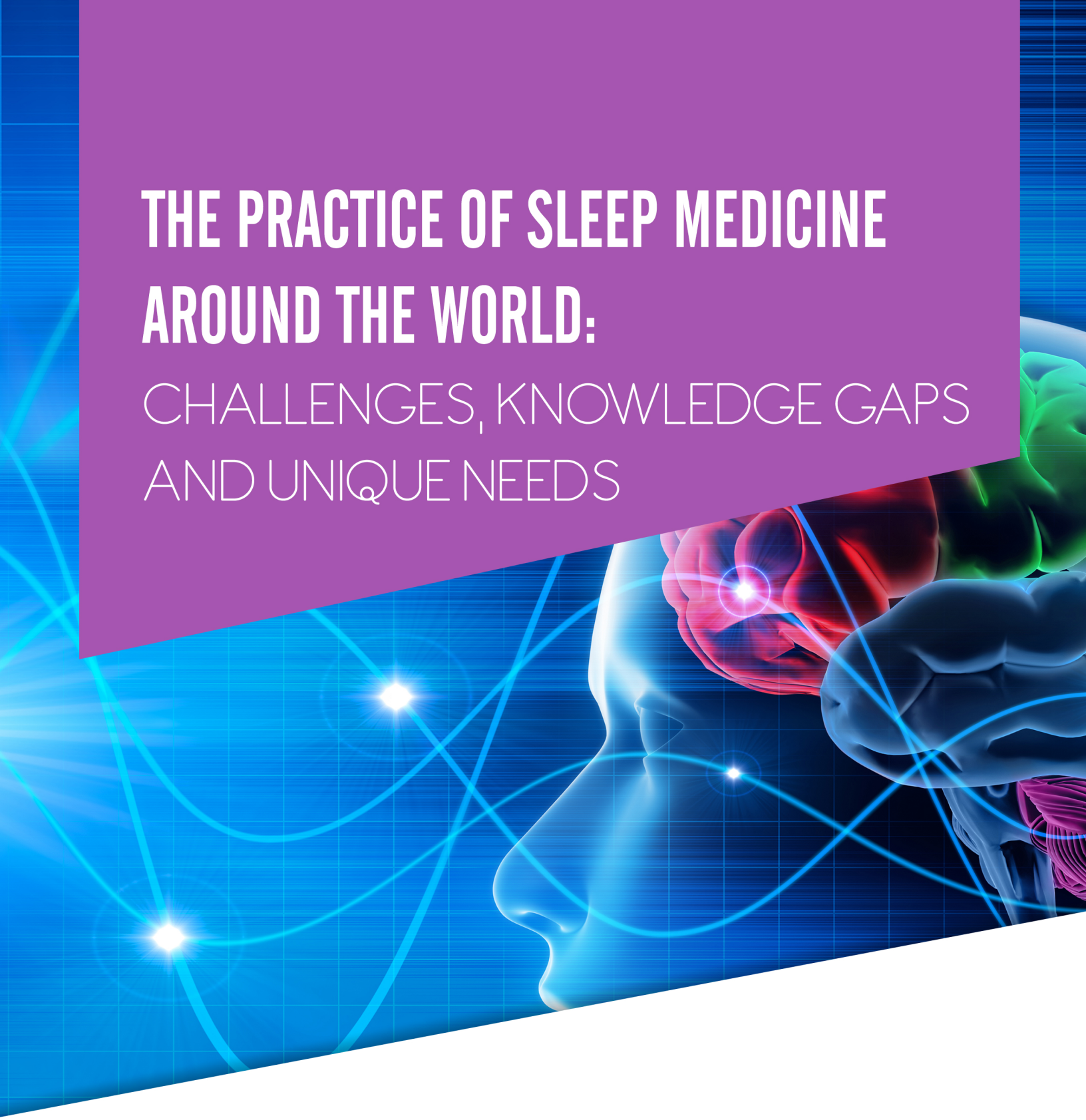
THE PRACTICE OF SLEEP MEDICINE AROUND THE WORLD:

CHALLENGES, KNOWLEDGE GAPS AND UNIQUE NEEDS



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PREFACE

The art and science of sleep medicine have evolved significantly over the past several decades. Both diagnostic and therapeutic advancements have led to a multidisciplinary approach to the field. Impactful research as well as technological innovations have been major catalysts in the rapid development of this important specialty.

Despite the above, those advancements have predominantly manifested in high and some middle-income countries. Meanwhile, there have been wide disparities in the delivery of care in economically disadvantaged parts of the world. When considering the entirety of sleep health and the wide range of sleep disorders, even within the same geopolitical areas, city, country, or continent, the ability to properly diagnose and, more importantly, manage sleep disorders by medical professionals and healthcare systems varies greatly.

Because of the multidisciplinary nature of the field, each editor of this publication comes from a different primary specialty. Dr. Marie-Louise M. Coussa-Koniski is a pulmonologist, Dr. Alain Michel Sabri is an otolaryngologist-head and neck surgeon and Dr. Hrayr P. Attarian is a neurologist. Similarly, the authors of the individual chapters cover a wide range of specialties, including the aforementioned ones as well as paediatrics, psychiatry, occupational medicine, internal medicine and others.

This textbook seeks to highlight the above by elucidating the particularities within each country, as well as the challenges encountered and the potential for improvement in the management of sleep disorders. The latter has a high impact on the healthcare of the individual, the healthcare system and various notions in terms of morbidity, mortality and overall well-being and quality of life. The impact of sleep disorders carries important economic implications. Leading healthcare experts describe the differences in the healthcare systems, available resources, patient population, accessibility as well as teaching and research in the field. Future directions and suggestions for improvement are also discussed.

We hope that you will find this textbook informative and that it will stimulate ideas for growth and development in the field of sleep disorders around the world.

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INTRODUCTION

Sleep is a biological imperative and one of the four pillars of health along with nutrition, physical activity and relaxation. Yet, sleep medicine has only recently become an individual discipline. Even then it is more developed in high-income countries than in middle or low-income ones. Although a large proportion of the world's population suffers chronically from poor sleep, addressing it is not a major priority. This is also true for economically disadvantaged populations even in the wealthiest of nations. The limitations to this are greatly due to a lack of resources for both screening for poor sleep health as well as for appropriate interventions. There is, however, a lack of knowledge about the impact of poor sleep on overall health. A fair proportion of healthcare workers both here and in other countries I have visited as part of my global health education work think of sleep medicine as only treating sleep apnea or a rare disease such as narcolepsy. Both are viewed as not essential for populations who have difficulty obtaining basic healthcare. Sleep medicine, however, could be much more than this. As different chapters in this book will show, sleep is one of the first bodily functions to be affected when people are displaced, or live in crowded tenements, or when they become homeless. Not getting sufficient and quality sleep can lead to both poorer cardiovascular health, increased risk of accidents and lower cognitive functioning. It can help prevent any type of upward mobility for the working poor in the developed world.

In mid October 2019 while in Lebanon, I ran the idea of this book by two colleagues, the pulmonologist Dr. Marie-Louise Coussa and the otolaryngologist Dr. Alain Michel Sabri. We all decided on the need for such a publication and decided to collaborate on it. Given my own background in neurology, we hoped our approach would be multidisciplinary. Political turmoil in Lebanon delayed the start of the project by a few months. At the beginning of 2020, we had already queried PubMed, Medline and Google Scholar for publications in English on sleep medicine, sleep health and overall sleep science. We identified 51 representative countries that had produced peer-reviewed papers on these topics. We spent the first 2 months of the, now infamous, year confirming authors. Thirty-five authors agreed. However, with the advent of the COVID-19 pandemic, the medical communities' priorities changed around the globe. This resulted not only in a delay in compiling this volume but also in the further withdrawal of seven of the original authors.

