: Quick COVID-19 severity index scores were higher in patients with OSA compared with those without OSA. However, the prevalence rates of type 2 diabetes ($P < .0001$), coronary artery disease ($P < .0001$), congestive heart failure ($P < .0001$), and chronic obstructive pulmonary diseases ($P < .0001$) were also significantly greater in the OSA group. Unadjusted models revealed higher risk of intensive care unit admission in patients with COVID-19 and OSA. However, such an association was attenuated and became nonsignificant after adjusting for age, sex, body mass index, and comorbid disease.

Conclusions: In our study, OSA does not appear to be an independent risk factor for worse COVID-19 outcomes in hospitalized patients. Further studies with larger sample sizes are needed to delineate the potential role of OSA in determining outcomes in hospitalized patients with COVID-19.

Keywords: obstructive sleep apnea, COVID-19, severity, hospitalization, comorbid conditions

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BRIEF SUMMARY

Current Knowledge/Study Rationale: The potential role of obstructive sleep apnea (OSA) on adverse consequences of COVID-19 has been proposed and the studies conducted in this regard are scarce. This study examines whether OSA is an independent risk factor for worse COVID-19 clinical outcome (mortality, length of hospital stay, intubation, and intensive care unit admission) in hospitalized patients.

Study Impact: OSA was not an independent risk factor for worse COVID-19 outcomes in hospitalized patients, but it is still reasonable to recommend screening for OSA in patients who acquire COVID-19 infection. This is based on the biological plausibility linking OSA to COVID-19–related comorbid conditions, which had been shown (in our study and other studies) to be the major determinant of COVID-19 outcomes.

INTRODUCTION

In December 2019, a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was described in Wuhan, in the Hubei province of China, causing a pandemic that has affected close to 100 million and killed over 2 million people worldwide, with almost 25% of the deaths occurring in the United States.[1] The clinical presentation varies from asymptomatic to severe illness, characterized by acute respiratory distress syndrome and multiorgan dysfunction, and ultimately death.[2,3] Many risk factors have been identified and linked to the severity of coronavirus disease 2019 (COVID-19), including age > 60 years and comorbid diseases (such as obesity, hypertension, and diabetes mellitus [DM]), leukocytosis, and lymphopenia.[4]

Obstructive sleep apnea (OSA) is a common sleep disorder, characterized by repetitive episodes of collapse of the pharyngeal airway, which has been independently associated with many comorbid diseases of the cardiovascular, metabolic, and central nervous systems.[5] A potential association between OSA and COVID-19 severity has been proposed,[6,7] and is based on the similarities in the pathophysiology between these entities, as well as mutually enhancing mechanisms that foster both the risk of infection and the immune response to the virus.[8] OSA, which is characterized by intermittent hypoxia and sleep fragmentation, elicits a cascade of chronic low-grade systemic inflammatory processes involving oxidative stress secondary to excessive generation and propagation of reactive oxygen species, and induction of transcriptional pathways underlying many proinflammatory

Σχόλιο:

Σε αυτή την αναδρομική μελέτη κοορτής οι συγγραφείς μελέτησαν αν το σύνδρομο αποφρακτικής άπνοιας στον ύπνο (ΣΑΥ) αποτελεί από μόνο του παράγοντα κινδύνου για νοσηλεία στο νοσοκομείο λόγω λοίμωξης COVID-19. 1738 ασθενείς που νοσηλεύτηκαν λόγω του COVID-19 χωρίστηκαν σε δύο ομάδες, σε αυτούς που είχαν ΣΑΥ και σε που δεν είχαν. Η βαρύτητα της λοίμωξης COVID-19 υπολογίστηκε σύμφωνα με τον δείκτη quick COVID-19 severity index.

Με βάση τον δείκτη quick COVID-19 severity index βρέθηκε πως οι ασθενείς με ΣΑΥ είχαν βαρύτερα συμπτώματα λόγω της λοίμωξης σε σύγκριση με αυτούς που δεν έπασχαν από ΣΑΥ. Επιπλέον οι ασθενείς με ΣΑΥ είχαν περισσότερες συννοσηρότητες όπως σακχαρώδη διαβήτη τύπου ΙΙ, στεφανιαία νόσο, καρδιακή ανεπάρκεια και χρόνια αποφρακτική πνευμονοπάθεια. Επίσης οι ασθενείς με ΣΑΥ και συννοσηρότητες είχαν μεγαλύτερες πιθανότητες εισαγωγής σε μονάδα εντατικής θεραπείας. Ωστόσο η συσχέτιση με το ΣΑΥ και τη βαρύτητα την λοίμωξης COVID-19 δεν βρέθηκε να είναι υψηλή όταν έγινε η προσαρμογή των αποτελεσμάτων με την ηλικία, το φύλο, τον δείκτη μάζας σώματος και τις συννοσηρότητες.

