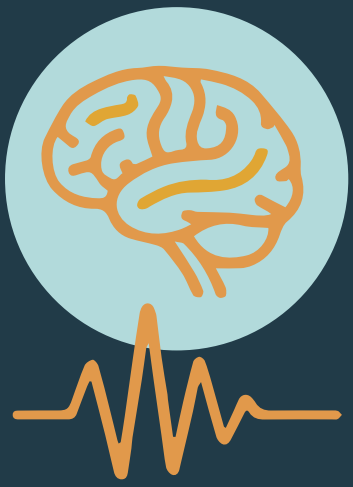

SLEEP CRO 2025 ZAGREB

Editor
Domagoj Vidović, MD, PhD

Graphic design
Natalia Ivanjko

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WELCOME MESSAGE

Dear colleagues,

It is a special honour and great pleasure to invite you on behalf of the Organizing Committee to Sleep Croatia 2025 - a congress on sleep disorders with international participation. The congress will be held in Zagreb, at the Zonar Hotel, from October 9- 11. 2025. The organizers have invited numerous distinguished domestic and foreign lecturers to the congress in order to present the latest knowledge in the field of sleep disorders. We invite you to send abstracts and actively participate in the Congress, so that all participants, through oral presentations or poster presentations, will receive information about new discoveries in sleep disorders. We hope that this congress will provide an opportunity and space for the exchange of knowledge and experiences, thus contributing to the betterment of those suffering from sleep disorders. In addition to work, we will try to spend pleasant moments in socializing and getting to know each other.

Best regards and see you in October in Zagreb!

Domagoj Vidović
Head of the Department of Sleep Disorders
Vrapče Psychiatric Clinic

ORGANIZERS

University Psychiatric Hospital Vrapče

Klinika za psihijatriju Vrapče
University Psychiatric Hospital Vrapče

With over 60 years of experience in diagnosing and treating sleep disorders, Vrapče is the leading institution in Croatia in somnology and interdisciplinary care for individuals with psychiatric and neurological co-morbidities. The hospital is the clinical base for the University of Zagreb School of Medicine, and its Centre for Sleep and Wake Disorders is recognized as a key institution for scientific and professional activities in this field.

Croatian Society for Sleep Apnoea

A national professional association uniting specialists from various disciplines to advance diagnostics, treatment, and education concerning sleep-disordered breathing. Operating under the Croatian Medical Association, the Society promotes an interdisciplinary approach to managing obstructive sleep apnoea and related conditions and actively participates in guideline development and public health initiatives.

Croatian Academy of Medical Sciences (CAMS)

An independent scientific and professional institution founded in 1961, dedicated to promoting medical science and improving public health. CAMS organizes scientific conferences, fosters research, and publishes professional literature (including *Acta Medica Croatica*), actively bridging science and clinical practice across all areas of medicine and public health.

GENERAL INFORMATION

REGISTRATION DESK OPENING HOURS

- Thursday October 9, 2025 12:00 – 19:00
- Friday October 10, 2025 08:00 – 18:00
- Saturday October 11, 2025 08:00 – 13:00

BADGES

- All delegates and guests will receive a name badge at the registration desk.
- The badge is the official meeting document and must be worn at all times.

CERTIFICATE OF CROATIAN MEDICAL CHAMBER CREDITS

- An application for accreditation will be submitted to the Croatian Medical Chamber in due time.

EXHIBITION OPENING HOURS

- **Thursday October 9, 2025**
  Preparation of exhibition area from 10:00
- **Friday October 10, 2025**
  Exhibition hours are 09:00 – 18:00
- **Saturday October 11, 2025**
  Exhibition hours are 09:00 – 13:00

WEB PAGE

https://sleepcro.com/sleep2025en/

CONTACT INFORMATION

Filida travel Agency
Dore Pfanove 7
10 000 Zagreb, Croatia
Mrs. Tatjana Mrzljak

VENUE

Hotel Zonar Zagreb is a modern, versatile congress centre ideal for conferences, meetings, and events. It features advanced technology like high-speed Wi-Fi, audio-visual systems, and customizable lighting, ensuring smooth event execution. The centre offers adaptable spaces from small meeting rooms to a large conference hall with natural light and ergonomic seating, accommodating several hundred participants. Dedicated event planners support logistics, catering, and technical needs, while diverse culinary options enhance the experience. Located in Zagreb's city centre, Hotel Zonar provides easy access from major transport hubs, making it a top choice for business events.

SLEEP CRO

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KEYNOTE SPEAKERS

KAREL ŠONKA

Dr. Šonka received his training in neurology and sleep medicine in Prague and Montpelier. He obtained the specialization of neurologist in 1988 (Czechoslovakia), the University diploma "Sleep and Wake" in 1992 (France) and passed the European Sleep Research Society examination for "Sleep Experts" in 2012 in Paris. He was appointed professor of neurology in 2004. Dr. Šonka served as president of the Czech Society of Sleep Research and Sleep Medicine for 11 years and president of the Czech Neurological Society for four years. Dr. Šonka is a member of the European Narcolepsy Network, the European Restless Legs Study Group, the International REM Sleep Behavior Study Group, the European Sleep Research Society and the World Association of Sleep Medicine.

BARBARA GNIDOVEC STRAŽIŠAR

Dr. Barbara Gnidovec Stražišar is a highly accomplished paediatric neurologist and sleep medicine specialist, holding prominent leadership roles both in Slovenia (Head of Paediatric Department, President of the Slovenian Sleep Society) and internationally through the ESRS (Clinical Vice President, previous committee leadership). Her extensive clinical training, research activities, and organizational leadership underpin her contributions to advancing paediatric sleep health across Europe.

LEJA DOLENC GROŠELJ

Dr. Leja Dolenc Grošelj created the first national Sleep Laboratory at the University Medical Center in Ljubljana in 1994, and is the Head of the Sleep Center. She is involved in many clinical and research projects in the field of sleep and is the author of European guidelines and scientific publications in different topics of sleep disorders. She is involved in sleep education for under and postgraduate students at the Medical Faculty and in organization and teaching at the European Sleep Summer School. She is the founder of Slovene Sleep Society and serves as a vice President of the Society and Slovenian Society of Clinical Neurophysiology.

IVANA ROSENZWEIG

Dr. Rosenzweig heads Sleep and Brain Plasticity Centre. The mission of SleepCity laboratory is to generate new understanding of mechanisms behind serious neurological and psychiatric disorders, and to propose their treatment and prevention through utilisation of sleep neurobiology. She is also a consultant neuropsychiatrist specialising in sleep and have received a Wellcome Trust award for research into unravelling the mechanisms of sleep, neuroplasticity and inflammation, making use of clinical and preclinical imaging experiments.

PROGRAMME

THURSDAY 09.10.2025. HALL A

12:00-14:00	**PARTICIPANT REGISTRATION**
14:00-15:45	**Sleep and Health: An Introduction to an Interdisciplinary Field** ***Moderators:*** *Domagoj Vidović and Barbara Barun*
14:00-14:15	**Domagoj Vidović:** *Between Wakefulness and Sleep: The Local Reality of Sleep Disorders*
14:15-14:30	**Zoran Đogaš:** *Croatian Contributions to Major European Projects in Sleep Medicine*
14:30-14:45	**Barbara Barun:** *Neurophysiology of Sleep*
14:45-15:00	**Ana Marija Šantić:** *Characteristics of Sleep Structure in Patients with Sleep Apnea and PTSD*
15:00-15:15	**Dinko Mitrečić:** *Neurodegeneration and Sleep Disorders: A Bidirectional Road*
15:15-15:30	**Aleksandar Savić:** *Personalized Medicine and the Integration of Sleep-Focused Interventions into Specialized Programs*
15:30-15:45	**Discussion**
15:45-16:15	**Nox Medical Satellite Symposium** **Pedro Noguerira:** *Artificial intelligence in the diagnosis of Sleep Apnea*
16:15-16:45	**Coffee Break**
17:00-19:00	**Congress Opening and Plenary Lectures** *Barbara Gnidovec Stražišar* *Ivana Rosenzweig* *Leja Dolenc Grošelj*
19:30	**Welcome Cocktail and Dinner**

FRIDAY 10.10.2025. HALL A

09:00-09:30	**Plenary lecture** **Karel Šonka**
09:45-11:30	**Respiratory Medicine and Sleep Apnea: Clinical Challenges and Approaches** ***Moderators:*** *Hrvoje Puretić and Igor Barković*
09:45-10:00	**Hrvoje Puretić**: *Controversies in the Treatment of Sleep Apnea*
10:00-10:15	**Igor Barković**: *Therapeutic Adherence in the Use of CPAP Devices: Our Experience*
10:15-10:30	**Ana-Marija Šola**: *Treatment-Emergent Central Sleep Apnea*
10:30-10:45	**Ivan Kopitović**: *Treatment Modalities for OSA*
10:45-11:00	**Ana Brajdić Šćulac**: *OSA symptom subtypes and cardiovascular outcomes*
11:00-11:15	**Ivana Huljev Šipoš**: *Ventilatory control and pCO_2 oscillations: Clinical use transcutaneous capnography in patient stratification*
11:15-11:30	**Discussion**
11:30-12:00	**INEL Satellite Symposium** **Pavol Pobeha:** *Haemodynamic on OHS patients*
12:00-12:15	**Coffee break**
12:15-14:00	**An Otolaryngologist's Perspective on the Treatment of Sleep Apnea** ***Moderators:*** *Ana Đanić Hadžibegović and Boris Šimunjak*
12:15-12:30	**Boris Šimunjak**: *DISE from Controversy to Consensus: The Rise of Drug-Induced Sleep Endoscopy in Diagnose and Treatment of Obstructive Sleep Apnea*
12:30-12:45	**Ana Đanić Hadžibegović**: *Surgical Treatment of Mild and Moderate OSA*

12:45-13:00	**Boris Filipović**: *Combined therapy for severe apnea: palate surgery and oral devices*
13:00-13:15	**Peter Lohuis**: *Mild to moderate apnea: the effect of nasal surgery (and the oral device)*
13:15-13:30	**Matej Delakorda**: *Laryngeal obstruction in patients with OSA*
13:30-13:45	**Brankica Gregorić Butina**: *Surgical treatment of OSA in children*
13:45-14:00	**Discussion**
14:00-14:30	**Tehnomedika Satellite Symposium** **Tinta Visser:** *New Approaches in Polysomnography (How to simplify PSG)* **Somnomedics AG**
14:30-15:30	**Lunch**
15:30-16:15	**Makpharm Panel on Insomnia**
16:15-16:30	**Coffee Break**
16:30-18:30	**Sleep Disorders in Clinical Practice, Part I** ***Moderators:*** *Stjepan Jurić and Marina Mioč*
16:30-16:45	**Petrana Brečić**: *Sleep Disorders and Suicidality*
16:45-17:00	**Marina Mioč**: *Can't Help Falling in Love with Sleep*
17:00-17:15	**Stjepan Jurić**: *Differential Diagnosis of Narcolepsy*
17:15-17:30	**Dragan Soldo**: *Sleep Disorders in the Family Physician's Office*
17:30-17:45	**Marko Ćurković**: *Concept Map of Digital Sleep Tools – A Promise for Widespread Unmet Needs*
17:45-18:00	**Anđelko Vidović**: *Sleep and Depressive Disorder*
18:00-18:15	**Ana Jadrijević-Tomas**: *Circadian Rhythm – The Rhythm of Life*
18:15-18:30	**Discussion**

18:30-19:00	**Tehnomedika Satellite Symposium** **Nikolaos Roussos:** *Telemonitoring in CPAP Therapy* **ResMed**
20:00	**Congress Dinner**