The final tally of 28 chapters covers most if not all the regions of the world, perhaps a bit heavy on North America and the Middle East, given our own origins. Figure **1** shows in green the countries of the world that we cover in the book. The big five, the most populous nations, are there. These are China, India, Russia, USA and Brazil. We also have examples from southern, western, eastern and northern Europe as well as North and Sub-Saharan Africa. In addition, we have chapters from Australia, Hong Kong, Thailand and Nepal.

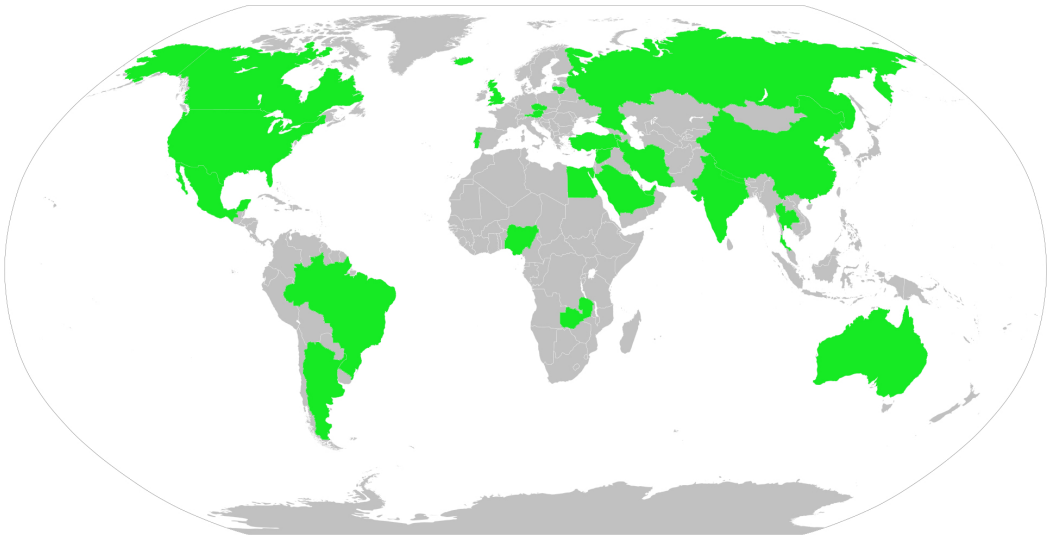

Fig. (1). In green are highlighted the areas of the world discussed in this book.

Each chapter addresses the following questions

1) The current practice of sleep medicine: This includes answers as to what type of facilities provide care, the type of practitioners involved in sleep medicine, any practice guidelines, professional societies or regulatory bodies, etc. In this subsection, there is a description of the kind of clinics and specialists who are primarily tasked with the care of patients with sleep complaints. A description of their educational backgrounds and any regulatory bodies that assure their continued competency in the area is given. Practice guidelines and who puts them in place are also mentioned with the availability of diagnostic tools and medications to treat common sleep disorders. We would also explore cultural nuances affecting sleep disorder care. Lastly, a description of payment systems for sleep diagnostic services and treatments is given.

2) Challenges to the practice of sleep medicine: This includes information about patient access to care, and barriers to appropriate care. In this subsection, the respective authors discuss what challenges they and their patients deal with in obtaining and delivering appropriate care. These include educational barriers, resource limitations and financial hardships. For instance, do primary care doctors and patients know much about sleep disorders? And what to do about sleep complaints? Are there clinics that can deal with the situation or are they overwhelmed with scant resources and have barely time to deal with more common medical problems?. Can patients even afford testing and treatment if these are even available? Are there regional differences in accessing care? For instance, a lot of developing nations may have excellent services in the cities but not in rural areas. Lastly, we would discuss cultural barriers to receiving appropriate sleep care.

3) Clinical and research knowledge gap: Unique needs of the field in that particular country and what can make the situation better and close these gaps and overcome barriers. In this

subsection, the respective authors address the presence or absence of country-specific epidemiological data on various sleep disorders and how it affects the clinical and educational efforts. They also discuss any limitations of the existing research as it applies to their unique regions. Lastly, they mention what educational opportunities are lacking among healthcare providers and what can be done to improve those.

We hope that this book will increase collaboration between countries of different economic quartiles and increase awareness of needs in lower-income regions and open up avenues by which these needs can be met. Especially with the acceleration of telecommunication in the age of COVID-19, these cooperative efforts are both more urgent and easier to accomplish. Lastly, we hope to raise awareness of the importance of sleep and facilitate ways to address its deficits for overall better health for all people of the world.

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DEDICATION

To my students who taught me the value of academic medicine and, as always, to my wife and soulmate Diana Monaghan

Hrayr P. Attarian

To my country Lebanon, may the hard times end soon and may it return to its past glory

Marie-Louise M. Coussa-Kosinski

To my late parents, Michel and Berthe Sabri
To my wife and daughter, Pascale and Raphaelle Sabri
To my brothers Dr. Roy and Rony Sabri
To my uncle Dr. Joseph Sabri
To my patients and my mentors

Alain Michel Sabri

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CHAPTER 1

Current Practice of Sleep Medicine in the USA

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Abstract: Sleep medicine and its practice in the United States of America (USA) has grown from the first center focusing on sleep disorders established at Stanford University in 1964 to more than 2,500 American Academy of Sleep Medicine (AASM) accredited sleep centers and numerous professional organizations supporting sleep health professionals including board-certified sleep medicine physicians, behavioral sleep specialists, advance practice registered nurses and/or physician assistants and sleep technologists. As sleep medicine continues to grow in the USA, multiple challenges including widening economic inequality, racial/ethnic inequities, and limited healthcare access directly affects the patient setting. Limited sleep medicine education in medical school restricts the ability to educate patients as well as primary care providers on the importance of identifying sleep disorders early on to improve access. The financial burdens of diagnosing and treating sleep disorders, particularly obstructive sleep apnea is seen in an estimated cost of $16 billion annually. Research and data collection includes surveillance surveys conducted by the Sleep and Sleep Disorders Team from the Centers for Disease Control and Prevention (CDC) as well as continuing research in the diagnosis and treatment of obstructive sleep apnea. Additional studies addressing sleep issues and racial disparities in the US are prudent in highlighting this crucial area. Continued efforts in clinical and research knowledge gaps are necessary to support the growing need for sleep medicine providers and services in the USA.

Keywords: Academy of Dental Sleep Medicine, American Academy of Sleep Medicine, Board-certified sleep physicians, Centers for Disease Control and Prevention, Durable Medical Equipment, Medicare, Positive airway pressure, Sleep disparities, Training programs.

BACKGROUND

The first electrocephalogram (EEG) patterns were documented by Loomis in the US describing NREM sleep [1], which paved the way for sleep medicine to grow as a profession. This led to the development of various professional societies to serve the requirements of individual sleep medicine practitioners and sleep disor-

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Hrayr P. Attarian, Marie-Louise M. Coussa-Koniski & Alain Michel Sabri (Eds.)

der centers. In 1964, Stanford University introduced a narcolepsy clinic, which was the first sleep disorders center established. There are currently more than 2,500 American Academy of Sleep Medicine (AASM) accredited sleep centers in the U.S. These centers are directed by a board-certified sleep medicine physician who coordinates care with a group of providers which may include otolaryngologists, behavioral sleep medicine specialists often with training in psychology, qualified dentists with sleep training, advanced practice registered nurses and/or physician assistants and sleep technologists.