Συμπερασματικά φαίνεται πως το ΣΑΥ από μόνο του δεν αποτελεί ανεξάρτητο παράγοντα κινδύνου για σοβαρή λοίμωξη COVID-19 αλλά αποτελεί όταν οι ασθενείς με ΣΑΥ έχουν μαζί και συννοσηρότητες. Όμως για ασφαλέστερα συμπεράσματα χρειάζονται περαιτέρω μελέτες.

Επιλογή άρθρου – Σχολιασμός: Καλλιρρόη Λάμπρου

Randomized Controlled Trial > Eur Respir J. 2021 Nov 4;58(5):2003687.

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Continuous positive airway pressure improves blood pressure and serum cardiovascular biomarkers in obstructive sleep apnoea and hypertension

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Abstract

Background: The impact of treatment for obstructive sleep apnoea (OSA) on reduction of cardiovascular risk is unclear. This study aimed to examine the effect of continuous positive airway pressure (CPAP) on ambulatory blood pressure (BP) and subclinical myocardial injury in subjects with OSA and hypertension.

Methods: This was a parallel-group randomised controlled trial. Subjects with hypertension requiring at least three antihypertensive medications and moderate-to-severe OSA were enrolled. Eligible subjects were randomised (1:1) to receive either CPAP treatment or control (no CPAP) for 8 weeks. Changes in ambulatory BP and serum biomarkers were compared. Stratified analysis according to circadian BP pattern was performed.

Results: 92 subjects (75% male; mean±sd age 51±8 years and apnoea-hypopnoea index 40±8 events·h^{-1}, taking an average of 3.4 (range 3-6) antihypertensive drugs) were randomised. The group on CPAP treatment, compared with the control group, demonstrated a significant reduction in 24-h systolic BP (-4.4 (95% CI -8.7- -0.1) mmHg; p=0.046), 24-h diastolic BP (-2.9 (95% CI -5.5- -0.2) mmHg; p=0.032), daytime systolic BP (-5.4 (95% CI -9.7- -1.0) mmHg; p=0.016) and daytime diastolic BP (-3.4 (95% CI -6.1- -0.8) mmHg; p=0.012). CPAP treatment was associated with significant BP lowering only in nondippers, but not in dippers. Serum troponin I (mean difference -1.74 (95% CI -2.97- -0.50) pg·mL^{-1}; p=0.006) and brain natriuretic peptide (-9.1 (95% CI -17.6- -0.6) pg·mL^{-1}; p=0.036) were significantly reduced in CPAP compared with the control group.

Conclusions: In a cohort with OSA and multiple cardiovascular risk factors including difficult-to-control hypertension, short-term CPAP treatment improved ambulatory BP, and alleviated subclinical myocardial injury and strain.

Trial registration: ClinicalTrials.gov NCT00881985.

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Σχόλιο:

Υπέρταση και ΣΑΑΥ είναι νόσοι με υψηλό επιπολασμό στον πληθυσμό.Το ΣΑΥ ανευρίσκεται σε περίπου 25-50% των υπερτασικών και υπάρχει σημαντική ετερογένεια στην απάντηση της ΑΠ στο CPAP με τους ασθενείς νεαρώτερης ηλικίας, πάσχοντες απο σοβαρό ΣΑΑΥ και με μη ελεγχόμενη ΑΠ να παρουσιάζουν καλύτερη απάντηση.

Μελετήθηκαν 40 ασθενείς (1:1 CPAP vs. control, parallel group RCT) που είχαν υπέρταση με τρία φάρμακα και μέτριο-σοβαρό ΣΑΑΥ, με AHI >15 events/h για περίοδο 8 εβδομάδων. Εγινε πλήρης in lab PSG, 24ωρη καταγραφή ΑΠ , μέτρηση καρδιακών βιοδεικτών και χρήση CPAP auto.

Βρέθηκε οτι το nondipping profile drives the response to CPAP. Η 24ωρη συστ. ΑΠ, 24ωρη διαστ.ΑΠ,ημερήσια συστ.ΑΠ, ημερήσια διαστ. ΑΠ, βρέθηκαν σημαντικά μειωμένες, χωρίς διαφορά στις νυκτερινές καταγραφές των πιέσεων. Επίσης οι καρδιακοί βιοδείκτες τροπονίνη και BNP ελαττώθηκαν σημαντικά με τη χρήση του CPAP, ενώ οι φλεγμονώδεις βιοδείκτες όχι. Υπήρξε συσχέτιση μεταξύ της ελάττωσης της τροπονίνης και της ελάττωσης της νυκτερινής συστ.ΑΠ. Οι nondippers που έλαβαν CPAP είχαν σημαντικά μειωμένες καταγραφές της ΑΠ σε σχέση με τους dippers (-4.5 έως - 7.1 mmHg).