FRIDAY 10.10.2025. HALL B

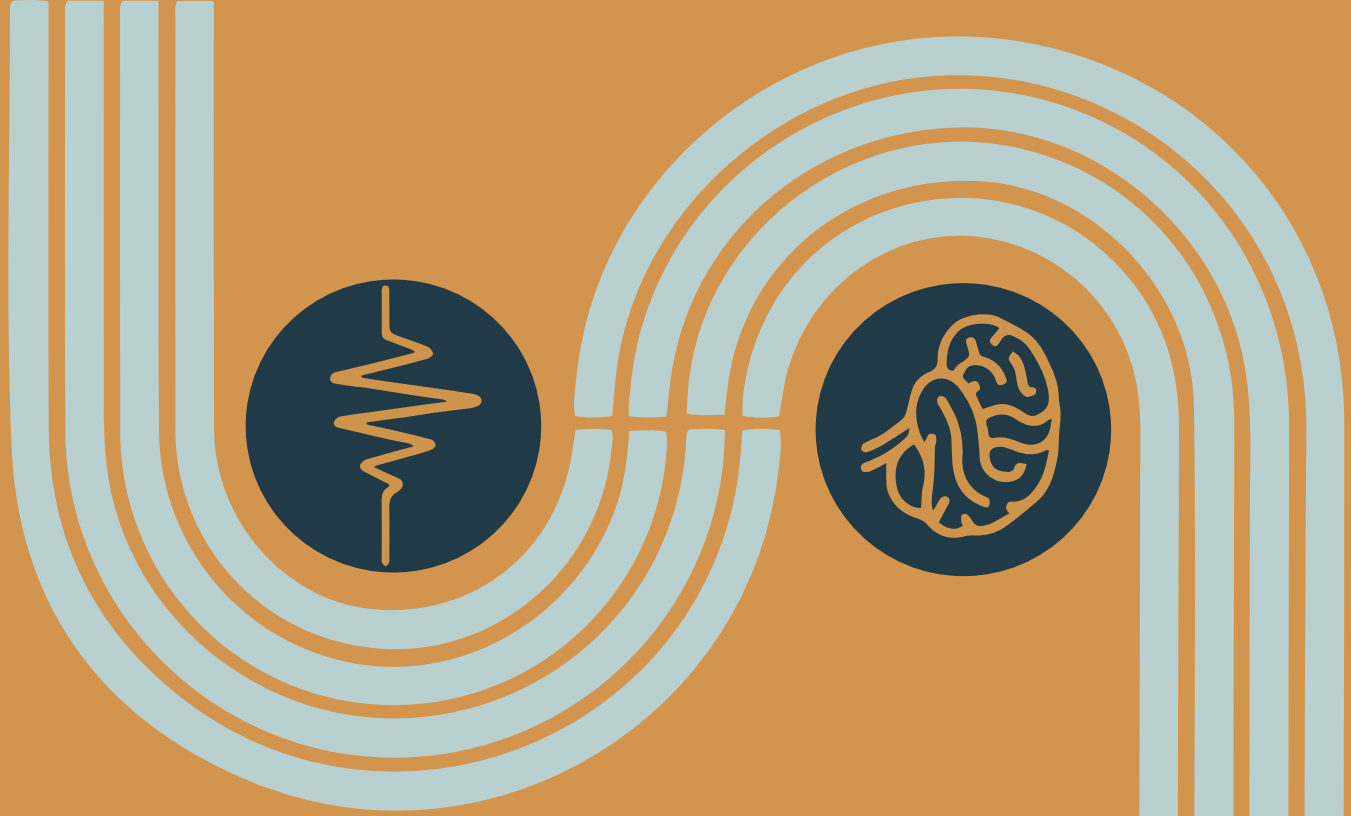
08:30-09:00	**PARTICIPANT REGISTRATION**
09:00–10:45	**The Role of the Nurse/Technician in the Diagnosis and Treatment of Sleep Disorders** ***Moderators:*** *Katarina Pisk and Danijela Hršak*
09:00-09:15	**Senka Repovečki:** *Insomnia as a Form of Communication*
09:15-09:30	**Nada Krmpotić:** *The Role of the Nurse in the Implementation of Diagnostic and Therapeutic Procedures at the Department of Sleep Disorders*
09:30-09:45	**Katarina Pisk:** *Artificial Intelligence (AI) in Sleep Medicine – Advantages and Disadvantages (Croatian Experiences)*
09:45-10:00	**Valentina Valičević:** *The Role of the Technician in Conducting the MSLT Test*
10:00-10:15	**Andreja Grgas:** *How Do Addicts Sleep?*
10.15-10:30	**Ksenija Pomper:** *Sleep Disorders in Women*
10:30-10:45	**Discussion**
10:45-11:00	**Coffee Break**
11:00–13:15	**Challenges in the Treatment of Apnea Syndrome** ***Moderators:*** *Zdeno Kožulj, Nikolina Šutija and Tomislav Slukan*
11:00-11:15	**Ivana Pesić:** *Manual CPAP Titration*
11:15-11:30	**Laura Ranogajec:** *Bilevel Positive Airway Pressure (BPAP) Treatment in Obesity Hypoventilation Syndrome*
11:30-11:45	**Zdeno Kožulj:** *NIV in Restrictive Ventilatory Disorders*

11:45-12:00	**Tomislav Slukan:** *Mouth Taping During PAP Therapy*
12:00-12:15	**Ivanka Šoštarić:** *Acceptance of CPAP Therapy in Outpatient and Inpatient Titration – A Comparative Analysis*
12:15-12:30	**Maja Tkaličanac:** *Breathing, Sleeping, and Moving – Physiotherapy and the Treatment of OSA*
12:30-12:45	**Nikolina Šutija, Željka Pilipović:** *Evaluating the Effectiveness of PAP Therapy – How to Improve Success? A Practical Perspective*
12:45-13:00	**Ivana Marušić Krnić, Ines Kunić Brlečić:** *Sleep-Disordered Breathing in Children with Prader-Willi Syndrome*
13:00-13:15	**Discussion**
13:15-13:30	**Coffee Break**
13:30-14:30	**INTERACTIVE WORKSHOP:...AND JUST LIKE THAT**
14:30-15:30	**Lunch**
15:30-17:30	**Poster Section**

SATURDAY 11.10.2025. HALL A

09:00-10:45	**A Broader Perspective on Sleep Apnea** ***Moderators:*** *Irena Šarc and Romana Gjergja Juraški*
09:00-09:15	**Irena Šarc:** *PAP Therapy for Obesity Hypoventilation Syndrome (OHS)*
09:15-09:30	**Kristina Ziherl:** *New parameters in assessing OSA severity - beyond AHI*
09:30-09:45	**Romana Gjergja-Juraški:** *Contemporary Challenges in Monitoring Children with Sleep Apnea*
09:45-10:00	**Jelena Šarić Jurić:** *Challenges in the Treatment of Central Sleep Apnea*

10:00-10:15	**Latica Friedrich:** *Cerebrovascular Risk in Patients with OSA*
10:15-10:30	**Danijela Žakić Milas:** *Executive Function Impairment in Patients with Obstructive Sleep Apnea Discussion*
10:30-10:45	**Discussion**
10:45-11:15	**Eli Lilly Satellite Symposium** **Ivo Darko Gabrić:** *Mounjaro: GIP/GLP-1 receptor agonism as a new chapter in the management of obesity and OSA*
11:15-11:30	**Coffee break**
11:30-13:30	**Sleep disorders in clinical practice, part II** **Moderators:** *Ana Marija Šantić and Ana Sruk*
11:30-11:45	**Jasna Mesarić:** *Drowsiness as a risk factor for patient safety*
11:45-12:00	**Ivana Zadro:** *A Night Spa for the Brain: How the Glymphatic System Works*
12:00-12:15	**Ana Sruk:** *Restless Nights, Evidence-Based Therapeutic Approaches: Development of AASM Guidelines for RLS and PLMD in Clinical Sleep Medicine Practice*
12:15-12:30	**Petra Nimac Kozina:** *Differential Diagnosis of Nocturnal Epileptic Seizures*
12:30-12:45	**Hrvoje Grbavac:** *RBD – Is It Just a Bad Dream?*
12:45-13:00	**Damir Mulc:** *Sleep Disorders in Psychotic Patients*
13:00-13:15	**Ivan Bolanča:** *Sleep Disorders in Menopause*
13:15-13:30	**Discussion**
13:30	**Closing of the Congress**



ABSTRACTS

Neurophysiology of Sleep

Barbara Barun[1]

1 University Hospital Centre Zagreb/School of Medicine University of Zagreb

The neurophysiology of sleep involves intricate neural mechanisms that play a crucial role in regulating sleep patterns and addressing various sleep disorders. Among others, hypothalamus, thalamus, and brainstem are key brain regions regulating critical functions in orchestrating the sleep-wake cycle. Disruptions in these areas can lead to a variety of sleep disorders, such as insomnia, obstructive sleep apnea, and narcolepsy, which affect millions of individuals worldwide. A focus will be placed on the neurochemical pathways that govern sleep, including the roles of neurotransmitters and neuropeptides like GABA, serotonin, and orexin which are essential for modulating sleep architecture and facilitating the transitions between different sleep stages. Additionally, the influence of circadian rhythms on sleep quality will be discussed, highlighting how external factors such as light exposure and lifestyle choices can impact these natural cycles. The session will incorporate clinical case presentation that illustrate the consequences of disrupted neurophysiological processes primarily in neurologic disorders, underscoring the bidirectional relationship between sleep and overall health. By integrating clinical findings with neurophysiological research, this discussion emphasizes the importance of a comprehensive approach in diagnosing and treating sleep disorders. Also emerging therapeutic strategies will be discussed, including pharmacological interventions and behavioral therapies, designed to restore healthy sleep patterns and ultimately improve patient outcomes.

Neurodegeneration and Sleep Disorders: A Bidirectional Road

Dinko Mitrecic[1]

1 University of Zagreb School of Medicine

Neurodegenerative diseases (ND) such as Alzheimer's, Parkinson's, Huntington's, and amyotrophic lateral sclerosis (ALS) exhibit a bidirectional relationship with sleep disorders, where each exacerbates the other. Neurodegeneration disrupts key sleep-regulating brain regions, including the suprachiasmatic nucleus (SCN) and brainstem, leading to circadian rhythm disturbances, reduced melatonin production, and sleep disorders like insomnia, REM sleep behavior disorder (RBD), and fragmented sleep. Conversely, chronic sleep deprivation impairs the glymphatic system, promoting the accumulation of neurotoxic proteins such as beta-amyloid and tau, which accelerate neurodegeneration. This vicious cycle is further driven by inflammation, oxidative stress, and mitochondrial dysfunction. Specific NDs manifest distinct sleep disturbances, such as sundowning in Alzheimer's or RBD in Parkinson's, often serving as early biomarkers. Longitudinal studies and early interventions targeting sleep regulation are critical for mitigating ND progression. The interplay between neuroendocrine, autonomic, and metabolic pathways underscores the importance of sleep in maintaining brain health and preventing neurodegeneration.

3 Personalized Medicine and the Integration of Sleep-Focused Interventions into Specialized Programs

Aleksandar Savić[1]

1 University Psychiatric Hospital Vrapce, University of Zagreb School of Medicine

The growing interest in personalized medicine has affected the field of sleep medicine as well, with an increased focus on the potential for individualized approaches as a way to optimize therapeutic interventions. All these approaches take into account the reciprocal relationship between sleep and various other domains of physical and mental health. Recent research has demonstrated clear and significant individual differences in sleep quality and vulnerability to different disorders, although not necessarily accompanied by biomarkers that are always easily applicable in clinical practice. The basis for the effective personalized approach, apart from awareness of genetic, environmental, lifestyle, and medical factors, is increasingly the integration of artificial intelligence and machine learning, enabling complex data analysis and the formulation of recommendations based on such analyses. It has been shown that large language models (LLMs), using multimodal data, can successfully predict sleep quality, pointing to the potential for automating certain aspects of care tailored according to individualization models. While there is strong momentum toward individualizing treatments for sleep disorders, a significant challenge in managing sleep difficulties within psychiatric conditions remains, and that is the perception of these disturbances as simply being secondary to psychiatric disorders. Although it is certainly true that psychiatric disorders and intensity of specific symptom domains are major factors influencing sleep quality and represent possible triggers for sleep disturbances, new insights into the complexity of sleep disorders and the bidirectionality of their interactions highlight the necessity of treating sleep disturbances as a specific and independent therapeutic target in certain cases, even within specialized psychiatric programs addressing primary psychitric conditions, such as psychotic or mood spectrum disorders. An example from mood disorders research illustrates how a disrupted circadian rhythm of melatonin can serve as both “state” and “trait” marker of mood disorders, and be strongly and specifically linked to certain symptoms (such as anhedonia), which underscores the importance of viewing this rhythm and its changes as a specific therapeutic goal that cannot be viewed solely through the lens of mood regulation.

Controversies In the Treatment of Sleep Apnea

Hrvoje Puretić[1]

1 University department of pulmonology, University Hospital Centre Zagreb

Sleep-related breathing disorders, especially obstructive sleep apnea (OSA), are quite common in subpopulation of patients burdened with obesity (Obesity hypoventilation syndrome, OHS) and obstructive pulmonary diseases (e.g. COPD) thus making the effective treatment of OSA more challenging. OSA may be present in 10 – 30% of COPD patients (Overlap syndrome) and even in 90% of OHS patients (70% having severe OSA) while pure sleep hypoventilation (without apneic episodes) is found less frequently. American Academy of Sleep Medicine recommends offering positive airway pressure treatment to every OSA patient, regardless of OSA severity (mild, moderate or severe), more so when cardiovascular, cerebrovascular, metabolic and endocrinological comorbidities are present. Management of OSA with continuous positive airway pressure (CPAP) device has been the choice of treatment since its invention in 1981 by Sullivan. By maintaining the upper airways open against repetitive collapse during sleep, CPAP alleviates increased work of breathing, improves oxygenation and normalizes diminished central ventilatory drive in both COPD and OHS patients, even without being able to deliver pressure support. In case of CPAP failure, intolerance of high pressures needed to treat severe OSA or in case of serious hypoventilation / comorbidities complicating the OSA, other treatment option would be the bi-level positive airway pressure (BPAP) device. Opposite to CPAP, BPAP may deliver pressure support and secure back-up respiratory rate, thus directly solving residual hypoventilation / hypercapnia. Even though some studies suggest clear benefit of one device over the other, mostly BPAP over CPAP, there is no superior benefit of BPAP regarding the usual OSA/COPD or OSA/OHS patient. In case of pure sleep-related hypoventilation or mild OSA complicated by significant sleep hypoventilation, there is no pathophysiologic rationale to administer CPAP device (no upper airways collapse / obstruction to correct with CPAP), so the BPAP would be the choice of treatment.