Board-certified sleep medicine physicians are required to complete medical school and residency training in one of the seven approved programs including anesthesiology, family medicine, internal medicine, neurology, otolaryngology, pediatrics, or psychiatry programs before matching into and completing an ACGME 12-month sleep medicine fellowship program to become board eligible. There are currently 95 sleep medicine fellowship training programs in the US. In addition to ACGME-accredited sleep medicine fellowship programs, there are two pilot programs in the Advancing Innovation in Residency Education (AIRE) initiative. A part-time model allows a trainee to continue additional employment during training. A combined model incorporates sleep training into an established specialty training program which allows graduates to become board eligible in both specialties upon completion. Previously board certification was administered by the American Board of Sleep Medicine which is now currently offered through the Sleep Medicine Certification Program developed by the American Board of Internal Medicine (ABIM), American Board of Family Medicine (ABFM), the American Board of Pediatrics (ABP), the American Board of Psychiatry and Neurology (ABPN), and the American Board of Otolaryngology (ABOto).

The AASM endorses three different types of accreditations. The first accreditation is for sleep facilities that manage patients, perform home sleep apnea testing, and provide a laboratory for in-center sleep studies. A second accreditation is for independent sleep practices to manage patients and conduct home sleep apnea testing. The last accreditation is for Durable Medical Equipment (DME) organizations to provide sleep-related DME to patients. Accreditation is not mandatory, however, many insurers require accreditation for sleep-related services reimbursement [2].

Professional organizations that support the practice and accreditation of sleep medicine in the US include the American Academy of Sleep Medicine (AASM), the Sleep Research Society, the American Board of Sleep Medicine, the Associated Professional Sleep Societies, and the Academy of Dental Sleep Medicine (ADSM). The historical development of these organizations is beyond

the scope of this chapter but the growth of each organization contributes directly to the current practice of sleep medicine in the US as we know it.

CHALLENGES TO THE PRACTICE OF SLEEP MEDICINE IN THE USA

The challenges to accessing and delivering optimal management for sleep medical conditions in the USA can be divided into 3 major areas: patients, healthcare systems, and healthcare providers. In the patient setting, the main barriers include affordability, racial and ethnic inequities, lower socioeconomic status, decreased health literacy, and limited healthcare access during the COVID-19 pandemic due to clinical operation restrictions.

Economic inequality in the USA has been associated with inequality in health. Americans with lower incomes have deficits in healthcare than wealthy Americans, in part, due to limited access to health insurance [3]. The implementation of healthcare reform through the Affordable Care Act or Obamacare, has increased healthcare access to more Americans, but the complexity of the USA healthcare system continues to serve as a barrier to healthcare access [4]. In the four largest states California, Florida, New York, and Texas, the rate of uninsured adults ages 19 to 64 varies from 12-30% [5].

Race is also a factor in access to healthcare. Studies have demonstrated that compared to Whites, Blacks do not receive similar treatment in the U.S. healthcare system. This is independent of the reduced access to healthcare facilities that Blacks often experience [6]. Black individuals are more likely to have poor sleep quality and greater risk factors for sleep apnea than White individuals. These differences persist despite adjusting for confounders such as medical comorbidities and socioeconomic status [7]. A Philadelphia-based cross-sectional study of 9,714 individuals assessed self-reported sleep quality in relation to socioeconomic factors including education level, employment status and level of poverty. African-Americans and Latinos reported poorer sleep quality in comparison with Whites. Participants with lower incomes were also found to have significantly poorer sleep quality. Post-college education is a protective factor against poor sleep. White subjects in lower poverty levels demonstrated the highest odds for poor sleep. This contrasts with other race/ethnic groups who did not have an increased likelihood of poor sleep after adjusting for the same covariates as above. These studies demonstrate that “sleep disparity” in the USA population evident in self-reported lower sleep quality is strongly associated with poverty and ethnicity [8].

A significant barrier to health care access in the rural USA is reluctance to seek health care in rural areas. This stems from cultural and financial limitations and is exacerbated when factoring in decreased range of services, availability of trained

CHAPTER 2

Sleep Medicine in Canada

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Abstract: Canada has an expansive, challenging geography with diverse demographics. The country is an industrialized and democratic nation situated at the northern end of the Americas. Canada provides universal healthcare to all residents through a single-payer system administered by its provinces and territories. Data suggests common sleep disorders are present at similar rates in other industrialized nations, with the exception of a larger number of shift workers and arctic residents subject to circadian disruption. Canada has 'punched above its weight' in contributing to the field of sleep medicine, with numerous well-known pioneering specialists in areas ranging from pathophysiology and diagnostic development, to pharmacologic, therapeutic and device treatment. The practice of sleep medicine is provided by trained physicians in neurology, respirology, psychiatry, internal medicine, family practice, otolaryngology, pediatrics, as well as psychology and dentistry amongst other providers. Major challenges to Canadian sleep medicine include limited public healthcare funding, variable funding mechanisms across the nation's jurisdictions, limited access to diagnostic and therapeutics, and conflicts-of-interest with business. Certain demographic groups are particularly at-risk, including socioeconomically challenged communities, indigenous populations, and other diverse minority groups. Canada's characteristics and challenges provide it with substantial research opportunities and a chance to lead in such areas as epidemiology, sleep medicine genetics, ethnic and cultural aspects, circadian and shift work considerations, home polysomnography and post-COVID transitions to more virtual sleep medicine care.

Keywords: Apnea, Canada, Circadian, COVID-19, Hypersomnolence, Insomnia, Narcolepsy, Restless, REM, Sleep.

BACKGROUND

Canada is the northernmost country in North America, bordering the Pacific Ocean to the west, the Arctic Ocean to the North, and the Atlantic Ocean to the East boasting the longest coastline in the world [1]. Its territory expands over 9.94 million square kilometres, making it the world's second-largest country by total

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area [1]. It shares the world's longest bi-national border with its only land neighbour, the United States of America [1].

The northern extent of the country leads to reduced daylight in the winter and can contribute to problems of circadian rhythms.

Canada's climate ranges from arctic and subarctic in the north, to subarctic throughout the central regions, warm-summer humid continental in the south and southeast, and oceanic and warm-summer Mediterranean in the southwest. Thus, winter and summer temperatures vary greatly across the country, with temperate to relatively warm winters and mild summers on the southwest coast, cold winters and warm summers in the prairies, and cold, cold winters and humid summers in the Great Lakes regions, and cold winters and mild summers on the east coast.

Canada's geology and ecology are varied, with a permafrost and tundra region in the north, a mountainous western region dominated by boreal forests including the coast and Rocky Mountain ranges, prairies in the centre, and deciduous lowland forests in the east along the Great Lakes and Atlantic Ocean.

For millennia, the land of what is now Canada was home to numerous indigenous communities. European expeditions led chiefly by the United Kingdom (UK) and France gradually colonized the lands from the 16th to 19th centuries, with the British eventually gaining autonomous control of 'British North America', and thereafter ceding autonomy peacefully to self-government gradually culminating in the UK's recognition of Canadian independence with the Statue of Westminster in 1931.

Canada is a parliamentary democracy, formed as a confederacy of ten provinces and three territories, together consisting of a total population of nearly 38 million people [1]. One of the least densely populated countries in the world, Canada can have difficulties providing care in many remote communities. Canada's populace is highly urbanized, and located in close proximity to its southern border [1]. The six largest urban areas of Toronto, Montreal, Vancouver, Calgary, Edmonton and Ottawa together make up nearly half of the country's population. Most bulk of sleep medicine care is administered from larger urban centres.