Η ημερήσια ΑΠ σε έδαφος συμπαθητικοτονίας υπόκειται σε αιχμές πίεσης λόγω εξωτερικών ερεθισμάτων και βρέθηκε οτι η χρήση CPAP για 6 εβδομάδες ελαττώνει την νορεπινεφρίνη και τη ημερήσια διαστ.ΑΠ, συνεπώς ο ημερήσιος συμπαθητικός τόνος είναι ο πρώτος που απαντά στο CPAP. Ελαφρώς αυξημένα επίπεδα τροπονίνης που είναι κάτω από τα φυσιολογικά όρια , δείχνουν χρονία μυοκαρδιακή βλάβη. Αυτά τα μετρίως αυξημένα επίπεδα τροπονίνης και pro-BNP σχετίζονται με αυξημένο κίνδυνο για ΣΝ, καρδιακή ανεπάρκεια, stroke και θνητότητα σε μια περίοδο > 10ετίας.

ΣΥΜΠΕΡΑΣΜΑ: Η χρήση του CPAP για τη θεραπεία του ΣΑΑΥ έδωσε επί πλέον έλεγχο της ΑΠ παρά τη χρήση πολλαπλών αντιυπερτασικών φαρμάκων και μπορεί να αποτρέψει την υποκλινική μυοκαρδιακή βλάβη και strain.

Επιλογή άρθρου – Σχολιασμός: Παναγιώτης Πανάγου

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REGULAR ARTICLE

Longitudinal Associations Among Diet Quality, Physical Activity and Sleep Onset Consistency With Body Mass Index *z*-Score Among Toddlers in Low-income Families

Lauren Covington, PhD, RN[1] · Bridget Armstrong, PhD[2] · Angela C. B. Trude, PhD[3] · Maureen M. Black, PhD[3,4]

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Abstract

Background Habits surrounding health behaviors (i.e., sleep, physical activity, diet) are developed in toddlerhood. Lack of consistent health habits may increase obesity risk among toddlers in low-income families.

Purpose To compare the role of sleep onset consistency, physical activity and diet quality as mediators between household poverty and toddler weight.

Methods Two hundred and seven toddlers (mean age = 20.2 months, 46% female, 68.1% Black) participating in an obesity prevention trial were assessed at three time points over 12 months. Using Actical accelerometers, we assessed sleep and physical activity at each time point for up to 1 week. We defined sleep onset consistency as the standard deviation of sleep onset across all days. We calculated the Healthy Eating Index-2015 from a 24-hr dietary recall. We used WHO standards to calculate BMI-for-age *z*-scores from toddlers' weight/length, and calculated poverty ratio from parent-reported income and family size. Multilevel mediation models tested toddler sleep onset consistency, physical activity, and diet quality as mediators between household poverty and toddler BMI *z*-score.

Results Toddlers from households with higher poverty ratios had more inconsistent sleep onset times. Toddlers with more inconsistent sleep onset times had higher BMI *z*-scores across all timepoints, even when accounting for physical activity and diet quality. Sleep onset consistency indirectly explained the association between household poverty and BMI *z*-score.

Conclusions Inconsistent sleep schedules could help explain the association between poverty and BMI. Future research should examine strategies to support low-income families to develop and maintain routines as a mechanism to prevent obesity and reduce disparities.

Trial registration number NCT02615158.

Keywords Toddlers · Bedtime · Obesity · Poverty · Physical activity · Diet quality

Introduction

Routines surrounding healthy behaviors are developed in toddlerhood (12–36 months) [1, 2], and are established into habits that are carried on into adolescence and adulthood [3]. Families have the opportunity to establish daily lifestyle habits in conjunction with toddler developmental milestones. Children begin walking at the start of toddlerhood, allowing them to partake in daily physical activity [4]. Food preferences and autonomy in eating begin in the second year of life, making toddlerhood an opportune time to introduce healthy food choices such as fruits and vegetables [5]. Additionally, by 12 months of age, toddlers reach an important milestone of sleep self-regulation (i.e., falling asleep independently at bedtime) [6]. Parenting practices, such as implementing consistent sleep routines enhance toddlers' ability to develop sleep-wake regulation [3, 6]. Although diet quality, regular physical activity, and adequate sleep can prevent unhealthy weight gain and associated chronic diseases, the health benefits of these behaviors are only realized when they are

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Σχόλιο:

Το άρθρο αυτό αναδεικνύει ότι νήπια οικογενειών χαμηλού εισοδήματος, τα οποία έχουν ακανόνιστο πρόγραμμα ύπνου καταλήγουν να έχουν υψηλότερο Δείκτη Μάζας Σώματος, ακόμη και όταν ληφθεί υπόψη η φυσική δραστηριότητα, η ποιότητα της δίαιτας και η διάρκεια του ύπνου των παιδιών.