5

Therapeutic Adherence in the Use of CPAP Devices: Our Experience

Igor Barković[1], Lućana Zec[1]

1 KBC Rijeka, KBC Rijeka

Continuous Positive Airway Pressure (CPAP) therapy remains the gold standard for treating obstructive sleep apnea (OSA). However, therapeutic success depends largely on patient adherence, which is influenced by multiple clinical, psychological, and behavioral factors. The commonly accepted definition of adequate CPAP adherence is using the device for at least four hours per night on at least 70% of nights. Although CPAP therapy is highly effective, poor adherence remains a major clinical challenge. To analyze therapeutic adherence among patients using CPAP devices and identify key factors that influence long-term compliance in real-world clinical practice. A retrospective evaluation of patient adherence was conducted. Adherence was defined as the number of nights with ≥4 hours of device use divided by the total prescribed nights. Adherence data were correlated with changes in the apnea–hypopnea index (AHI) and patient-reported satisfaction parameters. Patients who used the CPAP device consistently (10/10 nights) achieved a significant reduction in AHI (from baseline to 65/h), whereas partial users (3/10 or 7/10 nights) showed markedly less improvement (AHI 300–350/h). The main factors influencing adherence included device efficacy, comfort, ease of use, affordability (with full reimbursement by the Croatian Health Insurance Fund – HZZO), low maintenance, and compatibility with individual lifestyle. Optimal adherence to CPAP therapy significantly improves clinical outcomes in patients. Enhancing patient education, comfort, and device accessibility are crucial strategies for maintaining long-term compliance and maximizing therapeutic success.

Ana-Marija Šola[1]

1 Special Hospital for Lung Diseases

Treatment-emergent central sleep apnea (TE-CSA) refers to central apneas that appear or persist after positive airway pressure is started for obstructive sleep apnea. Early prevalence is roughly 5–10% (reported range 2–20%), and many cases remit over weeks to months. The pathophysiological driver is elevated loop gain—heightened chemoreflex response, strong CO_2–ventilation coupling, and circulatory delay—so PAP over-ventilation can drop $PaCO_2$ below the apneic threshold and trigger periodic breathing. ICSD-3-TR diagnosis requires a central apnea index ≥5/h with >50% central events on PAP and relevant symptoms, not better explained by another central sleep apnea disorder. Management begins with CPAP optimization: narrow APAP or use fixed CPAP, minimize expiratory pressure relief/pressure support, fix leaks, reinforce sleep hygiene, and reassess in 4–8 (up to 12) weeks. If symptomatic TE-CSA persists, consider bilevel ventilation with a backup rate (ST or iVAPS) or adaptive servo-ventilation; avoid bilevel without a backup. Use ASV cautiously in symptomatic heart failure with reduced ejection fraction. Acetazolamide can be an adjunct. Targets are CAI <5/h, symptom improvement, and strong adherence.

Can’t help falling in love with sleep

Marina Mioč[1]

1 University Psychiatric Hospital Vrapče

Insomnia is the most common sleep disorder and is characterized by difficulty falling asleep, difficulty maintaining sleep continuity, and/or early morning awakenings. These difficulties lead to various daytime symptoms such as fatigue, sleepiness, impaired concentration and memory, and mood disturbances. In order to speak of insomnia, the symptoms must occur despite adequate conditions for sleep being met (optimal ambient temperature, a darkened and quiet room). We distinguish short-term insomnia, which lasts less than three months, and chronic insomnia, which lasts longer than three months and in which symptoms occur at least three times per week. Chronic insomnia affects about 10% of the population, and its prevalence is even higher among individuals who suffer from medical conditions, particularly psychiatric disorders, as well as among older adults. It is believed that insomnia arises as a result of a complex interaction between cognitive hyperarousal, or excessive cognitive wakefulness, and altered circadian and homeostatic mechanisms that are important for the regulation of wakefulness and sleep. The foundation of all models is Spielman's 3P model, which proposes three separate groups of factors for understanding insomnia—predisposing, precipitating, and perpetuating factors—and facilitates understanding of how short-term insomnia develops into a chronic form. This model assumes the presence of predisposing factors that make the patient vulnerable to the development of insomnia (genetic factors and personality traits—such as a tendency toward perfectionism, internalization of problems, and neuroticism), precipitating factors (stressful life events), and perpetuating factors, which are the most important for maintaining insomnia, such as inappropriate behaviors (daytime sleeping, spending excessive time in bed) and dysfunctional beliefs and thoughts about sleep. Insomnia can be treated with pharmacological and non-pharmacological approaches, and sometimes with a combination of both. The problem with the pharmacological approach is that medications registered in Croatia for the treatment of insomnia (benzodiazepines and benzodiazepine

receptor agonists) should not be used daily over a prolonged period due to the risk of dependence. For this reason, "off-label" medications such as antidepressants and antipsychotics are often used in individuals with chronic insomnia. Compared with benzodiazepines and benzodiazepine receptor agonists, cognitive-behavioural therapy for insomnia (CBT-I) has shown comparable effectiveness during short-term treatment, but superior effectiveness over the long term. It is important, however, to emphasize that the success rate of CBT-I is around 60%, meaning that pharmacological therapy is still necessary for some patients. In addition, in Croatia—as well as in other countries worldwide—a major problem is the shortage of trained professionals who provide this therapy, and as a result it is not yet widely available to a broader group of patients.

8 From Controversy to Consensus: The Evolving Role of DISE in the Assessment and Management of OSA

Boris Šimunjak[1,4], Tatjana Goranović [2,3], Tena Šimunjak[1]

1 Department of Otorhinolaryngology and Head and Neck Surgery, Sveti Duh University Hospital, Zagreb, Croatia

2 Department of Anaesthesiology, Resuscitation and Intensive Care Medicine, Sveti Duh University Hospital, Zagreb, Croatia

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Obstructive Sleep Apnea (OSA) is a common and underdiagnosed disorder with significant public health implications, closely associated with cardiovascular, metabolic, and neurocognitive morbidities. While polysomnography remains the diagnostic gold standard, it lacks the ability to identify the anatomical site and mechanism of upper airway collapse. Drug-Induced Sleep Endoscopy (DISE) was introduced to bridge this diagnostic gap by enabling direct visualization of the airway during a pharmacologically-induced sleep state. Initial attempts to assess airway obstruction, such as Müller's maneuver and radiological imaging, provided limited insight. In 1978, Borowiecki was among the first to observe patients during natural sleep, but it was the work of Croft and Pringle in 1991 that established sleep nasendoscopy as a viable method. The procedure gained broader clinical adoption in the early 2000s and was standardized under the term DISE. DISE begins with careful patient selection, monitoring, and exclusion of unstable candidates. Sedation is typically induced using propofol, midazolam, or dexmedetomidine, titrated to mimic natural non-REM sleep while maintaining spontaneous respiration. OSA patients require particular attention due to increased sensitivity to sedatives and elevated risk of airway compromise. A flexible nasendoscope is inserted to assess airway dynamics at four key levels: velum, oropharyngeal lateral walls, tongue base, and epiglottis—classified using the VOTE scoring system for degree and pattern of collapse. The findings are interpreted post-procedure by a multidisciplinary team to guide therapeutic decisions, including surgery, oral appliances, or CPAP adjustment. DISE continues to face scrutiny regarding its reproducibility, the degree to which pharmacologically-induced sleep mimics natural sleep, and variability based on sedative choice. While propofol provides

controlled sedation, it may exaggerate airway collapse; midazolam offers lighter sedation with potentially less diagnostic yield. Despite these concerns, comparative studies have shown good correlation between DISE findings and natural sleep patterns, particularly during non-REM sleep. The lack of universal protocols and standardized reporting systems remains a significant barrier. Significant efforts toward standardization have been made through European position papers (2014, 2017) and the 2023 International Consensus Statement on OSA. These guidelines support DISE use in surgical candidates, patients intolerant to CPAP, and those being evaluated for oral appliance therapy. Emerging technologies, especially artificial intelligence (AI), are enhancing DISE through automated scoring systems and predictive models based on ultrasound or video analysis, improving accuracy, efficiency, and reproducibility. While DISE is not yet universally considered a gold standard, it is increasingly recognized as an indispensable tool in the individualized management of OSA. With ongoing refinement, AI integration, and international standardization, DISE has the potential to significantly enhance diagnostic precision and optimize treatment outcomes for patients with sleep-disordered breathing.

Surgical Management of Mild and Moderate Obstructive Sleep Apnea

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Obstructive sleep apnea (OSA) is a common disorder caused by recurrent upper airway collapse during sleep, resulting in intermittent hypoxemia, sleep fragmentation, and reduced daytime performance. Continuous positive airway pressure (CPAP) remains the gold standard for moderate to severe disease, but it is not the primary treatment for mild OSA, where behavioral measures, weight loss, positional therapy, or oral appliances are usually recommended. In contrast, surgical treatment plays a decisive role in patients with moderate OSA, where it is increasingly recognized as a key therapeutic option, particularly in those intolerant of CPAP. Modern surgical approaches are anatomy-driven and tailored to the individual pattern of obstruction. Nasal surgery (septoplasty, turbinate reduction) may improve airflow and adjunctive therapy tolerance. Contemporary palatal techniques, such as expansion sphincter pharyngoplasty and barbed reposition pharyngoplasty, have largely replaced uvulopalatopharyngoplasty due to superior outcomes and lower morbidity. At the tongue base, reduction of the lingual tonsils, often performed with coblation, laser or transoral robotic surgery provides effective airway enlargement and symptom improvement. Hypoglossal nerve stimulation has emerged as a highly effective option in carefully selected patients with moderate OSA. Surgical outcomes depend on careful patient selection, BMI, and evaluation of multilevel obstruction, with success measured by reductions in the apnea–hypopnea index, daytime symptom relief, and improved quality of life. In conclusion, while conservative measures remain central to the treatment of mild OSA, surgery is crucial in the management of moderate OSA. Modern, targeted surgical techniques offer durable improvements and play an indispensable role in comprehensive OSA therapy.

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Sleep-disordered breathing is very common in childhood. Snoring occurs in 7–10% of children, and 20–40% of those who snore sleep with their mouths open. The prevalence of OSA in children is estimated at 2–4%. Children affected by sleep-disordered breathing often experience slowed growth and development. Untreated pediatric OSA negatively affects behavior, attention, hyperactivity, and academic performance. Major risk factors include adenotonsillar hypertrophy, overweight, craniofacial anomalies, and neuromuscular disorders. Diagnosis is established by a multidisciplinary team based on thorough history and physical examination, with polysomnography representing the gold standard. The first-line treatment is adenotonsillectomy and/or adenotonsillotomy, which removes lymphoid tissue from the palatine and nasopharyngeal tonsils and represents the most commonly performed surgical procedure in children. Treatment success rates range from 75% to 90%.

New Parameters in Assesing OSA Severity – Beyond AHI

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Obstructive sleep apnea syndrome (OSAS) is traditionally diagnosed based on the apnea–hypopnea index (AHI), which counts respiratory events per hour. The 2014 International Classification of Sleep Disorders defines OSAS as AHI > 5/h with symptoms or comorbidities or AHI > 15/h. However, AHI only quantifies event frequency and omits event duration, the severity and length of oxygen desaturation, or the arousals and autonomic responses triggered by airway obstruction. Consequently, AHI correlates poorly with cardiovascular morbidity, mortality and excessive daytime sleepiness, underscoring the need for supplementary metrics. There are several groups of new metrics. Event-duration parameters such as total apnea–hypopnea duration (TAD) and the proportion of sleep spent in apnea, hypopnea or desaturation indicate how long breathing is impaired but still ignore hypoxaemic load. Measures linked to hypoxaemia are more predictive of cardiovascular risk: the oxygen desaturation index (ODI), average saturation, time below 90 % saturation (T90) and minimum saturation capture different aspects of intermittent hypoxaemia. A newer metric, the hypoxic burden—the area under the desaturation curve—integrates both depth and duration of desaturation and correlates strongly with cardiovascular and all-cause mortality. Ventilatory burden, the proportion of breaths with a >50 % reduction in airflow amplitude, offers an automated assessment of airflow limitation that predicts cardiovascular outcomes independently of hypoxic burden. Other promising markers include the intensity and timing of arousals and parameters of autonomic activation such as pulse transit time and heart rate response. Finally, the Baveno classification proposes a multidimensional model combining respiratory events and organ impact, stratifying patients into four groups based on symptoms and cardiovascular or metabolic comorbidities. Overall, these novel parameters aim to improve risk stratification and guide treatment decisions by capturing the physiological burden of OSAS beyond simple event counting. This integrative framework may ultimately guide personalized management once validated more widely.