Canada is one of the most ethnically and linguistically diverse countries in the world, driven by one of the highest per-capita immigration and refugee resettlement rates among nations. Nearly one-quarter of the population are first-generation immigrants, and belong to visible minorities [2]. Official languages are English and French, with the majority English-speaking in all provinces except Quebec, which retains a strong cultural distinctness in this regard. A sizeable indigenous community making up 4.9% of the population is present across all

provinces, however, most highly concentrated in the Northern Territories of Yukon, Northwest Territories and Nunavut [2]. A fifth of the country's population speaks a non-official tongue, most commonly Punjabi, Italian, Spanish, German, Cantonese, Tagalog and Arabic in order of magnitude [1]. This makes the translation of patient materials challenging.

Canada's population, while aging alongside other industrialized countries around the world, has the second-lowest proportion of those aged 65 and older, and the largest distribution of working-age adults among G7 countries [3].

Canada is ranked in the top category of 'very high', ranking twelfth among nations according to the Human Development Index [4]. It ranks 34th in GDP per capita of $48,300 [5], and boasts a median household income of $70,336 [6]. A substantial 14.2% of the population is low-income [6], and 8.7% lives in poverty [7].

Canada mandates the provision of universal healthcare to all residents and citizens, which is administered provincially and territorially. According to this system, the federal government provides funding support to the provincial and territorial systems, according to their agreement to provide healthcare according to standards of universality, accessibility, portability, comprehensiveness and public administration. The federal mandate is oriented for medically necessary care, which does not permit private healthcare providers. Canada does not allow private hospitals. Moreover, it does not include provision of paramedical services such as psychology, dentistry, or prescription medications. While subsidization provisions exist for children, seniors and social assistance recipients, the general population pays out of pocket, or has private insurance plans supplied by their workplaces or privately purchased to cover these expenses.

Canadian citizens access routine healthcare through a primary care provider (PCP), most commonly a family physician for adults, and family physician or pediatrician for children. The PCP manages routine health issues *via* clinical assessment, the utilization of outpatient investigations such as laboratory testing or imaging, and the prescription of treatments. Referrals for more specialized medical care are made from PCPs. Canadians are unable to directly seek care from specialist providers such as sleep specialists, unless referred by their PCP or another specialist.

EPIDEMIOLOGICAL DATA OF SLEEP DISORDERS IN CANADA

Insomnia

An epidemiological survey of adults across Canada showed 40% cases describing at least one symptom of insomnia [8]. Nearly one-sixth of Canadians polled

CHAPTER 3

Sleep Medicine in Mexico

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Abstract: Sleep medicine is a fascinating and still growing field in Mexico. We describe some historical background as well as some clinical and basic research topics that have been studied more recently. We also describe the main characteristics of the clinical practice of sleep medicine, some clinical practice guides for sleep disorders, regulatory bodies for the certification of physicians who practice sleep medicine, and the main types of professional positions in the care of patients with sleep disorders in Mexico. We also detail some of the challenges facing sleep medicine in Mexico, including the limited availability of professional training and human resource specialized in sleep medicine, and the need to implement governmental and public health actions to address sleep disorders in the Mexican population. Finally, we mention the implications of the COVID-19 pandemic in the operation of sleep clinics and the changes that have been implemented in the patient care model.

Keywords: Sleep Medicine, Current Practice, Insomnia, Mexico, Sleep Apnea.

INTRODUCTION

The beginning of basic sleep research is attributed to researchers such as Dr. Raúl Hernández Peón, Dr. Augusto Fernández Guardiola, Dr. René Raúl Drucker Colín [1] and Dr. Fructuoso Ayala Guerrero, all of whom have been researchers at the National Autonomous University of Mexico (UNAM). One of the first courses on sleep science offered in Mexico was "The Psychophysiology of Sleep", which has been taught since 1971 in the Faculty of Psychology at UNAM. One of the first books on sleep science in Mexico was called "Psicofisiología del sueño," published in 1983 [2]. Sleep medicine is a relatively recent area of the health sciences in Mexico, whose roots can be traced back to the 1980s in some sleep laboratories located in the National Institute of Neurology and Neurosurgery, in the Mexican Institute of Psychiatry (today the National Institute of Psychiatry)

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and different areas of the UNAM (such as the Faculties of Psychology and Medicine; as well as the Institute of Biomedical Research).

CLINICAL AND BASIC RESEARCH TOPICS

Some Mexican contributions to clinical sleep medicine have been in the topics of restless legs syndrome [3], psychology and sleep [4], sleep-disordered breathing [5], parasomnias [6] and neurodevelopment and sleep [7]. These lines of research have mainly been pursued in sleep disorder clinics at national institutes of health or public universities. Basic sleep research has mainly addressed sleep phylogeny [8, 9], psychopharmacology and sleep [10, 11] and sleep restriction [12]. These studies have been published by research groups based at public universities.

Over the last 40 years, sleep medicine has developed gradually in Mexico, fighting against two main obstacles: a) budget constraints in the federal health system, and b) little or no inclusion of sleep science or sleep medicine in the curricula of professionals in key fields such as medicine, psychology, dentistry, and physical therapy.

Sleep Medicine and Education

Over the years, specific courses and even degree programs have emerged, such as the Masters in Sleep Disorders at the Faculty of Psychology at UNAM, as well as postgraduate courses and medical specialties in sleep medicine in areas such as psychiatric disorders and sleep, sleep breathing disorders, and comprehensive sleep medicine [13]. Currently, however, there are no technical training programs or bachelor's or doctorate level degrees in sleep medicine in Mexico.

Scientific Societies Studying Sleep

There are three existing sleep-related scientific societies in Mexico. The Mexican Society for Sleep Medicine and Research was established in 1998, the Mexican Academy of Sleep Medicine in 2011, and the Mexican Association of Oral Sleep Medicine in 2019. These civil associations aim mainly to research sleep and sleep disorders, as well as provide training through courses, annual meetings and diploma courses. They also participate in health promotion activities such as the annual celebration of World Sleep Day.

Current Practice of Sleep Medicine

Sleep medicine is practiced in a public medicine setting at some university health facilities, such as the UNAM Sleep Disorders Clinic at Eduardo Liceaga General Hospital of Mexico. National Health Institutes also have some sleep clinic facilities, for example at the Ramón de la Fuente Muñiz National Institute of

Psychiatry, Ismael Cossío Villegas National Institute of Respiratory Diseases, or the Salvador Zubirán National Institute of Medical Sciences and Nutrition. All of these centers have limited infrastructure and personnel, leading to long waiting lists, however, patients benefit from low costs for consultations and polysomnographic diagnosis. In Mexico, sleep medicine is also available in private practice at sleep labs, sleep disorder centers and medical, dental or psychological consultations.

There are specialized sleep disorder centers for specific patient groups. For example, the Ismael Cossío Villegas National Institute of Respiratory Diseases cares mainly for patients with sleep-disordered breathing, while the Ramón de la Fuente Muñiz National Institute of Psychiatry cares for patients with mental disorders. There are also sleep disorder clinics that serve patients of any age (from premature neonates with central sleep apnea risk to elderly with symptoms of REM Sleep Behavior Disorder; RBD) and have the ability to diagnose most sleep disorders.