Η μελέτη δείχνει ότι η κανονικότητα του προγράμματος ύπνου στα νήπια είναι ένας πολύ σημαντικός παράγοντας που διαμεσολαβεί την σχέση ανάμεσα σε χαμηλό οικογενειακό εισόδημα και τη παχυσαρκία.

Επομένως, δεν αρκεί το νήπιο να κοιμάται αρκετές ώρες, αλλά θα πρέπει να υπάρχει κανονικότητα στην ώρα του ύπνου. Προφανώς αυτό είναι σημαντικό για όλα τα παιδιά ανεξαρτήτως κοινωνικο-οικονομικού επιπέδου, αλλά στη παρούσα μελέτη αναδείχθηκε ότι συσχετίζεται με υψηλότερο Δείκτη Μάζας Σώματος σε νήπια που προέρχονται από οικογένειες χαμηλού εισοδήματος. Αναγνωρίζεται ότι η κανονικότητα του προγράμματος του ύπνου είναι δύσκολη για οικογένειες οι οποίες ζουν με πτωχά μέσα, όταν υπάρχουν μονογονεϊκές οικογένειες, με πολλά παιδιά ή όταν αναγκάζονται οι γονείς να εργάζονται σε πολλές δουλειές και χωρίς κανονικά προγράμματα εργασίας.

Η σύσταση είναι τα παιδιά να κοιμούνται σε μία σταθερή ώρα που δε θα αποκλίνει πάνω από μία ώρα από τη συνηθισμένη ώρα του ύπνου.

Η μελέτη αυτή είναι σημαντική γιατί καταλήγει στο παραπάνω σοβαρό συμπέρασμα, το οποίο για πολλές οικογένειες είναι προφανές και τηρείται, αλλά για άλλες οικογένειες που αντιμετωπίζουν κοινωνικο-οικονομικά προβλήματα είναι πολύ δύσκολο να τηρηθεί.

Ο συσχετισμός ανάμεσα στη διάρκεια και στην ποιότητα του ύπνου και την παχυσαρκία έχει ξανασυζητηθεί σε ενήλικες και σε μεγαλύτερα παιδιά, όχι όμως τόσο μικρές ηλικίες. Η μελέτη του προβλήματος αυτού στα νήπια είναι πραγματικά σημαντική.

Επιλογή άρθρου - Σχολιασμός: Αντιγόνη Παπαβασιλείου

ARTICLES | MARCH 01 2021

Extended Work Shifts and Neurobehavioral Performance in Resident-Physicians

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POTENTIAL CONFLICT OF INTEREST: All authors have completed the International Committee of Medical Journal Editors uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare the following: no support from any organization for the submitted work, no financial relationships with any organizations that might have an interest in the submitted work in the previous 3 years, and no other relationships or activities that could appear to have influenced the submitted work.

FINANCIAL DISCLOSURE: All authors have completed the International Committee of Medical Journal Editors uniform disclosure form at www.icmje.org/coi_disclosure.pdf and declare the following: no support from any organization for the submitted work, no financial relationships with any organizations that might have an interest in the submitted work in the previous 3 years, and no other relationships or activities that could appear to have influenced the submitted work. In the interest of full disclosure, individual competing interest statements are below: Dr Rahman holds patents for prevention of circadian rhythm disruption by using optical filters and improving sleep performance in subjects exposed to light at night; Dr Rahman owns equity in Melcort Inc and has provided paid consulting services to Sultan & Knight Limited and Bambu Vault, LLC; Dr Rahman has received honoraria as an invited speaker and travel funds from Starry Skies Lake Superior, University of Minnesota Medical School, PennWell Corp, and Seoul Semiconductor Co, LTD; Dr Barger is on the scientific advisory board for CurAegis Technologies. She has received consulting fees from the University of Pittsburgh, Sygma, Insight, and Puget Sound Pilots; Dr St. Hilaire reports personal fees from The MathWorks, Inc, outside the submitted work and has received honoraria as an invited speaker from the Providence Sleep Research Interest Group, honoraria and travel funds for grant review