PAP Therapy for Obesity Hypoventilation Syndrome (OHS)

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Obesity hypoventilation syndrome (OHS) is defined by obesity (BMI ≥30 kg/m²) with awake hypercapnia ($PaCO_2$ >6 kPa) after exclusion of alternative causes and is commonly accompanied by sleep-disordered breathing, particularly obstructive sleep apnoea (OSA). Coexistence with clinically significant OSA is frequent (≈80–90%), and OHS prevalence increases with BMI, approaching ~20% at BMI >40 kg/m² and nearly 50% at BMI >50 kg/m². These epidemiological and physiological features support a phenotype-guided approach to positive airway pressure (PAP) therapy. In patients with OHS and severe OSA, continuous positive airway pressure (CPAP) is generally appropriate as initial management, whereas non-apnoeic OHS or OHS with only mild OSA typically warrants non-invasive ventilation (NIV). Evidence from randomized and pragmatic studies indicates broadly similar long-term clinical outcomes between modalities when appropriately selected and titrated. In the longest follow-up RCT trial, CPAP titrated during polysomnography (mean ≈10–11 cmH_2O) was compared with volume-targeted pressure-support NIV (mean IPAP ≈20 cmH_2O; EPAP ≈8 cmH_2O) over a median of 5.44 years; the primary outcome—annual days of hospitalization—was comparable between arms (≈1.6 vs ≈1.4 days/year), with no clear difference in overall mortality (≈15% vs ≈11%), while cardiovascular events remained frequent in this high-risk population. An observational study at University Clinic Golnik found no difference in survival between CPAP and BiPAP OHS users during an extended follow-up of 13 years. Current guidelines recommend that selection of initial modality and subsequent escalation should consider baseline $PaCO_2$, severity of OSA, failure of CPAP to correct hypercapnia, episodes of acute hypercapnic respiratory failure, tolerance and adherence, and local resource availability. Across phenotypes, structured follow-up with reassessment of gas exchange, adherence support, and intensive weight-management approaches to address cardiometabolic risk is central to reducing healthcare utilization and improving patient-centred outcomes in OHS.

13 Challenges in the Treatment of Central Sleep Apnea

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Central sleep apnea (CSA) is a heterogeneous sleep-related breathing disorder defined by reduced or absent ventilatory effort during sleep. The ICSD-3-TR classifies CSA into six categories, including primary CSA, CSA with Cheyne–Stokes respiration, treatment-emergent CSA, and CSA due to medical conditions, substance use, or high altitude. CSA affects about 5–10% of patients with sleep-related breathing disorders, more often men, and is particularly frequent in heart failure, stroke, and opioid users. Diagnosis remains challenging. CSA lacks specific symptoms and often overlaps clinically with insomnia, fatigue, or manifestations of comorbidities. Polysomnography (PSG) is the gold standard, yet distinguishing central from obstructive hypopneas can be uncertain without invasive measures such as esophageal pressure monitoring. Night-to-night variability further complicates diagnosis and classification, while patients frequently present with mixed forms of CSA and OSA, blurring treatment decisions. Current classifications rely more on clinical presentation than pathophysiology, which limits precision in diagnosis and management. Treatment is equally complex. No single therapy is universally effective, and most interventions offer modest benefits, mainly in disease severity indices rather than survival. According to the latest AASM task force guidelines, conditional recommendations support CPAP, BPAP with backup rate, adaptive servo-ventilation (ASV), low-flow oxygen (in heart failure and at high altitude), acetazolamide, and transvenous phrenic nerve stimulation (TPNS). BPAP without a backup rate is discouraged, as it may worsen CSA. However, evidence quality is consistently low to very low, and treatment responses vary by phenotype and comorbidity. Cost, accessibility, and feasibility also limit the widespread application of advanced therapies such as ASV and TPNS. In summary, CSA is difficult to diagnose due to nonspecific symptoms, overlapping phenotypes, and variability across nights. Treatment options remain limited and supported by low-quality evidence, with little impact on mortality. Addressing diagnostic uncertainty, refining phenotype-based classifications, and developing targeted therapeutic strategies are essential to improve patient outcomes.

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Obstructive sleep apnea (OSA) is recognized as an important risk factor for numerous cardiovascular events, including stroke. Although the severity of OSA is most commonly expressed by the apnea–hypopnea index (AHI), increasing evidence suggests that this index alone is insufficient for characterizing associated comorbidities. To investigate the association between cerebrovascular risk and biochemical markers of inflammation (calprotectin, pentraxin-3, and phospholipase A2) in individuals with OSA. Methods: Participants with clinical suspicion of OSA underwent overnight respiratory polygraphy, biochemical testing, and assessment of cerebrovascular risk using carotid artery atherosclerosis indices measured by ultrasound. Appropriate statistical tests were applied, with significance set at $p<0.05$. A total of 115 participants (mean age 52±11.3 years, 69% male) had a mean AHI of 35.2±23.9. Levels of calprotectin, phospholipase A2, and pentraxin-3 did not correlate with carotid atherosclerosis indices. In multiple regression analysis, atherosclerosis in the carotid bulb and proximal internal carotid artery was best predicted by leukocyte count, age, and maximal apnea duration. Further studies are required to identify reliable biochemical markers for assessing cerebrovascular risk in patients with OSA. Meanwhile, standard clinical, biochemical, and respiratory polygraphy findings—such as older age, higher leukocyte count, and longer apnea duration—may assist clinicians in identifying patients at higher cerebrovascular risk.

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Executive Function Impairment in Patients with Obstructive Sleep Apnea

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Obstructive sleep apnea (OSA) is known to have disruptive effects on cognitive functions. In general, OSA patients displayed poorer performance in executive functions and memory. Some cognitive functions found to be benefited from a sufficient period of treatment, i.e. average of 6 months of effective CPAP use. There are few studies revealing the effects of OSA on memory processing phases, while this provides very important information for discriminative diagnoses among neurodegenerative disorders. On the other side, the results with executive functions are not so clear-cut.

Drowsiness As A Risk Factor For Patient Safety

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Sleep deficiency among physicians is a pervasive but often underestimated determinant of both professional well-being and patient safety. A growing body of research links poor sleep quality, circadian disruption, and sleep deprivation to cognitive impairments, burnout, and increased risk of medical errors. This review synthesizes evidence on how physicians' sleep affects quality of care and explores implications for health system policies. A rapid narrative review was conducted, focusing on empirical studies and systematic reviews examining the relationship between sleep parameters (duration, quality, sleepiness, insomnia) and patient safety outcomes in healthcare settings. Key validated instruments (PSQI, ESS, ISI, PROMIS SRI) and organizational moderators (safety culture, workload, shift design) were mapped. International evidence was contextualized with existing Croatian data on physician burnout and work patterns. Findings consistently demonstrate that poor sleep quality and excessive sleepiness among physicians are associated with higher self-reported error rates and lower perceived quality of care. Shift work and rapid rotations amplify circadian misalignment, contributing to cumulative fatigue. Organizational safety culture-particularly non-punitive response to errors and teamwork-modifies the impact of individual fatigue on patient outcomes. Evidence-based interventions, such as fatigue risk management systems and scheduling reforms, have shown measurable safety benefits. Sleep is a critical but modifiable determinant of healthcare quality. Integrating validated sleep assessments into occupational health monitoring and embedding fatigue management into institutional safety systems could yield substantial improvements in both physician well-being and patient outcomes. Croatia, with its unified licensing system and existing burnout data, offers a strong foundation for a national initiative linking drowsiness and patient safety.

A Night Spa for the Brain: How the Glymphatic System Works

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Sleep plays a critical role in brain health, supporting memory, emotional balance, immune function, and especially brain detoxification. A key player in this detox process is the glymphatic system, a specialized glia-dependent perivascular network that facilitates the clearance of metabolic waste from the brain, primarily via cerebrospinal fluid (CSF) influx along periarterial spaces, exchange through astrocytic aquaporin-4 channels, and efflux along perivenous pathways. This system is most active during deep non-REM (N3) sleep, when interstitial space expands and noradrenergic tone is low, promoting efficient removal of neurotoxic proteins such as amyloid-β and tau, and supporting nutrient distribution and overall brain homeostasis. Although traditionally considered most active during deep sleep, recent research challenge this view, suggesting a more complex relationship between sleep and glymphatic function. Several factors like sleep deprivation, aging, vascular pathology , altered aquaporin-4 expression and certain medications reduce its efficiency and has been associated with neurological conditions including Alzheimer's disease, Parkinson's disease, multiple sclerosis, migraines, and traumatic brain injury. Enhancing deep sleep and preserving the natural architecture of sleep may play a crucial role in supporting glymphatic function. Current research is actively exploring both pharmacological and non-pharmacological strategies to modulate this system, with the aim of preventing or slowing the progression of neurodegenerative diseases. While debate around the glymphatic system continues, it remains a promising target for the development of novel therapies in neurological disorders.

Restless Nights, Evidence-Based Therapeutic Approaches: Development of Aasm Guidelines for Rls And PLMD in Clinical Sleep Medicine Practice

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Restless Legs Syndrome (RLS) is a neurological disorder characterized by an urge to move the legs, often accompanied by unpleasant sensations, most commonly during rest and in the evening or at night. Periodic Limb Movements during Sleep (PLMS) frequently co-occur with RLS and may disrupt sleep further; when these movements lead to significant impairment without another underlying cause, the condition is classified as Periodic Limb Movement Disorder (PLMD). Central iron deficiency is considered a key factor in the pathophysiology of RLS, and evaluation of serum ferritin and transferrin saturation is essential. Iron supplementation, either oral or intravenous, is indicated when levels fall below established thresholds, as correction of iron deficiency has been shown to improve symptoms. Current first-line pharmacological treatments for RLS include gabapentin enacarbil, gabapentin, pregabalin, and intravenous ferric carboxymaltose, all of which are supported by moderate- to high-certainty evidence for improving symptom severity, sleep quality, and overall quality of life, with favorable tolerability profiles. Additional treatments with conditional support include ferrous sulfate, intravenous ferumoxytol, low molecular weight iron dextran, dipyridamole, extended-release opioids, and bilateral peroneal nerve stimulation, typically reserved for more refractory or specific cases. Dopaminergic agents such as pramipexole, ropinirole, and rotigotine, previously used as standard therapies, are now discouraged for long-term use due to the high risk of augmentation—a treatment-induced worsening of symptoms over time. Levodopa, cabergoline, clonazepam, valproic acid, bupropion, and other older or off-label medications are also not recommended due to limited efficacy, risk of augmentation, or potential for serious side effects. In adults with end-stage renal disease, gabapentin, intravenous iron sucrose, and vitamin C may be beneficial in selected cases, while dopaminergic drugs should be avoided. In the pediatric population, ferrous sulfate remains the primary recommended treatment, provided iron status is appropriately evaluated. These therapeutic strategies reflect current priorities in the management of RLS and PLMD, and are consolidated in the 2025 clinical practice guidelines released by the American Academy of Sleep Medicine, which emphasize long-term safety, patient-specific treatment planning, and minimization of harm.

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Differential Diagnosis of Sleep Disorders and Nocturnal Epileptic Seizures: Clinical Challenges and Approaches

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Nocturnal events represent a frequent diagnostic challenge, as both sleep disorders and epileptic seizures may manifest with overlapping clinical features during the night. Differentiating between parasomnias, sleep-related movement disorders, and nocturnal epileptic seizures is essential for accurate diagnosis, appropriate treatment, and improved patient outcomes. This lecture will highlight key clinical, electrophysiological, and polysomnographic markers that aid in distinguishing epileptic seizures from non-epileptic sleep phenomena. Emphasis will be placed on semiology, timing within the sleep cycle, and the role of video-EEG polysomnography in capturing and characterizing events. In addition, practical diagnostic algorithms and case-based examples will be presented to illustrate common pitfalls and strategies to overcome them.

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Rapid Eye Movement (REM) Sleep Behavior Disorder (RBD) is a parasomnia characterized by loss of normal skeletal muscle atonia during REM sleep, leading to complex motor and vocal behaviors reflecting dream enactment. Its prevalence in the general population ranges from 0.5% to 2%, predominantly affecting men over 50 years of age, and may reach 14% in elderly cohorts. Neuropathological and longitudinal evidence strongly associate idiopathic RBD (iRBD) with a-synucleinopathies, including Parkinson's disease (PD), dementia with Lewy bodies (DLB), and multiple system atrophy (MSA). Phenoconversion rates from iRBD to an overt neurodegenerative disease reach 35% within 5 years and up to 90% after 15 years. Early non-motor features such as hyposmia, dysautonomia, impaired color vision, and mild cognitive impairment provide prodromal biomarkers of neurodegeneration. Polysomnography demonstrates REM sleep without atonia (RSWA), and electroencephalography, neuroimaging, and genetic studies further support its prognostic role. Risk factors include male sex, smoking, depression, antidepressant use, and neuropsychiatric comorbidities, whereas higher education is protective. Antidepressants—especially serotonergic and anticholinergic agents—can trigger or unmask RBD, though such cases carry lower neurodegenerative risk than idiopathic forms. Current therapy remains symptomatic: clonazepam and melatonin are first-line treatments, with pramipexole, cholinesterase inhibitors, and cannabidiol as adjuncts in selected patients. Recognizing and monitoring iRBD is critical, as it represents one of the most reliable clinical windows into prodromal synuclein-related neurodegeneration.