Sleep medicine is practiced mainly by physicians such as neurologists, psychiatrists, internists, geriatricians, pediatricians, and pulmonologists, as well as by psychologists and dentists. In Mexico, physicians can be certified in sleep medicine through the councils of pulmonology, neurology, psychiatry, neurophysiology and otolaryngology. However, there are currently no specific organizations to certify other health professionals (such as psychologists or dentists) in sleep medicine or as polysomnography technicians.

Clinical practice guidelines related to sleep medicine have mostly been prepared by task forces comprising physicians, dentists and psychologists. These include the clinical guides for the diagnosis and treatment of sleep disorders [14]; detection, diagnosis and treatment of obstructive sleep apnea syndrome in adults [15]; and for diagnosis and treatment of insomnia in the elderly [16]; as well as the international multicentric consensus [5]. These publications have the academic endorsement of national government agencies such as the Mexican Institute of Social Security (IMSS) and the Ministry of Health.

Patients have access to diagnostic services such as polysomnographic records or multiple sleep latencies tests (though actigraphy is not yet available as a diagnostic tool), CPAP device titration, cognitive behavioral therapy for insomnia [17], dental treatment for sleep-disordered breathing, and pharmacological treatment. With respect to pharmacological treatment, government health agencies offer free drug therapy for insomnia, but this is limited to some benzodiazepines (mainly clonazepam, lorazepam or diazepam), anti-histamines (such as hydroxyzine or diphenhydramine), antidepressants (*i.e.* amitriptyline, fluoxetine,

CHAPTER 4

Sleep Medicine in Australia

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Abstract: This chapter explores the current context of sleep medicine in Australia. Detailed descriptions of the providers involved in sleep health care, the services available for the assessment and management of sleep disorders, the professional organisations supporting and advocating for sleep medicine, Australian clinical guidelines, and the barriers limiting the provision of best practice sleep health care are presented within this chapter. Sleep medicine is available within Australia by means of publicly funded specialist-led sleep services such as public hospital outpatient clinics and sleep laboratories, and private referral options including specialist sleep physicians, sleep psychologists and private sleep laboratories. Access to publicly funded sleep services are often limited by long wait times for assessment and management, insufficient numbers of sleep-trained providers and long distances to travel for those individuals located in rural and remote areas. Private sleep services offer shorter waiting times than public sleep services, however the associated costs of accessing private treatment mean that it is limited to those with the financial means to afford it. Subsidies for many treatments for sleep disorders, such as continuous positive airway pressure and mandibular advancement splints, are also restricted to those on government benefits and/or those who hold private health insurance coverage. Research exploring new models of care for sleep health care within the primary care setting is currently being conducted in an effort to improve access to care for the many Australians living with sleep disorders.

Keywords: Australia, Barriers to care, Healthcare delivery, Insomnia, Obstructive sleep apnea, Sleep medicine.

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THE AUSTRALIAN HEALTHCARE SYSTEM

The Australian healthcare system is composed of a complex mix of services that include public and private hospitals, primary health care (*e.g.* general practitioners [GPs], allied health, dental, community and public health) and specialist medical services which are funded by the government (state/territory or federal) and non-government sources (*e.g.* not-for-profit organisations, private health insurers, and individual out-of-pocket payments). In 2017-18, more than two-thirds (AUD$126.7 billion; 68.3%) of total health expenditure in Australia was funded by governments [1]. The Australian health system utilises a hybrid model of financing with healthcare funded through either taxation or privately *via* a voluntary private health insurance system. A universal, taxpayer-funded public health insurance scheme known as Medicare was introduced in Australia in 1984 and currently provides free or subsidised access to public hospital services as well as consultations, investigations and treatment by health professionals. Medicare consists of three main parts – hospital, medical and pharmaceutical. Government subsidised medical services and prescription medications are set out in the Medicare Benefits Schedule (MBS) and Pharmaceutical Benefits Schedule (PBS), respectively [2, 3]. Government-funded healthcare and support services are also provided by the Department of Veterans' Affairs (DVA) to war veterans, serving and former members of the Australian Defence Force, Australian Federal Police and their families [4].

CURRENT PRACTICE OF SLEEP MEDICINE IN AUSTRALIA

Sleep Medicine Practitioners

In Australia, the first point of contact for patients with a suspected sleep disorder is typically within primary health care *via* a GP who may then refer patients to specialist sleep services for sleep physician review and/or polysomnography (PSG) testing. PSGs can be conducted overnight at home or in a sleep laboratory, and are provided by specialist sleep services within public hospitals or privately-operated sleep centres. Specialist sleep centres are overseen by qualified sleep medicine physicians and typically employ sleep technicians, scientists and/or nurses. Many sleep centres have affiliations with, or refer patients to see, Ear, Nose and Throat (ENT) surgeons, dentists, sleep-trained or general psychologists, other specialist physicians, such as neurologists and psychiatrists who may have a special interest in sleep disorders management, and allied health practitioners (*e.g.* dieticians, exercise physiologists and pharmacists).

Sleep Medicine Training in Australia

The typical pathway for qualification as a sleep medicine physician in Australia is through completion of specialist Respiratory Medicine training (minimum of two core years following completion of Basic Physician Training), and one year of specialist Sleep Medicine training *via* the Royal Australasian College of Physicians [5, 6]. Thus, almost all physicians practising within the sleep field in Australia are dually certified in Respiratory and Sleep Medicine. Unlike medical practitioners, nurses are not required to complete formal sleep-related education to work in sleep health. There are also no formal educational requirements to become a sleep technologist, although sleep technologists commonly have degrees in science, nursing or psychology and a graduate certificate in sleep science is available for those individuals interested in pursuing a career as a sleep technologist. For dentists wishing to practice dental sleep medicine, there is currently no formal certification available, however a Fellowship in Dental Sleep Medicine has recently been introduced by the Australasian Sleep Association. For psychologists, the Australian Psychological Society offers a 'Foundations in Sleep Psychology' online course that provides an overview of insomnia, sleep apnoea, and circadian rhythm disorders but there is currently no formal program for accreditation to administer Cognitive Behavioural Therapy for Insomnia (CBTi) that is recognised throughout Australia. Additional training programs are being developed to increase the amount of sleep health education in post-graduate psychology university programs [7, 8], and CBTi training-and-accreditation programs are offered through Australian professional sleep and psychology bodies.

Sleep Study Testing and Obstructive Sleep Apnea Management

The cost of sleep physician consultations is covered in part by the MBS if patients are referred by a GP to see the specialist. There are several MBS items available for the investigation of sleep disorders in adults and children, including in-laboratory (level 1) or at-home (level 2) diagnostic polysomnography (PSG), treatment initiation and treatment effectiveness PSG studies, as well as daytime hypersomnolence testing (*i.e.* Multiple Sleep Latency Tests [MSLT] and Maintenance Of Wakefulness Tests [MWT]) [9, 10]. Limited-channel (*i.e.* level 3 and 4) sleep studies are not currently subsidised in Australia. Medicare criteria mandate that GPs who wish to directly refer patients for diagnostic laboratory or home PSG must confirm that patients have a high pre-test probability of symptomatic, moderate-severe obstructive sleep apnea (OSA) by meeting the following criteria [1]: an OSA50 score ≥5, STOP-BANG score ≥3 or high-risk score on Berlin Questionnaire; plus [2] an Epworth Sleepiness Scale score ≥8 [11 - 14]. Otherwise, patients must have professional attendance with a qualified sleep

CHAPTER 5

Sleep Medicine Practice and Training in Saudi Arabia

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Abstract: Sleep medicine as an independent medical specialty is relatively new in Saudi Arabia. Since its foundation, there has been significant growth and an increase in the number of sleep medicine physicians and technologists to meet the continuous increase in demand among the Saudi population. In response to the expansion of sleep medicine in Saudi Arabia, the Saudi Commission for Health Specialties (SCHS) established clear guidelines for the accreditation of sleep medicine physicians and technologists in 2012. Currently, there are two training programs providing structured training and certification in sleep medicine in Saudi Arabia. Despite this progress, there are still many difficulties hindering sleep medicine growth in Saudi Arabia, including the shortage of trained technicians, and specialists, the lack of financial support, and awareness of sleep disorders and their profound effects on healthcare workers and healthcare authorities. In the future, it is essential to introduce sleep medicine in the medical educational system at all levels to show the importance of early recognition and management of sleep disorders, in addition to developing research that is necessary to build knowledge about the prevalence of many sleep disorders in order to help to plan the number of sleep specialists and sleep facilities needed to meet the increasing demands. This chapter discusses the current practice of sleep medicine, and the challenges it faces in Saudi Arabia, in addition to the available data and research about common sleep disorders among the Saudi population.