activities from the National Institutes of Health, and travel funds from the American Academy of Neurology; Dr Stone reports grants from Merck & Co outside the submitted work; Dr Phillips is an investigator on a project supported by the Cooperate Research Center for Alertness, Safety, and Productivity at Monash University; He also holds a patent (US20150080756A1) for estimating arousal states from ambulatory recordings by using sleep and wake models; Dr Klerman reports personal fees from Pfizer Pharmaceuticals, from Sleep Research Society, and from National Sleep Foundation, outside the submitted work; Dr Wright reports grants from the National Institutes of Health during the conduct of the study, personal fees from Circadian Therapeutics, LTD, grants, personal fees, nonfinancial support and other support from CurAegis Technologies, personal fees from Kellogg's, nonfinancial support from Somalogic, Inc, personal fees from the American Academy of Sleep Medicine, personal fees from the American College of Chest Physicians, personal fees from the American College of Sports Medicine, personal fees from the American Diabetes Association, personal fees from the Associated Professional Sleep Societies, grants from Philips Inc, and personal fees from the Obesity Medicine Association outside the submitted work; Dr Halbower reports she has a patent for In-Ear Sensing Systems and Methods for Biological Signal Monitoring pending; Dr Sanderson reports grants from the National Institutes of Health during the conduct of the study; Dr Zee reports grants from the National Institutes of Health during the conduct of the study, personal fees from Merck, grants and personal fees from Eisai, grants and personal fees from Philips, personal fees from Sanofi, grants from Jazz, grants from Technogel, grants and personal fees from Harmony Biosciences, grants from Apnimed, grants from X (a division of Alphabet, Inc), and other support from Teva outside the submitted work; In addition, Dr Zee has the following 3 patents pending: US Serial No. 62/038,700, PCT/US2015/045273, 62/515,361; Dr Landrigan reports grants from Patient-Centered Outcomes Research Institute during the conduct of the study, personal fees and other support from I-PASS Patient Safety Institute, personal fees from the Children's Hospital Association, and personal fees from Virgin Pulse outside the submitted work; Dr Czeisler reports grants from Cephalon Inc, Jazz Pharmaceuticals Plc., Inc, National Football League Charities, Optum, Philips Respironics, Inc, Regeneron Pharmaceuticals, ResMed Foundation, San Francisco Bar Pilots, Sanofi S.A., Sanofi-Aventis, Inc, Schneider Inc, Sepracor, Inc, Mary Ann & Stanley Snider via Combined Jewish Philanthropies, Sysco, Takeda Pharmaceuticals, Teva Pharmaceuticals Industries, Ltd, and Wake Up Narcolepsy and personal fees from Bose Corporation, the Boston Celtics, the Boston Red Sox, Cephalon, Inc, Columbia River Bar Pilots, Ganésco Inc, the Institute of Digital Media and Child Development, Klarman Family Foundation, Samsung Electronics, Quest Diagnostics, Inc, Teva Pharma Australia, Vanda Pharmaceuticals, the Washington State Board of Pilotage Commissioners, and Zurich Insurance Company, Ltd; In addition, Dr Czeisler holds a number of process patents in the field of sleep and circadian rhythms (eg, photic resetting of the human circadian pacemaker), and holds an equity interest in Vanda Pharmaceuticals, Inc; Since 1985, Dr Czeisler has also served as an expert on various legal and technical cases related to sleep

and/or circadian rhythms, including those involving the following commercial entities: Casper Sleep Inc, Comair/Delta Airlines, Complete General Construction Company, FedEx, Greyhound, HG Energy, LLC, Purdue Pharma, LP, South Carolina Central Railroad Co, Steel Warehouse, Inc, Stric-Lan Companies, LLC, Texas Premier Resource, LLC, and United Parcel Service; Dr Czeisler receives royalties from the New England Journal of Medicine, McGraw Hill, Houghton Mifflin Harcourt/Penguin, and Philips Respironics, Inc for the Actiwatch-2 and Actiwatch-Spectrum devices; Dr Czeisler's interests were reviewed and managed by Brigham and Women's Hospital and Partners HealthCare in accordance with their conflict of interest policies; Dr Lockley reports commercial interests from the last 3 years (2015–2018), unrelated to the work, which are listed below: Dr Lockley has received consulting fees from the Atlanta Falcons, the Atlanta Hawks, Delos Living LLC, Noble Insights, OpTerra Energy Services Inc, Pegasus Capital Advisors LP, Serrado Capital, Slingshot Insights, and Team C Racing; He has current consulting contracts with Akili Interactive; Apex 2100 Ltd; BHP Billiton; Consumer Sleep Solutions; Headwaters Inc; Hintsa Performance AG; Light Cognitive; Lighting Science Group Corporation; Mental Workout; McCullough Hill Leary PS; Paul, Weiss, Rifkind, Wharton & Garrison, LLP; PlanLED; Six Senses; and Stantec and Wyle Integrated Science and Engineering; Dr Lockley has received unrestricted equipment gifts from Biological Illuminations LLC, Bionetics Corporation, and F.LUX Software LLC; has equity in iSLEEP, Pty; had received royalties from Oxford University Press; has received honoraria plus travel, accommodation, and/or meals for invited seminars, conference presentations, or teaching from BHP Billiton, Estee Lauder, Informa Exhibitions (USGBC), and Teague; and has received travel, accommodation, and/or meals only (no honoraria) for invited seminars, conference presentations, or teaching from IES, Lightfair, USGBC, DIN, and SLTBR; Dr Lockley has completed investigator-initiated research grants from Biological Illumination, LLC and has an ongoing investigator-initiated grant from F. Lux Software LLC; he is a program leader for the nonprofit clinical research center for Alertness, Safety and Productivity, Australia, through an adjunct faculty position at Monash University and an unpaid member of the Scientific Advisory Board for the nonprofit Midwest Lighting Institute; Dr Lockley holds a process patent for "Systems and methods for determining and/or controlling sleep quality," which is assigned to the Brigham and Women's Hospital per Hospital policy; Dr Lockley has also served as a paid expert in legal proceedings related to light and health; the other authors have indicated they have no financial relationships relevant to this article to disclose.