Sleep Disturbances in Patients with Psychosis

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Sleep and circadian disturbances are increasingly recognized as important features of psychotic spectrum disorders, significantly contributing to symptom severity, functional impairment, and in some cases, higher suicidal risk. These disturbances often precede the onset of psychotic symptoms, suggesting that they may serve as early vulnerability markers and potential targets for intervention. Similarly, adolescents at high risk for depression, whose baseline sleep abnormalities (including shorter REM latency, higher REM density, increased REM sleep, and elevated nocturnal cortisol) predict later depressive episodes, patients with chronic psychosis and those at risk commonly show sleep disturbances such as reduced total sleep time, prolonged sleep onset latency, and increased wake after sleep onset (WASO). Advances in digital phenotyping, such as smartphone-based monitoring, provide scalable methods for early detection and personalized management. Neurotransmitters and neuromodulators are key regulators of sleep architecture and circadian rhythms. Generally, serotonin promotes slow-wave sleep while suppressing REM, acetylcholine induces REM, noradrenaline contributes to muscle atonia during REM, and dopamine promotes arousal. Molecules such as melatonin, delta-sleep-inducing peptide, and Factor S further modulate circadian rhythms, though their precise mechanisms remain incompletely understood. Disruption of circadian rhythms, including altered clock gene expression and dopamine signaling, affects up to 80% of patients with schizophrenia and correlates with symptom severity. Regarding pharmacological treatment selection, the differential effects of antipsychotics underscore the importance of considering both their therapeutic benefits and potential impacts on sleep, particularly in patients with preexisting sleep disturbances. Atypical antipsychotics, partly through serotonergic mechanisms, can be effective even in non-psychotic patients, suggesting effects beyond the alleviation of psychotic symptoms. For instance, quetiapine may modify sleep architecture by reducing slow-wave and REM sleep while increasing sleep latency and WASO, whereas olanzapine and clozapine generally prolong total sleep time, with olanzapine additionally improving sleep structure. In contrast, first-generation antipsychotics typically increase REM latency. Among other interventions, cognitive-behavioral therapy remains essential component of treatment, while other pharmacological agents such as zopiclone or melatonin may be considered to optimize sleep. Tailoring interventions to the individual patient's needs is critical for improving both sleep quality and overall treatment outcomes.

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Sleep disorders are common during perimenopause and postmenopause, affecting an estimated 40–60% of women. They significantly impair quality of life, cognitive functions, emotional health, and increase the risk of metabolic and cardiovascular diseases. The etiology involves hormonal changes (decline in estrogen and progesterone), vasomotor symptoms, circadian rhythm alterations, comorbidities (depression, anxiety, sleep apnea), and lifestyle factors. A specific challenge for gynecologists is the timely recognition and differential diagnosis of insomnia and secondary sleep disorders related to menopausal symptoms. Hormone therapy, especially the combination of estrogen and micronized progesterone, demonstrates a beneficial effect on sleep quality through central GABAergic action and reduction of vasomotor episodes. Alternative options include non-pharmacological approaches (sleep hygiene, cognitive-behavioral therapy) and, for selected patients, pharmacological interventions outside the hormonal sphere. Gynecologists play a key role in identifying sleep disorders during menopause, conducting differential diagnoses, and selecting individualized treatments with an emphasis on safety and long-term outcomes.

Insomnia as a Form of Communication

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Insomnia is traditionally viewed as a disorder and a negative experience that disrupts quality of life. However, it can also be understood as a form of communication, a symptom through which the body and psyche express internal conflicts, emotional states, and unconscious dynamics. Thus, insomnia ceases to be merely the absence of sleep and becomes a "voice" seeking recognition. The psychodynamic approach allows a deeper understanding of insomnia as a manifestation of repressed content and unresolved conflicts. In this context, the Oedipus complex can be cited as an archetypal example of unconscious conflict, prohibition, and feelings of guilt that may prevent one from surrendering to sleep. Wakefulness then appears as a form of resistance to unconscious content and a symbolic guarding of the ego's boundaries. It is important to emphasize that insomnia does not always have exclusively pathological meaning. It can also be useful as a signal warning of imbalance, encouraging introspection, mobilizing adaptive mechanisms, or protecting the person from overwhelming emotions. In this way, insomnia may have protective and transformative functions. Understanding insomnia as communication opens space for an integrative treatment approach, in which pharmacological and psychotherapeutic perspectives complement each other, and the symptom is seen as a message rather than just a problem to be eliminated.

Artificial Intelligence (AI) in Sleep Medicine: Advantages and Disadvantages (Croatian Experiences)

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Artificial intelligence (AI) is defined as the ability of machines to learn from experience and acquire skills through examples, rather than solely perform calculations based on instructions from human users. In 2020, the American Academy of Sleep Medicine (AASM) published its first statement on the implementation of artificial intelligence in sleep medicine, and since then, the potential use of AI has developed at an unprecedented pace worldwide, but somewhat slower in Croatia. The implementation of AI has expanded beyond simple scoring (analysis) of polysomnography under supervision and holds the potential to assist in processing clinical documentation, predicting disease risks, diagnosing conditions, selecting optimal treatments, as well as predicting and monitoring treatment response and clinical outcomes—thereby improving clinical care. However, the integration of AI in sleep medicine must be carefully considered to ensure long-term accuracy, maintain safety standards, and safeguard transparency. In Croatia, the current use of AI in sleep medicine is primarily focused on determining sleep stages and respiratory events, identifying sleep-related movements, and processing data from positive airway pressure (PAP) devices. Other aforementioned benefits are not yet widely implemented in Croatian sleep centers. Manual analysis of all these aspects of polysomnographic findings is a labor-intensive process that requires significant effort for dataset evaluation. The use of AI in this domain is advantageous because it allows for more time to be dedicated to patient care, while also improving staff efficiency. The drawbacks of AI use have been noted among staff who are not adequately trained in sleep medicine and rely solely on AI-generated data without proper clinical validation. Patients using PAP devices in Croatia evaluate treatment efficiency for sleep apnea through manufacturer software, which is based on algorithms incorporating AI for data processing. The advantage of this approach lies in the accessibility and speed of obtaining data. However, targeted verification with PAP devices combined with polysomnography has clearly shown that PAP device data does not correspond closely to polysomnographic findings. This is one of the reasons why it is essential to emphasize the integration of clinical expertise with the use of AI.

The Role of the Technician in Conducting the MSLT T POSTERS est

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The Multiple Sleep Latency Test (MSLT) is one of the most important diagnostic procedures in sleep medicine. Its main purpose is to measure how quickly a patient falls asleep during the day under controlled conditions. It is most often used to diagnose narcolepsy and excessive daytime sleepiness. While the final interpretation of the test belongs to the physician, the role of the technician is essential. The technician is responsible for preparing the patient, setting up the equipment and ensuring that the recording is accurate and reliable. The MSLT is usually performed after a night of polysomnography, which must be taken into account by the technician. It is the technicians duty to check whether the patient has followed the preparation rules, such as avoiding caffeine or certain medications. The technician also explains the procedure clearly to the patient and helps reduce any stress or uncertainty before starting the test. A crucial step is the preparation of the equipment. The technician applies electrodes for EEG, EOG and EMG, making sure that they are well placed and give a good signal. Even a small mistake here can cause artifacts and reduce the quality of the recording. During the four/five scheduled daytime naps the technician guides the patient, ensures a quiet and comfortable environment and monitors the recordings in real time. Any irregularities or technical issues must be carefully documented. Although the physician is responsible for analyzing the results and giving the diagnosis, the quality of the data fully depends on the technicians work. If the test is not performed correctly, the results may be misleading, which can even lead to the wrong diagnosis. This highlights the responsibility of the technician in the whole process. The MSLT is a key diagnostic tool in sleep medicine and the technician plays a vital role in its success. By preparing the patient, setting up the equipment properly, and monitoring the test carefully, the technician ensures that the data collected are reliable. This makes the technician an essential member of the diagnostic team, supporting accurate diagnosis and effective treatment of sleep disorders.

How Addicts Sleep?

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Addiction and sleep problems often go hand in hand. Nearly all addictive substances affect sleep in some way—making it difficult, interrupting it, or altering its structure. This can create a vicious cycle: sleep disorders can worsen addiction, while addiction further disrupts sleep quality. Alcohol addiction and insomnia are closely linked. Alcohol is sometimes used as a sleep aid, but long-term it has a profoundly negative impact on sleep quality and structure. As a central nervous system depressant, alcohol can induce drowsiness and facilitate falling asleep, but this is a false sense of rest. It interrupts the sleep cycle and significantly reduces REM sleep, resulting in shallow, poor-quality sleep. Nighttime awakenings are common, and apnea symptoms worsen due to alcohol's relaxing effect on throat muscles. Insomnia is also one of the most challenging symptoms of withdrawal crises and delirium, often leading to relapse. In psychoactive substance addicts, sleep is difficult, fragmented, and structurally altered. They may go days without sleep or experience very light sleep when they do, leading to severe, long-lasting insomnia that can persist for years. Behavioral addictions are also strongly associated with insomnia, which deeply affects mental health and daily functioning—manifesting as stress, anxiety, depression, circadian rhythm shifts, etc.—making insomnia both a cause and consequence of behavioral addictions. Sleep problems in addicts are serious and common; resolving them can be a long process, but with the right approach—habit changes, lifestyle modifications, improved sleep hygiene, and psychotherapy—recovery is possible.

Sleep disorders in women

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Sleep disorders represent a growing health problem in modern society. Women are often at higher risk due to specific biological, hormonal, and psychosocial factors. Hormonal changes play a key role in disrupting sleep rhythms, while increased stress sensitivity, anxiety, and depression further exacerbate sleep problems in women. Beyond biological factors, sociocultural aspects—such as women's roles in family and work—can lead to chronic fatigue, reduced quality of life, and poorer sleep. This paper reviews the most common sleep disorders in women, including insomnia, obstructive sleep apnea, restless legs syndrome, and others. It examines how different life stages—menstruation, pregnancy, post-partum period, and menopause—affect sleep quality. The paper also emphasizes the importance of early symptom recognition, individualized treatment approaches, and non-pharmacological methods such as cognitive-behavioral therapy, sleep hygiene, and relaxation techniques. Further research is needed to better understand the specifics of women's sleep and develop effective treatment strategies.

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In this presentation, we will briefly explain the patient titration procedure on a CPAP device during the night. We will outline the key parameters to consider when adjusting the patient's pressure and specify in which types of apnea pressure needs to be increased versus decreased.

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Treatment with Bilevel Positive Airway Pressure (BPAP) for Hypoventilation Syndrome in Obese Patients

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Hypoventilation syndrome in obese patients manifests as respiratory failure, hypoxemia, hypercapnia, and pulmonary hypertension in the absence of lung or neuromuscular diseases. It may develop alongside sleep apnea syndrome but does not have to. The most common treatment method is the use of BPAP (Bilevel Positive Airway Pressure) devices, which deliver two different positive air pressures—for inspiration and expiration.

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Lung diseases are classified into obstructive lung diseases (e.g., asthma, chronic obstructive pulmonary disease, and bronchiectasis), restrictive lung diseases (e.g., interstitial lung diseases, chest wall abnormalities, and neuromuscular diseases), and vascular abnormalities (e.g., pulmonary thromboembolism and pulmonary arterial hypertension). Restrictive lung diseases are divided into parenchymal and extraparenchymal. The most common parenchymal restrictive lung diseases include sarcoidosis, IPF, pneumonitis, and interstitial disease, while the most common extraparenchymal restrictive lung diseases are neuromuscular diseases, diaphragm weakness, muscular dystrophies, kyphoscoliosis, obesity, etc. Non-invasive ventilation (NIV) is any form of ventilatory support applied to patients without the use of an endotracheal tube. It is used in patients with acute or chronic respiratory failure. NIV improves gas exchange, reduces respiratory work, and allows recovery of respiratory muscles. NIV improves gas exchange, lung function, quality of life, and exercise tolerance in patients and is also used in the stable phase of the disease.

Mouth Taping With Pap Therapy

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Most people on PAP therapy use nasal masks, and some of them will have a problem with air leakage through the mouth which can happen when the mouth opens unintentionally during sleep. Mouth taping is one of the methods that can alleviate this problem and help with optimization and adherence to PAP therapy. This method is not suitable for all PAP therapy users, and here we can include people with adhesive allergies, nasal congestion and nasal deformities (septum), facial hair, claustrophobia, and oro-nasal mask users. Some alternatives for mouth taping are: chinstrap, nasal strips, treatment of nasal congestion, using a humidifier, and oro-nasal mask users. There are also risks when using mouth taping like aspiration and suffocation if the PAP device stops working. So far, little research has been done on mouth taping, and further research is needed.

Acceptance of CPAP Therapy in Outpatient and Inpatient Titration – A Comparative Analysis

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Due to technological advancements and shifts in healthcare priorities, increasing emphasis is placed on the role of the day hospital as an efficient and modern form of care delivery. Day hospitals facilitate shorter hospital stays, reduce the risk of complications and healthcare costs, and improve the accessibility of medical services. Particular attention is given to patient education, especially regarding the use of CPAP (Continuous Positive Airway Pressure) devices in the treatment of obstructive sleep apnea, with the aim of encouraging active patient participation and responsibility in their own treatment. However, the day hospital model also has limitations, including feelings of insecurity, difficulties in adaptation, and reduced program flexibility. Younger adult patients with milder symptoms often underestimate the importance of therapy and may avoid attending sessions due to everyday obligations. In contrast, inpatient care provides 24-hour support and a sense of security. An optimal model may involve a hybrid approach, combining day and night hospital care, supported by a multidisciplinary team and accessible educational and visual resources.