Keywords: Barriers, Developing countries, Education, Polysomnography, Prevalence, Sleep disorders.

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INTRODUCTION

Saudi Arabia is the fifth largest country in Asia, with an estimated land area of 2,150,000 km^2 (830,000 $miles^2$). In the official census from 2019, Saudi Arabia's population was estimated to be 34.2 million people, with nearly two-thirds of its population under the age of 30 years and one-third under the age of 15 years old [1]. Although Arabs and Muslims have always expressed special interest in sleep as it is repeatedly cited in the Holy Qu'ran as one of God's signs, "And among His signs is your sleep by night and by day" (Sūrah 30, Ar-rūm, verse 23) [2], sleep medicine is considered a novel medical specialty in Saudi Arabia [3].

HEALTHCARE SERVICES IN SAUDI ARABIA

In Saudi Arabia, the Ministry of Health is the primary governmental healthcare provider (79% of the provided health services) [1, 4]. All Saudis as well as government workers have the right to free health care services supported by the government. The private sector also provides healthcare services (21%), particularly in cities and large towns, the expenses of which are usually covered by insurance companies or by the patients [5].

In 2010, the ratio of doctors and nurses per 10,000 residents in SAUDI ARABIA was 16 and 36, respectively; those numbers are less than those from countries of the developed world [4].

CURRENT PRACTICE OF SLEEP MEDICINE

Early and up to the mid1990s, pulmonologists in Saudi Arabia were relying on overnight pulse oximetry to establish the diagnosis of obstructive sleep apnea (OSA) and used to empirically initiate continuous positive airway pressure (CPAP) therapy and titrate the pressure to treat oxygen desaturation [6]. At that time, the lack of specialized sleep disorders clinics and facilities designated resulted in the occupation of hospital beds by patients with sleep disorders [7]. However, after the increase in the awareness of sleep medicine recently, several sleep disorders centers were opened [5].

In a survey in 2013, sleep disorders centers for diagnosing and treating sleep-related disorders were found in the three main cities in Saudi Arabia: Riyadh (six sleep facilities), Jeddah (seven sleep facilities), and Dammam (five sleep facilities) [8].

According to the national survey conducted in 2013, the number of beds/100,000 individuals, and the number of studies/100,000 individuals were 0.11 and 18.0, respectively [8]. The number of sleep medicine specialists (doctors who

completed a minimum of 6 months of formal full-time fellowship training in sleep medicine) was 37, translating to 0.012/100,000 people [8]. The current members of the Saudi Sleep Medicine Group are 55 sleep medicine physicians and surgeons. Of all sleep studies conducted, 80% were performed for sleep-disordered breathing, 7% for movement disorders, 5% for narcolepsy, 7% addressed insomnia, and 1% investigated other conditions [8].

Almost 90% of sleep disorders facilities are run by Respiratory Medicine Physicians [8], the majority of whom were trained in North America. All sleep disorders facilities in Saudi Arabia observe the American Academy of Sleep Medicine (AASM) regulations for diagnosing and treating sleep disorders [5]. In addition to pulmonologists, there are many otolaryngologists in Saudi Arabia with a special interest in surgical interventions for OSA [5]. There are also dentists and maxillofacial surgeons in Saudi Arabia who provide treatment for OSA using mandibular advancement devices [5]. There is still a significant shortage of psychologists specializing in sleep medicine; therefore, sleep medicine physicians tend to offer cognitive behavioral therapy for insomnia [5].

SLEEP MEDICINE TRAINING AND ACCREDITATION

In response to the continuous increase in the demand for sleep medicine services in Saudi Arabia [3], the accreditation of sleep medicine physicians and technologists was vital to patient care.

Numerous studies have shown that accrediting sleep centers and certifying physicians were associated with better outcomes and better compliance and adherence to management plans in patients with sleep disorders [9, 10]. Additionally, the accreditation of sleep medicine as a unique self-governing medical specialty will pave the way to establishing a Saudi national fellowship training program in sleep medicine.

In planning for this assignment, the Saudi Commission for Health Specialties (SCFHS) established the National Committee for the Accreditation of Sleep Medicine Practice of Physicians and Technologists in 2011 [11], aiming at developing: 1) accreditation regulations for physicians to be classified as sleep medicine specialists; and 2) accreditation regulations for technicians to be classified as sleep medicine technologists [11].

A physician is accredited as a sleep physician if he/she is a medical doctor (MD) and is qualified in the subspecialty of sleep medicine and has competency in the clinical evaluation, physiological assessment, diagnosis, treatment, and prevention of sleep and circadian rhythm problems [5, 11]. The national committee used two routes to approve specializing in sleep medicine. The first route included

CHAPTER 6

Sleep Medicine in the United Arab Emirates

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Abstract: Sleep disorders are increasingly being recognized as a major health problem in the UAE. The rising prevalence, potentially modifiable risk factors, and impact on global health outcomes have prompted the growth of sleep medicine. The burden of under-recognized disease has encouraged patient and physician-centric education. Supported by nationalized health insurance plans, the medical fraternity has adopted a multi-disciplinary approach to optimize resources and outcomes, while recognizing that these measures are initial steps in the unique challenges posed.

Keywords: Cultural influence, CPAP compliance, Insomnia, Obstructive sleep apnea, Regulatory body.

INTRODUCTION

The United Arab Emirates (UAE) is on the Arabian Peninsula bordering Saudi Arabia and Oman, occupying a land mass of approximately 83,600 sq km. The UAE consists of a federation of seven different constitutional monarchies, Abu Dhabi (the capital), Ajman, Dubai, Fujairah, Ras Al Khaimah, and Umm Al Quwain. The UAE is a member of the Gulf Cooperation Council (GCC), which includes the countries of Bahrain, Kuwait, Oman, Qatar and Saudi Arabia) and part of the Middle East North Africa (MENA) region. UAE nationals are referred to as Emiratis, and while sharing close cultural ties with GCC countries, they retain their own cultural identity. The total population of the UAE is approximately 10 million people; 11.6% are Emiratis and the remaining 88.4% of the population consist of expatriates [1]. The majority of the UAE's population (85%) resides in the emirates of Dubai, Abu Dhabi and Sharjah [1]. The UAE is a

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Muslim country and 76% percent of UAE residents (including both citizens and non-citizens) are Muslim.