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OBJECTIVES:

Extended-duration work rosters (EDWRs) with shifts of 24+ hours impair performance compared with rapid cycling work rosters (RCWRs) that limit shifts to 16 hours in postgraduate

year (PGY) 1 resident-physicians. We examined the impact of a RCWR on PGY 2 and PGY 3 resident-physicians.

METHODS:

Data from 294 resident-physicians were analyzed from a multicenter clinical trial of 6 US PICUs. Resident-physicians worked 4-week EDWRs with shifts of 24+ hours every third or fourth shift, or an RCWR in which most shifts were ≤16 consecutive hours. Participants completed a daily sleep and work log and the 10-minute Psychomotor Vigilance Task and Karolinska Sleepiness Scale 2 to 5 times per shift approximately once per week as operational demands allowed.

RESULTS:

Overall, the mean (± SE) number of attentional failures was significantly higher (*P* =.01) on the EDWR (6.8 ± 1.0) compared with RCWR (2.9 ± 0.7). Reaction time and subjective alertness were also significantly higher, by ~18% and ~9%, respectively (both *P* <.0001). These differences were sustained across the 4-week rotation. Moreover, attentional failures were associated with resident-physician–related serious medical errors (SMEs) (*P* =.04). Although a higher rate of SMEs was observed under the RCWR, after adjusting for workload, RCWR had a protective effect on the rate of SMEs (rate ratio 0.48 [95% confidence interval: 0.30–0.77]).

CONCLUSIONS:

Performance impairment due to EDWR is improved by limiting shift duration. These data and their correlation with SME rates highlight the impairment of neurobehavioral performance due to extended-duration shifts and have important implications for patient safety.

Subjects: Administration/Practice Management, Sleep Medicine, Workforce

Σχόλιο:

Η πολυκεντρική αυτή μελέτη αναφέρεται στην επίδραση του παρατεταμένου ωραρίου εργασίας ιατρών που υπηρετούν σε παιδιατρικές ΜΕΘ τόσον όσον αφορά τη λειτουργία της προσοχής, όσο και στην απόδοσή τους στη φροντίδα των παιδιών που νοσηλεύονται στην εντατική μονάδα.

Μελέτησαν νέους ιατρούς- ειδικευόμενους στο 2^{ο} και 3^{ο} χρόνο της ειδικότητας- που ασχολήθηκαν στη ΜΕΘ για 24 ώρες ή εναλλακτικά για 16 ώρες στη διάρκεια 4 εβδομάδων.

Κατέληξαν πως η υπνηλία και οι «απροσεξίες» ήταν σημαντικά λιγότερες όταν οι βάρδιες των δευτεροετών και τριτοετών ειδικευομένων στις ΜΕΘ ήταν έως 16 ώρες, παρά όταν ήταν διάρκειας 24 ωρών. Προτείνουν οι υπεύθυνοι ΜΕΘ να επανεξετάσουν τα ωράρια των ιατρών που τις καλύπτουν προς αποφυγή προβλημάτων.

Είναι γεγονός πως σε σχέση με άλλα επαγγέλματα, οι ιατροί έχουν μείνει πίσω στον προγραμματισμό ασφαλών ωραρίων εργασίας, μολονότι υπάρχουν άφθονα δεδομένα για τη δυσμενή επίδραση της στέρησης ύπνου πάνω στην υγεία γενικότερα, και στη λειτουργικότητα των εργαζομένων. Η έλλειψη συγκεκριμένων και ευρέως αποδεκτών οδηγιών πάνω στο θέμα αυτό πιθανόν να οφείλεται στην ετερογένεια των αποτελεσμάτων της βιβλιογραφίας, στο προβληματισμό σχετικά με την εκπαίδευση των ειδικευομένων ιατρών και σε οικονομικούς παράγοντες.

Τονίζεται ότι το θέμα αυτό πρέπει να συζητείται και να αντιμετωπίζεται, διότι αφορά την ασφάλεια των ασθενών αλλά και την ποιότητα της ζωής των ιατρών, οι οποίοι χρειάζονται τον ύπνο τους, όπως και όλοι οι άλλοι εργαζόμενοι.