Sleep-Related Breathing Disorders In Children With Prader-Willi Syndrome

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Prader-Willi syndrome (PWS) is a rare genetic disorder that affects 1:10000 - 30000 newborns. The early symptoms of PWS are hypotonia, failure to thrive, and hypogonadism, which are later joined by short stature, hyperphagia with morbid obesity, scoliosis, osteoporosis, mild to moderate intellectual impairment, behavioral disorders, etc. Important associated features of PWS include sleep disorders such as obstructive sleep apnea (OSA), Central sleep apnea (CSA), hypoventilation, hypersomnia, and excessive daytime sleepiness. Growth hormone therapy (GHT) is effective in improving stature, growth velocity, mobility, behavior, cognition and quality of life, but also with possible side effects such as breathing difficulties during sleep. Initial polysomnography is recomended before GHT. Polysomnography (PSG) is the gold standard in detecting sleep-disordered breathing. Polysomnography parameters include all-night continuous recording of a 6-channel EEG, measurement of nasal and/or oral airflow, chin and lower leg electromyogram, electrocardiogram, thoracic and abdominal plethysmography, pulse oximetry, body position sensor, snoring sensor, and audio/video monitoring. In Unit for Sleep Disorders at Children's Hospital Srebrnjak, 42 children with PWS have been monitored since 2008, 20 boys and 22 girls, age 4 months to 18 years. About 80% of patients with PWS had sleep-disordered breathing: CSA more frequent in infants, OSA and hypoventilation in others. Treatment included adenoidectomy/tonsillectomy, reduction diet, supplemental oxygen and in 5 children with complex apnea non-invasive ventilation (NIV) therapy. Sleep disorders and sleep-disordered breathing are important clinical features of children with PWS. The effects of growth hormone therapy are positive and multiple. Early diagnosis and controlled nutrition from an early age prevents increased morbidity and mortality. An interprofessional team approach, familly and caregiver education is necessary to optimize clinical outcomes, reduce morbidity, and improve the quality of life and longevity of patients with PWS.

Evaluation of the Effectiveness of PAP Therapy - How to Increase the Success of PAP Therapy? “A View from Practice”

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Healthy sleep is essential for overall health. Obstructive sleep apnea (OSA) is a disease that manifests as a sleep disorder and sleep - disordered breathing, characterized by episodes of interruption of breathing, with episodes of awakening and excessive fatigue and sleepiness during the day. PAP (Positive Airway Pressure) therapy with a device is the “gold standard” and one of the effective methods of treating OSA. Study objective: understand PAP device usage patterns and reasons for non-use, in order to develop patient education and support strategies with the goal of increasing adherence to therapy and reducing the health risks associated with sleep apnea.

Breathing, Sleeping, and Movement – Physiotherapy and OSA Treatment

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Obstructive sleep apnea (OSA) is the most common sleep-related breathing disorder and, along with insomnia, one of the most frequent sleep disorders overall. Combined with physical and mental comorbidities, it significantly impairs the quality of life of affected individuals. To analyze the epidemiological and clinical characteristics of patients with OSA and present the possibilities of physiotherapeutic intervention. Methods: Analysis of data from medical records of patients treated at the Sleep and Wakefulness Disorders Center, Vrapče Psychiatric Clinic. Results: Most participants were under 65 years old (70.4%), with 15.6% under 45. Excess body weight was present in 95% of patients, and 62.9% were obese. In addition to OSA, 56.7% had physical disease comorbidities, while 27.1% had both physical and mental comorbidities. The most common physical comorbidities were cardiovascular, cerebrovascular, metabolic, and respiratory diseases, while mental disorders were dominated by depression, anxiety, and insomnia (24%). Compared to the general population of the Republic of Croatia, participants had higher prevalence of diagnoses from ICD-10 groups E00–E90, F00–F99, I00–I99, J00–J99, M00–M99, and Z00–Z99. Conclusion: The results indicate that individuals with OSA carry a significant burden of physical and mental diseases, where physiotherapeutic interventions such as structured therapeutic exercise, oropharyngeal exercises, manual therapy, respiratory and relaxation techniques can play an important role in treatment. Further research is needed to standardize physiotherapy procedures and integrate them into multidisciplinary OSA treatment approaches.

POSTERS

Cognitive Behavioral Therapy for Insomnia (CBT-I): Effectiveness And Key Techniques

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CBT-I is established as the first-line treatment for chronic insomnia, with consistent support from international guidelines. Evidence demonstrates moderate-to-large, durable improvements across key sleep outcomes, including sleep efficiency, sleep onset latency, wake after sleep onset, and insomnia severity. CBT-I integrates several behavior niques that address different aspects of insomnia. Sleep efficiency is targeted primarily through Sleep Restriction Therapy (SRT) and Stimulus Control Therapy (SCT), which consolidate nocturnal sleep and re-associate the bed as a cue for sleep rather than wakefulness. SRT limits time in bed to the actual average sleep duration in order to build sleep pressure, then gradually expands this window once efficiency improves, whereas SCT instructs patients to go to bed only when sleepy, get out of bed if unable to sleep, maintain a fixed wake time, and avoid naps. Sleep hygiene interventions address environmental and lifestyle factors that undermine sleep, such as caffeine use or screen exposure, although evidence suggests they are insufficient when applied alone. Structured sleep preparation, including relaxation, calming routines, and arousal reduction, supports the transition to sleep and reduces presleep hyperarousal. Improving sleep patterns through regularization of schedules further stabilizes circadian timing, particularly when combined with SRT. Cognitive therapy addresses maladaptive beliefs and catastrophic misperceptions about sleep, such as the fear of severe daytime impairment without "8 hours of sleep," thereby reducing presleep worry and improving daytime functioning. Overall, these interventions can be matched to patient needs depending on whether the primary complaint is difficulty falling asleep, staying asleep, or managing anxiety about sleep. The strongest and most durable effects of CBT-I are achieved when behavioral and cognitive components are combined into a multicomponent intervention. However, if only a single type of technique is applied, behavioral methods such as SRT and SCT have consistently demonstrated the most robust efficacy.

Challenges In The Management Of Sleep Disorders In Family Medicine Practice

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Sleep disorders present a common reason for consultations in family medicine, yet their management can be particularly challenging, especially in patients with complex psychiatric comorbidities. Insomnia may appear as an isolated disorder or as a symptom of underlying mental illness, reducing quality of life. Family physicians often face the difficult task of balancing pharmacological and non-pharmacological interventions, while keeping in mind the risk of misuse of hypnotic medications. Case Report: This is a case of a 55-year-old female patient suffering from recurrent depressive disorder, who presented to her family physician with complaints of persistent difficulties initiating sleep. Her psychiatric history also included manic episodes, severe dissociative disorder, and anxiety disorder. Patients treatment included vortioxetine of 10 mg and diazepam of 2 mg per day. She reported continued struggle with insomnia despite diazepam therapy. The patient was prescribed zolpidem of 5 mg at bedtime. Since then, the patient has been requesting new prescriptions approximately every 20 days, reporting mild improvement in sleep quality but an inability to fall asleep without the medication, which brought to attention possible zolpidem dependence. Managing insomnia in primary care can be challenging, especially when psychiatric comorbidities are present. In this case, the patient's psychiatric background and ongoing psychopharmacological treatment limited the therapeutic options available to the family physician. Although zolpidem provided symptom relief, its continued use raised concerns about tolerance, dependence, and reducedg long-term benefit. At the same time, the physician had to balance the patient's need for restorative sleep with the risks of extended hypnotic therapy. Non-pharmacological approaches such as sleep hygiene counseling and cognitive-behavioral therapy could provide valuable alternatives, but they are often difficult to access in primary care settings. Collaboration with psychiatrists, regular therapy reassessment, and patient education about the safe hypnotics use are essential for ensuring both short-term improvement and long-term safety. The presented case illustrates the complexity of treating sleep disorders in family medicine. Individualized care, ongoing evaluation of risks and benefits, together with patient education remain central to achieving safe and sustainable treatment of insomnia in primary care.

Cheyne–Stokes Respiration In Unilateral Thoracic Muscle Atrophy And Hemidiaphragm Paralysis: Successful Stabilization With Adaptive Servo-Ventilation

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Cheyne–Stokes respiration (CSR) develops as a consequence of unstable ventilatory control characterized by high loop gain. This includes increased chemoreflex sensitivity (controller gain), a strong effect of ventilation changes on $PaCO_2$ (plant gain), and a prolonged circulation delay often present in heart failure. The result is a pattern of alternating hypo- and hyperventilation with associated oxygen desaturation and hypercapnia. In some patients, asymmetric chest wall mechanics may further contribute to ventilatory instability. A male patient with post-traumatic right brachial plexus injury and paresis presented in 2023 with progressive respiratory deterioration, right-sided heart failure, and respiratory acidosis. Clinical evaluation revealed right arm weakness, marked atrophy of the right hemithoracic musculature, and dysfunction of the right hemidiaphragm. Echocardiography showed preserved left ventricular ejection fraction (65%), mild right ventricular dilatation, and no signs of pulmonary hypertension. Spirometry demonstrated a restrictive ventilatory defect (FVC 58%). Thoracic ultrasound indicated minimal right hemidiaphragm excursion, and MSCT confirmed diffuse atrophy of right hemithoracic musculature. Polysomnography revealed frequent central apneas and a CSR pattern with significant desaturations and hypercapnia. Atrophy and paralysis of the right hemidiaphragm altered transthoracic pressure dynamics and ventilation distribution. The right lung exhibited increased compliance, paradoxical movements, and basal collapse, while the left lung compensated, producing regional ventilation–perfusion mismatch and variable plant gain. The combination of delayed circulatory feedback and heightened chemoreflex sensitivity amplified oscillations around the apneic CO_2 threshold, perpetuating CSR.Conventional noninvasive ventilation (S/T and PC modes) failed to stabilize breathing due to fixed pressure support, rigid backup rate, and poor synchrony in asymmetric chest mechanics, resulting in recurrent hyperventilatory overshoot and desaturations to ~60%. Adaptive servo-ventilation (ASV) was introduced, providing breath-by-breath adjustment of pressure support and dynamic EPAP. ASV achieved stable tidal and minute ventilation, corrected desaturations, and normalized acid–base balance. ASV effectively reduced controller and plant gain by stabilizing alveolar ventilation and preventing hypocapnic overshoot. Dynamic EPAP facilitated right lung recruitment and reduced ventilation–perfusion mismatch. In patients with CSR, heart failure, and unilateral diaphragmatic dysfunction, ASV may offer clear advantages over standard S/T modes in stabilizing ventilation and improving gas exchange.

Chronic Insomnia And Parasomnias As Part Of Post-Traumatic Stress Disorder – A Case Report

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Sleep disorders are relatively common comorbidities in psychiatric conditions, especially post-traumatic stress disorder (PTSD). Insomnia and parasomnias, such as nightmares, can significantly impair the quality of life and worsen the underlying psychiatric condition. This case report illustrates the clinical challenges in diagnosing and treating sleep disorders in a psychiatric patient and highlights the need for individualized diagnostic and therapeutic approaches in patients with PTSD. A 53-year-old male, former soldier and Croatian war veteran, diagnosed with PTSD since 2011, presents due to worsening of pre-existing chronic insomnia, frequent nightmares (3-5 times a week), episodes of intense awakening with feelings of panic, disorientation, and excessive daytime sleepiness. He also describes that he "wrestles" in his sleep during the night, shouts, and sometimes unintentionally injures himself or his partner. The patient denies cataplexy, sleep paralysis, restful afternoon naps and states that he remembers most dreams vividly. He occasionally uses diazepam 5 mg, melatonin up to 5 mg, sertraline 50 mg, and zopiclone 7.5 mg, which do not seem to help with falling asleep. The findings of the orientational neurological examination and basic laboratory workup were normal. The patient was referred for a polysomnography, which showed sleep fragmentation, regular sleep latency (>10 minutes), and REM sleep behavior disorder (RBD) noted due to increased motor activity of the limbs during REM sleep. A psychiatric examination was performed, and the evaluation confirmed a high level of anxiety and re-traumatization in dreams with nightmares present. Treatment was initiated with a combination of sleep hygiene education, cognitive-behavioral therapy for insomnia (CBT-I), and pharmacotherapy (nitrazepam 5 mg and trazodone 150 mg for insomnia, and clonazepam as needed for RBD). After 8 weeks, there was a decrease in the frequency of nightmares, an improvement in sleep quality, and a subjective feeling of safety during the night with seldom daytime sleepiness. This case highlights the importance of recognizing insomnia and parasomnias in the context of PTSD and the need for an individualized and interdisciplinary approach. The combination of psychotherapy, pharmacotherapy and patient education can significantly improve treatment outcomes and enhance patient compliance with health professionals.