HEALTHCARE INFRASTRUCTURE

The UAE has a far-reaching comprehensive, government-funded health service, and a burgeoning private health sector that both deliver a high standard of care. Healthcare is regulated at both the Federal and Emirate level. To date, health care in the UAE has been funded mainly by the government. Public healthcare services are administered by different regulatory authorities in the UAE including the Ministry of Health and Prevention, the Health Authority-Abu Dhabi (HAAD), the Dubai Health Authority (DHA) and the Emirates Health Authority (EHA). Under the 'Thiqa' national insurance program, the Abu Dhabi Government provides full medical coverage for all UAE nationals living in Abu Dhabi. Citizens receive a Thiqa card, through which they have comprehensive access to a large number of private and public healthcare providers.

MEDICAL COVERAGE

Medical coverage for continuous positive airway pressure (CPAP) and Bi-level positive airway pressure (BiPAP) devices has to meet eligibility criteria, determined by the Health Authority of Abu Dhabi (HAAD) including central sleep apnea, obesity hypoventilation syndrome (OHVS) with BMI greater than 30, obstructive sleep apnea (OSAS). Similarly non-invasive positive pressure ventilation, BiPAP device is covered for chronic obstructive pulmonary disease, OHVS, end-stage lung diseases with respiratory failure in patients awaiting lung transplant (*e.g.*, chronic obstructive pulmonary disease, cystic fibrosis, idiopathic pulmonary fibrosis, and sarcoidosis), respiratory insufficiency/failure with kyphoscoliosis of the thoracic spine or other chest wall deformity, neuromuscular disease (*e.g.*, amyotrophic lateral sclerosis, myasthenia gravis, and polio). Requirements for coverage devices require prior authorization along with ICD and CPT codes with the highest level of specificity (Thiqa insurer). ENT and Dental sleep medicine services are readily available to help pursue alternative treatments.

Sleep Disorders in the UAE

The available empirical literature suggests that the prevalence of poor sleep and sleep disorders is high in the UAE. A recent study of a non-clinical population of 100 female Emirati university students found that 75% reported poor sleep quality and an average sleep duration of 6.1 hours (± 1.9) [2]. In UAE healthcare settings, 34% of patients with type II diabetes mellitus reported poor sleep quality. In culturally similar KSA, a cross-sectional study of 2,095 adults showed that 33.8%

of participants reported a sleep duration of less than 7 hours/night [2], 78.3% reported poor sleep quality [3], and 20.5% reported excessive daytime sleepiness [4]. Poor sleep is strongly correlated with smart-device overuse, and has increased considerably in Middle Eastern countries [1]. 47.5% of the population surveyed in three cities in UAE reported being heavy users of smart-devices, 74.5% of the participants used their smart-device at bedtime [5]. 81% of heavy smart device users were reported to be poor sleepers [5].

Sleep Disordered Breathing

Obstructive sleep apnea (OSA) is a common disease worldwide, primarily due to the obesity epidemic. In the UAE, the 2016 prevalence of obesity was estimated to be 29.9% of the adult population. The prevalence and major risk factors for sleep-disordered breathing within the UAE are similar to those in other countries. A study of 1,214 consecutive patients presenting to a primary healthcare clinic in Dubai, found that 20.9% were at high risk of OSA [6]. A higher risk was seen in Saudi Arabia, with 31.9% of the population presenting as high risk for OSA based on the Berlin Questionnaire (BQ) [7], a self-report measure demonstrated to reliably identify OSA [10]. A recent UAE-based study [8] examining sleep-disordered breathing based on self-report of snoring) showed 34.2% of participants reported snoring. Of these participants, 43.2% were at risk of OSA [8], as measured by the BQ [7]. Males, older adults (50–60 years) and obese participants were more likely to snore than their counterparts [8], and smoking, hypertension, and nasal septal deviation were all significantly correlated with snoring ($p < .01$) [8].

Restless Legs Syndrome

Restless legs syndrome (RLS) is estimated to impact 7 to 10% of young to middle aged people and 10 to 20% in those older than 60 years. In the Middle East region, in Saudi Arabia, 8.4% prevalence of RLS was observed in a study of 2682 participants [9]. Pregnancy, iron deficiency anemia (26.9%) and gastritis were the most frequent causes of RLS among females, whereas genetics, hypertension, and related neurological diseases were the main risk factors for RLS among men [10]. However, unlike findings of most studies, RLS significantly affects males more than females. Restless legs syndrome (RLS) affects the quality of life and survival in patients on hemodialysis with a smoking history contributing to a poor outcome. UAE-specific data is limited. Accurate diagnosis, access to tertiary clinics and time to diagnosis as well as pharmacotherapeutic options are showing a positive trend.

CHAPTER 7

Sleep Medicine in Hong Kong – Development, Knowledge Gaps and Future Challenges

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Abstract: The development of sleep medicine in Hong Kong has often been driven by clinical needs. The 1980s saw a surge of interest in sleep apnoea and brought multiple specialties together to study the diagnosis and management of sleep-related breathing disorders. Sleep and mood disorders often go hand in hand. With circadian disruption and sleep deprivation impacting the general population, including our paediatric age groups, the lack of quality sleep is a public health concern. Unfortunately, training in sleep medicine has been fragmented from undergraduate curricula to specialty training requirements. Sleep service standardisation is just beginning, although progress has been slow. Due to the lack of a specialty board, the Hong Kong Society of Sleep Medicine is providing a platform for interdisciplinary collaboration especially in training and education for both healthcare professionals and the general public, while the university-affiliated departments will provide the lead for multi-disciplinary research.

Keywords: Sleep medicine, Service development, Training, Research, Challenges, Hong Kong.

INTRODUCTION

Sleep medicine is a new medical arena with multidisciplinary involvement. We will review the historical development of sleep medicine and services in Hong Kong, followed by the elaboration of challenges in sleep medicine development in

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three clinical specialties (respiratory medicine, pediatrics, and psychiatry) as well as technologist training in Hong Kong.

EARLY SLEEP RESEARCH AND SLEEP LABORATORIES IN HONG KONG

Overnight polysomnography (PSG) was first conducted in the sleep laboratories of the two local university-affiliated hospitals (Prince of Wales Hospital, PWH, and Queen Mary Hospital, QMH respectively) in the 1980s. PWH reported early laboratory-diagnosed Chinese narcolepsy patients in a retrospective study [1] that confirmed a high association with HLA DR2 similar to the Western population [2]. The prevalence rate of narcolepsy in Hong Kong Chinese was later found to be 0.034% in a population-wide study [3].

Obstructive Sleep Apnoea Cases with Multidisciplinary Input

With improved understanding and characterisation of sleep apnoea syndrome by Guilleminault [4] and the introduction of Continuous Positive Airway Pressure (CPAP) by Sullivan [5], obstructive sleep apnoea syndrome (OSAS) cases were identified and reported locally [6, 7]. At the beginning, sleep testing required the collaboration of psychiatrists who were running sleep laboratories and pulmonologists who were managing severe OSAS patients with complications, such as cor pulmonale and respiratory failure. Otolaryngologists were also being consulted for snoring and providing surgical treatment such as tonsillectomy and uvulopalatopharyngoplasty (UPPP) [8]. Since the 1990s, drug-induced sleep video nasoendoscopy was performed to enhance the understanding of OSAS patients' upper airway dynamics [9]. Skeletal surgery [10] was also introduced by local Maxillofacial Surgeons to widen the upper airway [11].