Επιλογή άρθρου - Σχολιασμός: Αντιγόνη Παπαβασιλείου

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SLEEP BREATHING PHYSIOLOGY AND DISORDERS • REVIEW

Validation of the STOP-Bang questionnaire for screening of obstructive sleep apnea in the general population and commercial drivers: a systematic review and meta-analysis

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Abstract

Purpose Obstructive sleep apnea (OSA) is a critical occupational health concern, but is often undiagnosed in the general population and commercial drivers. The STOP-Bang questionnaire is a simple, reliable tool to screen for OSA, which could improve public health in a cost-effective manner. The objective of this systematic review and meta-analysis is to assess the validity of the STOP-Bang questionnaire to detect OSA in these key populations.

Methods We searched MEDLINE, Embase, Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, PsycINFO, Journals @ Ovid, Web of Science, Scopus, and CINAHL for relevant articles from 2008 to March 2020. The quality of studies was appraised using Cochrane Methods criteria. To calculate pooled predictive parameters, we created 2 × 2 contingency tables and performed random-effects meta-analyses.

Results Of 3871 citations, five studies that evaluated STOP-Bang in the general population (n = 8585) and two in commercial drivers ($n = 185$) were included. In the general population, prevalence of all OSA (AHI ≥ 5), moderate-to-severe OSA (AHI ≥ 15), and severe OSA (AHI ≥ 30) was 57.6%, 21.3%, and 7.8% respectively. In commercial drivers, the prevalence of moderate-to-severe OSA was 37.3%. The trends of high sensitivity and negative predictive value of a STOP-Bang score ≥ 3 illustrates that the questionnaire helps detect and rule out clinically significant OSA in the general population and commercial drivers.

Conclusion This meta-analysis demonstrates that the STOP-Bang questionnaire is a valid and effective screening tool for OSA in the general population and commercial drivers.

Trial registration PROSPERO No. CRD42020200379; 08/22/2020

Keywords Obstructive sleep apnea · Screening questionnaire · STOP-Bang questionnaire · General population · Commercial drivers

Introduction

Obstructive sleep apnea (OSA) is characterized by cessation of breathing during sleep, which leads to poor sleep patterns and daytime somnolence. OSA is an increasingly common sleep-breathing disorder and a substantial public health concern [1, 2]. The reported prevalence of overall OSA in the general adult population ranges from 9 to 38% [3–5] with an estimated 80–90% of those individuals with OSA remaining undiagnosed [6, 7]. Among commercial drivers, who are a safety-sensitive occupational group, OSA is present in 24–28% of the workforce [8, 9]. If left undiagnosed and untreated, OSA can lead to serious health consequences including hypertension [10], cardiovascular diseases [11, 12], cognitive

Lina Chen and Bianca Pivetta authors shared first authorship.

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Σχόλιο:

Το ερωτηματολογίου STOP-Bang, λόγω της πρακτικότητας και της υψηλής του ευαισθησίας, έχει επικυρωθεί σε χώρους χειρουργικής και κλινικής ύπνου παγκοσμίως.

Ο στόχος αυτής της συστηματικής ανασκόπησης και μεταανάλυσης είναι να αξιολογηθεί η εγκυρότητα του ερωτηματολογίου OSA στην ανίχνευση της αποφρακτικής άπνοιας (OSA) σε δύο σημαντικούς πληθυσμούς, όπως ο γενικός πληθυσμός αλλά και οι επαγγελματίες οδηγοί.

Αναζητήθηκαν σχετικά άρθρα από το 2008 έως τον Μάρτιο του 2020, η ποιότητα των οποίων αξιολογήθηκε με χρήση τα κριτήρια της Μεθόδου Cochraine.

Από 3871 αναφορές, συμπεριλήφθηκαν πέντε μελέτες που αξιολόγησαν το STOP-Bang στο γενικό πληθυσμό (n =8585) και δύο σε επαγγελματίες οδηγούς (n=185). Στο γενικό πληθυσμό, ο επιπολασμός όλων των OSA με AHI≥5, AHI≥15 AHI≥30 ήταν57,6%, 21,3%και 7,8% αντίστοιχα. Σε επαγγελματίες οδηγούς, ο επιπολασμός της μέτριας έως σοβαρής OSA ήταν 37,3%.

Οι τάσεις υψηλής ευαισθησίας και αρνητικής προγνωστικής αξίας μιας βαθμολογίας STOP-Bang≥ 3, δείχνουν ότι το ερωτηματολόγιο βοηθά στην ανίχνευση και τον αποκλεισμό σημαντικής OSA στον γενικό πληθυσμό και στους επαγγελματίες οδηγούς.