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Effects of Long-Term Benzodiazepine Use in Older Adults

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The proportion of adult patients using benzodiazepines long-term (> 6 months) averages 24 %, with the highest prevalence observed among older adults, reaching approximately 50 %. Since 2021, the prevalence of benzodiazepine use in individuals aged 65 years and older has declined, although the incidence of prescribing within this group remains the highest compared to other age categories. A 2020 study demonstrated that cognitive effects in older, highly educated individuals were not associated with the duration of benzodiazepine use; similar impairments were observed with both short-term (< 180 days) and long-term use (> 180 days). Declines were noted in executive functions (visual and motor), while no effects were detected on other cognitive domains. These findings are in contrast with other studies reporting reduced cognitive performance linked to prolonged benzodiazepine use, although those studies did not adequately match participants for educational attainment and anxiety levels, both of which influence cognitive function. No association has been established between benzodiazepine use and the development of dementia in individuals over 60 years of age. However, reductions in hippocampal and amygdalar volumes have been reported in relation to the duration of benzodiazepine use. In older adults, benzodiazepine use has been consistently associated with an increased risk of falls and fractures. Evidence regarding all-cause mortality is inconsistent, with some studies confirming an association and others reporting no significant link. While benzodiazepine use confers certain benefits related to sleep, such as reduced sleep latency, increased total sleep time, improved sleep efficiency, and decreased wake after sleep onset it also affects slow-wave sleep, which is directly tied to short-term memory. Long-term use may therefore contribute to memory impairments in older adults. In conclusion, despite certain benefits, the long-term use of benzodiazepines in older adults carries more risks than advantages and is not recommended.

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Sleep disorders play a significant role in forensic psychiatry due to their impact on emotional regulation, cognitive functioning, and behavioral patterns. Insomnia is often associated with irritability, impulsivity, and reduced self-control, which can lead to violent or risky behaviors with legal consequences. Chronic sleep disorders further increase the risk of aggressive behavior, substance misuse, and suicidality, thereby underscoring their forensic relevance. There is growing evidence that sleep disorders may serve as early predictors of violent recidivism, although further research is needed to confirm causal relationships. Incorporating sleep-quality assessment into standardized forensic evaluations could facilitate earlier identification of at-risk individuals and the development of more effective intervention strategies. Systematic monitoring and appropriate treatment of sleep disorders thus represent an important step toward reducing the risk of violent recidivism and ensuring more objective legal decisions in forensic psychiatry.

How Soldiers Sleep: Trauma-Associated Sleep Disorder (TSD)

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Trauma-Associated Sleep Disorder (TSD) is a recently conceptualized entity in military psychiatry, first systematically described in soldiers and veterans. It emerges following exposure to traumatic events (e.g., combat, explosions, assaults) and is defined as a distinct sleep disorder rather than a secondary manifestation of post-traumatic stress disorder (PTSD). Core features include trauma-related nightmares accompanied by complex motor and vocal behaviors during sleep. While these behaviors resemble REM sleep behavior disorder (RBD), the dream content in TSD is uniquely anchored to traumatic experiences, distinguishing it from idiopathic RBD. Epidemiological trends indicate a marked rise in sleep disorders within military populations. Between 2005 and 2019, the prevalence of insomnia and sleep apnea increased significantly. Soldiers with obstructive sleep apnea (OSA) are at elevated risk of developing PTSD and traumatic brain injury (TBI). In a cohort of 725 service members, 27% were diagnosed with mild OSA, 24% with insomnia, and 24% with moderate-to-severe OSA. Furthermore, 42% reported sleeping fewer than five hours per night, of whom 85% had been deployed and 58% presented with comorbid conditions such as PTSD and chronic pain. Clinical descriptions suggest that TSD arises acutely after trauma, often presenting with nightly symptoms that may diminish gradually over subsequent years. The syndrome frequently overlaps with both PTSD and RBD, leading some authors to conceptualize it as a "bridge" between these disorders. Importantly, TSD demonstrates a strong association with TBI, underscoring its neuropsychiatric relevance. The functional impact is considerable. Sleep disorders significantly compromise cognitive performance, vigilance, decision-making capacity, reaction time, and operational safety. Williams et al. (2014) highlight that chronic sleep deprivation and related disorders critically undermine military readiness, and physiological adaptation to persistent sleep loss is unattainable. Standard therapeutic approaches are further complicated by the operational demands and unpredictability inherent to military environments. Consequently, experts advocate for the systematic integration of sleep optimization strategies and the adaptation of treatment protocols to the unique conditions of military service. In sum, Trauma-Associated Sleep Disorder (TSD) constitutes a trauma-induced parasomnia that is nosologically distinct from both PTSD and idiopathic RBD, though it shares features with each. Its high prevalence, association with deployment-related trauma, and significant functional consequences render it a critical focus of military mental health research and clinical practice.

Impact of CPAP Therapy on Quality of Life in Patients with Obstructive Sleep Apnea

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Patients with OSA report impaired general health and quality of life. CPAP has been shown to affect survival rates in critically ill patients, to reduce cardio- and cerebrovascular fatal events. However, studies investigating the impact of CPAP therapy on the quality of life of patients with OSA are still limited. We wanted to examine the quality of life in patients with OSA before and after 3 months of CPAP treatment. Methods: The participants were adults diagnosed with OSA. The excluded criteria were history of any prior OSA treatment and acute psychosis. Anthropometric, demographic, clinical data and medical history were collected. Each patient was started on CPAP therapy. Four questionnaires were used in both study points: Epworth Sleepiness Scale (ESS), Pittsburgh Sleep Quality Index (PSQI), Functional Outcome of Sleep Questionnaire (FOSQ) and 36-Item Short Form Survey (SF 36). Participants were divided into two groups: good compliance and poor compliance group. A total of 119 subjects, mostly overweight male with the mean age of 55.34±9.89 years, were included in the study. There was a significant improvement in daytime sleepiness and functional outcomes ($p<0.001$) after three months. Also, study participants had better scores in subgroups of general productivity ($p<0.001$), activity level ($p<0.001$), vigilance ($p<0.001$), intimate relationships, sexual activity ($p=0.004$), physical functioning ($p=0,042$), physical limitations ($p=0,001$), vitality ($p<0.001$) and general health ($p=0,021$). After CPAP therapy, there was lower total PSQI ($p<0.001$), better subjective sleep quality ($p<0.001$), less sleep disturbances ($p<0.001$) and better daytime functioning ($p<0.001$). There was no significant difference in sociodemographic and medical data in two groups. In addition, improvements correlated with better adherence to CPAP. Subjects with poor compliance had worse results in total PSQI ($p=0.001$), subjective sleep quality ($p=0.032$), sleep latency ($p=0.05$), sleep efficacy ($p=0.004$) and sleep disturbances ($p=0.005$). The results of physical functioning ($p=0.041$), vitality ($p=0.009$), mental health ($p<0.001$), social functioning ($p=0.004$) and general health ($p=0.039$) were better in the group with good compliance. CPAP therapy leads to improvements across all domains of quality of life, with more pronounced benefits observed in the compliant group.

Insomnia and The Risk of Suicidal Behavior

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Insomnia and other sleep disturbances are increasingly recognized as independent and significant risk factors for suicidal thoughts, plans, and behaviors. Meta-analyses and longitudinal studies indicate that individuals with insomnia are approximately twice as likely to develop suicidal ideation compared to those without sleep problems, and this association remains significant even after controlling for depression and other psychiatric disorders. A systematic review further confirms that sleep disturbances, including insomnia and nightmares, are consistently associated with suicidality across different populations and age groups, with emotional dysregulation, increased impulsivity, and cognitive deficits proposed as potential mechanisms. In clinical populations, particularly among patients with depression, meta-analytic findings show that sleep disturbances significantly increase the risk of suicidality (OR ≈ 2.45), with nightmares emerging as a particularly strong predictor (OR ≈ 4.47), while insomnia also nearly doubles the risk (OR ≈ 2.29). Among adolescents, short sleep duration has been identified as especially hazardous, nearly doubling the likelihood of suicidal thoughts and plans, which underscores the importance of early detection and intervention. Chronic sleep disturbances may disrupt circadian regulation, heighten negative affect, and impair executive functions, thereby diminishing resilience to stress and increasing susceptibility to impulsive behaviors that can precipitate suicidal acts. Although most studies are observational and cannot establish definitive causality, the evidence is consistent and robust, positioning insomnia and other sleep problems as critical yet often underrecognized targets in suicide risk assessment and prevention. Clinical practice should therefore include routine evaluation of sleep quality, and interventions addressing insomnia, such as cognitive-behavioral therapy for insomnia, may hold substantial potential for reducing suicide risk.

Insomnia Management in a Patient with Chronic Pain

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Patients with chronic pain often seek help from their family physician. Those patients may have multiple comorbidities with insomnia being one of them. In those cases, it is difficult to assess the origin of insomnia, but it can be multifactorial, influenced by pain and psychological burden. Therefore, choosing an appropriate hypnotic requires a thorough evaluation and ongoing monitoring to ensure safe and effective long-term management. This is the case of a 56-year-old male with history of chronic back pain that underwent three spinal surgeries. Despite the surgeries he is still experiencing pain on everyday basis that is being treated conservatively with medication. At the moment, the pain is managed with benzodiazepam (5 mg), tapentadol (100 mg), pregabalin and non-steroidal anti-inflammatory drugs. He is also taking escitalopram 10mg and olanzapine 5mg. In addition to persistent pain, he struggles with insomnia which further lowers his quality of life. His insomnia was first treated with diazepam which only helped for a short amount of time. Changing the medication to zolpidem showed improvement for over a year. Recently, zopiclone was introduced as a replacement therapy. The patient responded well and reported better sleep quality. Discussion: Managing insomnia is often challenging, particularly in patients with chronic pain. Careful monitoring of treatment response is essential, especially when multiple medications are involved. This case illustrates how the effectiveness of zolpidem may diminish over time, emphasizing the need for regular reassessment rather than relying on a single long-term solution. Switching to zopiclone improved the patient's sleep, but it also raises questions about how long this benefit will last. Alongside pharmacological management, patients with insomnia should be encouraged to adopt non-pharmacological strategies, including sleep hygiene counseling, regular physical activity, and a well-balanced diet. For family physicians, the balance between effective insomnia relief and long-term safety remains delicate. Zopiclone provided meaningful short-term improvement in this patient, but its benefits may diminish over time with a risk of developing tolerance or dependence. This highlights the importance of regular monitoring and reassessment to detect changes in response and adjust treatment as needed.

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Insomnia as a Risk Factor for Postpartum Depression

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Postpartum depression (PPD) affects about 15% of new mothers and can have serious consequences for both mother and infant. While hormonal fluctuations and psychosocial stress are well-known contributors, disturbed sleep is emerging as a significant risk factor. Many new mothers face fragmented sleep due to infant care, and some also experience insomnia (difficulty falling or returning to sleep even when the baby is asleep). Research has increasingly linked insomnia and poor sleep quality to the development of PPD. This work aims to evaluate whether insomnia is a significant risk factor for PPD by synthesizing evidence from recent clinical studies on perinatal sleep and maternal mood. We reviewed relevant studies that examined maternal sleep (particularly insomnia symptoms or subjective sleep quality) during late pregnancy and the postpartum period in relation to PPD outcomes. Priority was given to longitudinal cohort studies and systematic reviews that measured sleep via standardized questionnaires or objective monitoring and assessed depressive symptoms postpartum. Key outcomes included whether poor sleep prospectively predicted higher postpartum depression levels.Women reporting insomnia or poor sleep in the perinatal period consistently had higher rates of postpartum depressive symptoms. Prospective cohorts indicate that subjective sleep quality in the early postpartum weeks is a strong predictor of later depression severity. Objective measures of fragmented sleep (e.g., frequent awakenings, low sleep efficiency) also correlate with greater PPD severity, whereas total sleep duration is less predictive. Insomnia during pregnancy is similarly associated with higher PPD risk, supporting the notion that sleep disturbances often precede and potentially contribute to depression onset rather than occur solely as a symptom. Insomnia appears to be a modifiable risk factor for PPD. Early identification and management of perinatal sleep problems – through interventions like cognitive-behavioral therapy for insomnia or improved sleep hygiene – may help reduce the incidence and severity of postpartum depression. Given the strong connection between sleep and mood, addressing insomnia should be an integral component of postpartum care.

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Nightmares are a highly prevalent and distressing symptom of post-traumatic stress disorder (PTSD), affecting the vast majority of individuals with the disorder and exerting significant impact on sleep quality, daily functioning, and overall PTSD symptomatology. Nightmares in PTSD often manifest as recurrent, vivid re-experiencing of traumatic events, although they can also include more abstract threat-related content. Epidemiological data indicate that up to 96% of individuals with PTSD experience nightmares, and over 90% report sleep disturbances, making nightmares a core intrusion symptom in diagnostic criteria. The bidirectional relationship between sleep disturbance and PTSD is well-documented: disturbed sleep not only serves as a symptom but can also worsen PTSD severity and hinder recovery, even persisting after other daytime symptoms remit. Nightmares in PTSD are linked to alterations in sleep architecture, particularly rapid eye movement (REM) sleep fragmentation, increased sympathetic arousal, and neurophysiological markers of hyperarousal. They are commonly described as realistic, easily recalled, and are frequently replicative, closely mirroring actual traumatic events or their central affective themes. They also contribute to maladaptive fear memory consolidation and are associated with greater risks for comorbidities such as depression, suicidality, and substance use. Their persistent nature can interfere with emotional processing and daily functioning. Recent research has identified that nightmares are not only a hallmark of PTSD but may also act as a maintaining or aggravating factor, predicting the trajectory and chronicity of the disorder. Imagery Rehearsal Therapy (IRT) is currently recognized as the first-line psychological treatment for trauma-related nightmares. IRT involves rescripting the nightmare into a less distressing version and repeatedly rehearsing the new narrative, which has demonstrated large effect sizes in reducing nightmare frequency, improving sleep quality, and diminishing PTSD symptoms over both short and long-term follow-up. In conclusion, nightmares are a central, predictive, and prognostic symptom of PTSD, intricately linked with the course and severity of the disorder. Their successful treatment, particularly via targeted behavioural interventions like IRT, not only reduces nightmare burden and improves sleep but can facilitate overall symptom remission and functional recovery for those with PTSD.