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Assessment of obstructive sleep apnea-related sleep fragmentation utilizing deep learning-based sleep staging from photoplethysmography

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Abstract

Study Objectives: To assess the relationship between obstructive sleep apnea (OSA) severity and sleep fragmentation, accurate differentiation between sleep and wakefulness is needed. Sleep staging is usually performed manually using electroencephalography (EEG). This is time-consuming due to complexity of EEG setup and the amount of work in manual scoring. In this study, we aimed to develop an automated deep learning-based solution to assess OSA-related sleep fragmentation based on photoplethysmography (PPG) signal.

Methods: A combination of convolutional and recurrent neural networks was used for PPG-based sleep staging. The models were trained using two large clinical datasets from Israel (n = 2149) and Australia (n = 877) and tested separately on three-class (wake/NREM/REM), four-class (wake/N1 + N2/N3/REM), and five-class (wake/N1/N2/N3/REM) classification. The relationship between OSA severity categories and sleep fragmentation was assessed using survival analysis of mean continuous sleep. Overlapping PPG epochs were applied to artificially obtain denser hypnograms for better identification of fragmented sleep.

Results: Automatic PPG-based sleep staging achieved an accuracy of 83.3% on three-class, 74.1% on four-class, and 68.7% on five-class models. The hazard ratios for decreased mean continuous sleep compared to the non-OSA group obtained with Cox proportional hazards models with 5-s epoch-to-epoch intervals were 1.70, 3.30, and 8.11 for mild, moderate, and severe OSA, respectively. With EEG-based hypnograms scored manually with conventional 30-s epoch-to-epoch intervals, the corresponding hazard ratios were 1.18, 1.78, and 2.90.

Conclusions: PPG-based automatic sleep staging can be used to differentiate between OSA severity categories based on sleep continuity. The differences between the OSA severity categories become more apparent when a shorter epoch-to-epoch interval is used.

Statement of Significance

Differentiation between sleep and wakefulness, which is needed to assess obstructive sleep apnea (OSA)-related sleep fragmentation, is commonly performed using EEG signal segmented to 30-s epochs. With this protocol, some of the sleep stage transitions may be omitted. As home measurements are becoming increasingly common, assessment of sleep fragmentation with a simple measurement setup is needed. In this study, automatic PPG-based sleep staging was used to assess sleep fragmentation in a clinical population with suspected OSA. Overlapping epochs were used with the automatic deep learning models to obtain a higher resolution of the sleep architecture. The results show that PPG-based automatic sleep staging is possible and can be utilized to differentiate between OSA severity categories with respect to sleep fragmentation.

Key words: obstructive sleep apnea; sleep fragmentation; sleep staging; deep learning; survival analysis

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Σχόλιο:

Είναι απαραίτητο για την συσχέτιση της του συνδρόμου της αποφρακτικής υπνικής άπνοιας και του κατακερματισμένου ύπνου, η ακριβής διάκριση μεταξύ ύπνου και εγρήγορσης. Η κατηγοριοποίηση των σταδίων του ύπνου γίνεται χειροκίνητα βάσει του ΗΕΓ, το οποίο είναι αρκετά χρονοβόρο. Σε αυτήν την εργασία αξιολογείται η προσπάθεια ώστε μία αυτοματοποιημένη διαδικασία να προσδιορίσει τον κατακερματισμό του ύπνου σε ασθενείς με αποφρακτική υπνική άπνοια, μέσω της φωτοπληθυσμογραφίας (PPG). Κατά τον NREM ύπνο η μέση αρτηριακή πίεση και η καρδιακή παροχή μειώνονται ενώ αντίθετα στον REM ύπνο η μέση αρτηριακή πίεση και ο καρδιακή συχνότητα αυξάνονται. Αυτές τις διακυμάνσεις αξιοποιεί η μέθοδος φωτοπληθυσμογραφίας .

Σε δύο μεγάλες βάσεις κλινικών δεδομένων εφαρμόστηκε η μέθοδος και αξιολογήθηκε ξεχωριστά στις ακόλουθες ταξινομήσεις

α) WAKE/NREM/REM

β) WAKE/N1+N2/N3/REM

γ) WAKE/N1/N2/N3/REM

Η αυτοματοποιημένη κατηγοριοποίηση των σταδίων του ύπνου παρουσίασε ακρίβεια της τάξης του 83,3% για την διάκριση WAKE/NREM/REM, 74,1% για την διάκριση WAKE/N1+N2/N3/REM και 68,7% για την διάκριση WAKE/N1/N2/N3/REM.

Συμπερασματικά, η βασισμένη στην φωτοπληθυσμογραφία (PPG) αυτόματη ανάλυση των σταδίων ύπνου μπορεί να διαχωρίσει τα στάδια βαρύτητας του αποφρακτικού συνδρόμου αξιολογώντας την συνοχή του ύπνου, ιδιαίτερα αν χρησιμοποιηθεί χρονικό διάστημα μικρότερο των 30 sec.

Επιλογή άρθρου – Σχολιασμός: Ευαγγελία Φλώρου