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Dopamine Agonists-Induced Addictive Behaviors in Restless Legs Syndrome: A Narrative Literature Review

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In addition to iron deficiency, dopamine dysregulation in the brain underlies the development of restless legs syndrome (RLS). Low doses of dopamine agonists (DA), initially prescribed for Parkinson's disease, are effective in the treatment of RLS symptoms. The most commonly prescribed DAs include bromocriptine, cabergoline, pramipexole, and ropinirole. However, since dopamine is the main neurotransmitter in the brain's reward system, it is reasonable to ask whether patients with RLS can develop addictive behaviors. A literature search was conducted using PubMed and Google Scholar with the keywords: dopamine agonist AND restless legs syndrome AND (use disorder OR addict* OR use). Original research articles, literature reviews, case reports, and letters to the editor are included. DAs can trigger the development of impulse control disorders (ICDs): pathological gambling, hypersexuality, compulsive shopping, binge eating, punding. This occurs because most DAs, are selective and have a higher affinity for D3 receptors located in the mesolimbic system. The hallmark of ICDs is that the individual is unable to resist a behavior even though it is harmful. Some studies demonstrate that dopamine dysregulation syndrome (DDS) often develops first, leading to compulsive intake of increasingly higher DA doses, with subsequent emergence of addictive behaviors. One study reported that 17% of RLS patients develop ICDs, most commonly pathological gambling and compulsive shopping. Thus, although lower DA doses are typically used in RLS compared with Parkinson's disease, ICDs may still develop in these patients. Risk factors include male sex, risk-prone personality, a history of psychiatric or addictive symptoms. The symptoms resolve within several weeks after DA discontinuation. Furthermore, more recent literature indicates that patients can also develop dopamine agonist–induced use disorder without the presence of ICDs. The majority of reported cases involve levodopa, which acutely increases dopamine levels in the brain, unlike other long-acting DAs. In addition, dopamine agonist withdrawal syndrome (DAWS) may occur, presenting with typical psychiatric symptoms in RLS patients after discontinuation of DA therapy, even in the absence of prior ICDs or substance use disorder. Despite effectiveness of dopamine agonists in the RLS treatment, other therapuetic options according to AASM guidelines should also be considered.

Prevalence of Obstructive Sleep Apnea in Long-Term Psychiatric Patients With Schizophrenia: A Literature Review

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Obstructive sleep apnea (OSA) is a common and clinically important comorbidity in psychiatric populations, particularly among individuals with schizophrenia, where risk factors such as long-term antipsychotic use, obesity, metabolic problems, and sedentary lifestyle are very frequent. In the general population, the prevalence of OSA with daytime sleepiness is estimated at 3–7% in men and 2–5% in women (Punjabi, 2008) while psychiatric cohorts show substantially higher rates. Ghazikhanian and Surti (2024) reported that up to 72% of patients with schizophrenia were at high risk for OSA according to screening tools, while 14% self-reported a prior diagnosis. The study also suggested that patients with poorer cognitive functioning, especially those with chronic schizophrenia, may be less likely to seek help for OSA symptoms, highlighting a gap in detection and treatment. In the polysomnography study by Okada et al. (2022), which investigated psychiatric patients with sleep-related complaints, found that 58% of the schizophrenia subgroup had OSA. Most of the OSA cases were moderate to severe, underscoring the clinical significance of the disorder. Although the high prevalence partly reflects a selected inpatient sample, it is also consistent with known risk factors in schizophrenia such as antipsychotic-induced weight gain, sedentary lifestyle, and metabolic syndrome. Despite these findings, OSA often remains underrecognized in psychiatric settings. Its core symptoms such as daytime sleepiness, fatigue and poor concentration overlap with manifestations of psychiatric illness and medication side effects, which complicates detection. Untreated OSA contributes to cardiovascular and metabolic morbidity, worsens quality of life, and may exacerbate psychiatric symptoms. Across the literature, there is a consistent call for improved detection and management of OSA in patients with severe mental illness. Incorporating validated screening instruments followed by referral for polysomnography when indicated could facilitate earlier diagnosis. Overall, OSA appears to be a frequent yet underrecognized comorbidity among long-term psychiatric patients with schizophrenia, and greater clinical awareness and integration of sleep medicine into psychiatric care are needed to optimize treatment for this vulnerable population.

Upper Airway Resistance Syndrome (UARS) – A Case Report

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Upper Airway Resistance Syndrome (UARS) is a sleep-disordered breathing condition characterized by increased resistance to airflow in the upper airway during sleep, leading to repetitive arousals without significant oxygen desaturation or apnea. We present a case report of a 29-year-old male with a six-month history of loud snoring, episodes of choking during sleep, and increased daytime sleepiness. Despite seemingly adequate sleep duration, he reported persistent fatigue, poor concentration, and occasional unintended sleep episodes during the day. He also described frequent nocturnal awakenings and occasional bedwetting. His Epworth Sleepiness Scale (ESS) score was 19, indicating excessive daytime sleepiness. About five years ago, he was treated with sertraline for presumed psychological causes of insomnia, which worsened his sleep quality. He has no history of serious illness, does not take any medications, and denies any drug allergies. Other sleep disorders were ruled out, and his bowel and bladder habits are normal.
A full-night polysomnography (PSG) was conducted to investigate the cause of his symptoms. The study revealed markedly low sleep efficiency (37.8%) and an absence of REM sleep. Sleep architecture was dominated by stage N2 sleep (72.6%) and N3 sleep (22.5%), with minimal time spent awake or in REM. The apnea-hypopnea index (AHI) was 3.7 events per hour, with no significant oxygen desaturation. However, the arousal index was elevated at 9.9 events per hour, and frequent inspiratory flow limitation was observed (9.4% of total sleep time). No limb movements or epileptiform activity were noted. Despite a normal AHI, the presence of repetitive arousals and inspiratory flow limitation supported a diagnosis of UARS. A CPAP trial was initiated, resulting in improved sleep continuity, increased alertness, and reduced daytime sleepiness. This case underscores the diagnostic challenge of UARS, which often presents with significant clinical symptoms despite a normal AHI. Polysomnography—rather than respiratory poligraphy—with detailed analysis of flow limitation and arousals is essential for accurate diagnosis. Early recognition and treatment with CPAP can lead to substantial symptom relief and may prevent long-term complications.

Somnological Side Effects of Psychotropic Medication

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Parasomnias induced by psychotropic medication represent an important and underrecognized connection between psychiatry and sleep medicine. Evidence from case reports, cohort studies, polysomnography, and systematic reviews indicates that sedative-hypnotics, antidepressants, and antipsychotics may precipitate abnormal nocturnal behaviors. Some of those include sleepwalking, sleep-related eating disorder, nightmares, and rapid eye movement (REM) sleep behavior disorder (RBD). Hypnotics such as zolpidem are strongly associated with complex amnestic behaviors such as nocturnal eating and sleep-driving, which are likely related to altered arousal transitions. Antidepressants such as selective serotonin reuptake inhibitors, serotonin–norepinephrine reuptake inhibitors, tricyclics, and mirtazapine have been connected with both non-REM and REM parasomnias. Clinical and population-based studies suggest a three- to fivefold increased risk of RBD-like symptoms among antidepressant users. Quantitative polysomnographic data confirm that antidepressants elevate REM sleep without atonia, a pathophysiological hallmark of RBD. Some studies further show that patients with antidepressant-associated RBD display markers of prodromal neurodegeneration, such as impaired olfaction, motor slowing, autonomic dysfunction, and mild cognitive impairment, although the rate of conversion to overt Parkinson's disease or dementia with Lewy bodies appears lower than in idiopathic RBD. Antipsychotics such as olanzapine, quetiapine, and risperidone, as well as mood stabilizers such as lithium and valproate, have been linked to sleepwalking, nightmares, and sleep-related eating. Pharmacovigilance reviews confirm that nightmares, sleepwalking, and RBD are the most frequently reported drug-induced parasomnias, while disturbances of dopaminergic and serotonergic systems contribute to restless legs syndrome, periodic limb movements, and bruxism. These findings emphasize that psychotropic medications can have complex effects on sleep. These effects can range from therapeutic benefits in insomnia to the induction of potentially injurious parasomnias. Recognition of iatrogenic parasomnias is clinically essential to prevent injury, optimize treatment, and differentiate pharmacologic side effects from early neurodegenerative disease.

Sleep Disturbances in Oncology Patients

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Sleep disturbances represent one of the most prevalent and clinically significant symptoms in patients with malignant diseases, with reported prevalence rates ranging from 30% to 75% depending on tumor type and treatment modality. They are particularly frequent in breast, lung, prostate, and hematological cancers, where both disease burden and treatment-related toxicities contribute to disruption of sleep–wake regulation. The etiology is multifactorial, encompassing pain, fatigue, medication side effects, circadian rhythm disruption, as well as psychiatric comorbidities such as anxiety and depression. Insomnia and poor sleep quality are consistently associated with heightened psychological distress, reduced treatment adherence, impaired functional status and diminished health-related quality of life. Cancer patients often adopt various coping strategies in response to persistent sleep disturbances, ranging from behavioral adjustments, such as daytime napping, irregular sleep-wake scheduling, and increased use of stimulants like caffeine, to psychological mechanisms including denial, distraction, and seeking social support. While some strategies provide temporary relief, others may paradoxically worsen sleep quality and fatigue, creating a cycle of maladaptive coping. Importantly, many patients report reluctance to disclose sleep problems to their oncology team, perceiving them as secondary to cancer treatment, which contributes to underdiagnosis and undertreatment. Importantly, prospective studies in breast and colorectal cancer populations have demonstrated that persistent sleep disruption and circadian rhythm alterations are independent predictors of shorter overall survival, underscoring their prognostic relevance. Despite this, sleep problems are frequently underrecognized in routine oncology practice. Evidence-based management should prioritize non-pharmacological approaches such as cognitive-behavioral therapy for insomnia, sleep hygiene counseling, and relaxation-based interventions, which remain first-line treatments. Pharmacotherapy, including short-term use of nonbenzodiazepine hypnotics, melatonin receptor agonists, and selected sedating antidepressants, may be indicated in cases of severe or refractory insomnia, but requires careful monitoring for drug–drug interactions and potential adverse effects in the oncological context. An integrated care model involving oncologists, psychiatrists, and psycho-oncology services is essential to ensure systematic screening, timely intervention, and optimization of both psychological well-being and oncological outcomes.

Abuse of Stimulants and Their Impact on Sleep

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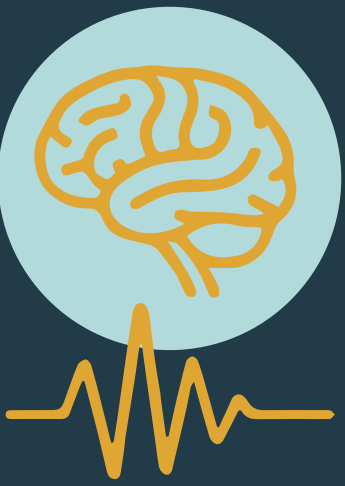
The abuse of stimulants (cocaine, amphetamines, methamphetamine, methylphenidate, caffeine and energy drinks) is becoming increasingly frequent and is associated with numerous health consequences, among which sleep disorders occupy a prominent place. Sleep, as a fundamental physiological function, is particularly sensitive to the effects of stimulants because they modulate the dopaminergic and noradrenergic systems. The aim of this paper is to present the impact of stimulant abuse on the architecture and quality of sleep, with an emphasis on clinical implications and treatment challenges. Recent scientific and professional literature on the relationship between stimulants and sleep disorders was reviewed, including clinical studies, longitudinal research and practice reports. Stimulants lead to prolonged sleep onset latency, a reduction in total sleep time and significant disturbances in sleep structure, including reduced representation of REM and slow-wave sleep. Long-term use is associated with chronic insomnia, anxiety and depressive symptoms, and cardiovascular complications. During abstinence, rebound hypersomnia is observed, but sleep quality remains impaired for weeks to months, which increases the risk of relapse. Sleep disorders are a frequent and clinically significant consequence of stimulant abuse. The integration of pharmacological and non-pharmacological interventions aimed at regulating sleep represents an important part of comprehensive treatment and rehabilitation of individuals addicted to stimulants. Further research is needed to develop targeted therapeutic strategies.



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