RESPIRATORY SLEEP MEDICINE IN HONG KONG

With the availability of computerised PSG systems and CPAP treatment, an increasing number of respiratory services in public hospitals started providing sleep diagnostic and treatment services in the 1990s. Between 1997 and 2000, two community studies that determined the prevalence of OSAS among middle-aged adults in Hong Kong were conducted at QMH. Based on PSG, it was estimated that 9% of middle-aged men had OSA, while 4.1% were symptomatic with daytime sleepiness [12]. Prevalence of OSAS was lower among middle-aged women at 2.1% [13]. With age, however, there was a 12-fold rise among women from the fourth to the sixth decade. The University of Hong Kong (HKU) researc-

hers have gone on to study cardiometabolic complications [14 - 16] and underlying pathogenetic mechanisms of OSA.

Sleep Service Challenges

Attended overnight PSG is labour-intensive. The first full-time sleep technologist was recruited and trained by the Chinese University of Hong Kong (CUHK) before undergoing overseas training in 1986. (Please see the latter paragraphs on the sleep technologist training) However, few public hospitals were funding technical positions for sleep technologists to work full time in the sleep laboratory. Instead, most hospitals operated sleep services in beds or rooms attached to inpatient wards and relied on night-shift nurses to conduct unattended overnight PSG. Without designated staff, it was difficult to perform manual non-invasive positive airway pressure titration for indicated patients or manual scoring of PSG tracings. There was also a lack of protected time for physicians to score or review PSG studies. Support for patients receiving long-term home CPAP treatment was not always available. As a result, the average waiting time for adult PSG testing in public hospitals often exceeds a year.

The situation of supply not meeting demand is complicated by commercial CPAP suppliers' attempts to fill the gap. Self-financed home unattended PSG and auto-adjusting CPAP trials without prior diagnosis or titration report review by physicians are not uncommon. Since there is no statutory body monitoring the quality of sleep testing or reporting in Hong Kong, OSA could be over-or misdiagnosed. Poor initial CPAP experience is known to adversely affect patients' CPAP acceptance and treatment compliance.

Role of Home Sleep Assessment Tests (HSAT)

To meet the ever-increasing demand for early diagnosis and treatment of OSAS patients, a randomised controlled trial (RCT) was conducted by the PWH Medical Department to compare ambulatory approach (HSAT and home auto CPAP titration) with the hospital-based approach. The home-based approach was found to be non-inferior to the hospital-based approach in terms of CPAP usage and clinical outcomes. Patients with suspected OSAS benefited from a shorter waiting time to testing while hospitals could reserve inpatient beds for acutely ill patients rather than ambulatory OSAS patients [17].

Public Medical (Hospital Authority) Sleep Laboratory Service Model for Adult Obstructive Sleep Apnoea

The year 2020 saw the implementation of a 24-hour sleep laboratory service model for adult sleep apnoea at two public (Hospital Authority, HA) hospitals.

CHAPTER 8

Sleep Medicine in China

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Abstract: As the world's most populous country, China has a high prevalence of sleep disorders, posing a huge public health burden. After 30 years of development, more and more professionals, patients, and public health policymakers are recognizing the importance of sleep. Although sleep problem is recognized in the Traditional Chinese Medicine area, modern sleep medicine starts from the diagnosis and treatment of obstructive sleep apnea. By 2017, about 2,000 sleep centers had been established nationwide which can diagnose and treat OSA, narcolepsy, restless legs syndrome, REM sleep disorder, and other sleep diseases. Research in different sleep fields has emerged in the recent 20 years. However, there are gaps between the sleep service capacity and the demand from patients due to the lack of sleep professionals as well as the medical insurance coverage. Education and training of both physicians and technicians still have a long way to go. Understanding the development and challenges will help us maintain the development of sleep medicine in China.

Keywords: Sleep disorders, Sleep medicine, China, Practice.

China is a developing country with 1.4 billion people. With the rapid development of the economy during the past decades, sleep health is getting more and more attention in China, and it has been included in the Healthy China Initiatives 2019-2030. One of its aims is to increase the average sleep time from 6.5 hours to longer than 7 hours. In addition, China's Brain Plan launched in the year 2021 includes both basic sleep and human sleep disorders research projects, which will promote the research level in China.

EPIDEMIOLOGICAL DATA

In recent years, with the rapid changes in lifestyle and the aging of the population, the incidence of sleep disorders is increasing rapidly in China. It was estimated that about 15% of the population suffers from chronic insomnia [1], which is the most common sleep disorder. The number of patients with obstructive sleep apnea

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(OSA) in China exceeds 170 million, which ranks the first in the world [2]. Using a questionnaire survey followed by portable screen testing, the population study indicated that the prevalence of sleep apnea with an apnea-hypopnea index (AHI) >5 and daytime sleepiness is 3.5%-4.8% in the Chinese population over 30 years old [3]. Later, another study showed that Han people have a higher prevalence than some minorities such as Zhuang people [4]. Higher prevalence was seen in obese people, males, post-menopause women, and subjects from urban [4]. The special facial structure may contribute to the high sleep apnea incidence [5, 6].

Narcolepsy has long been considered a rare disease in China. A population-based epidemiology study reported a prevalence of 0.034% (95% confidence interval: 0.01-0.12%) in Hongkong Chinese, which belongs to the south of China [7]. However, if this could represent the Northern part of China remains unclear, as the HLA gene distribution and environmental factors that may trigger narcolepsy differ between the two regions. In September 1998, collaborations were developed between Peking University People's Hospital's sleep lab and the neurology service of Beijing Children's Hospital [8], a gradually increased incidence of presentation of narcolepsy cataplexy in the pediatric neurology clinic, with a range of 0.04%-0.063% [8]. This increasing incidence may be attributed to the increasing awareness of this disease. In 2011, we reported that the incidence of childhood narcolepsy increased several folds in China following the H1N1winter flu pandemic (pH1N1) [9].

The prevalence of RLS was reported to be 0.69% to 7.2% in Chinese adults [10 - 12], depending on the survey methodology and population. It is widely recognized that like other eastern Asians, RLS prevalence is low in Chinese. With the development of sleep medicine, data from more epidemiological and clinical practice imply that this might not be right. REM behavior disorder (RBD) was reported in 0.38% of elder Chinese (≥70 years old) in Hong Kong [13]. Other sleep disorders, such as central hypersomnia, dyssomnia, and sleep-related movement disorders, are relatively less recognized and may be considered as rare, but still cannot be ignored in such a rapidly changing society with a large population, the medical care, and economic burden of sleep disorders are heavy.

DEVELOPMENT OF SLEEP MEDICINE IN CHINA

Many philosophical and theoretical questions about sleep and dream have been written in traditional Chinese medicine literature [14]. Varied approaches, including traditional herbs, auto-hypnosis, exercises, and acupuncture, have been used to treat insomnia since ancient times. They are now still used as the first-line treatment for insomnia by many physicians in China. However, the practice of modem sleep medicine in China starts with the recognition of sleep apnea [15].

The first diagnosis of OSA in China was in 1981 by Dr. HUANG Xi-zhen through observation at Peking Union Hospital. Unfortunately, the patient did not receive any treatment and died during sleep several years later. The first polysomnography (PSG) system was modified from an electroencephalograph (EEG) machine by Dr. Huang's group in 1983. Five cases of sleep apnea syndrome were published in the Chinese Journal of Internal Medicine in 1985, which implied that OSA was recognized by the Chinese medical community [16]. In 1986, Dr. Huang set up the first sleep lab in China after six-month training at the sleep center of Stanford University. However, the development of sleep medicine was very slow. There were only 4-5 sleep labs in China by the year 1997.

During the past ten to fifteen years, with the rapid development of the economy, the demand for sleep services in China grows fast. According to a sampling survey conducted in the year 2017 by the Chinese Sleep Research Society, it was estimated that there were around 2000 sleep labs or centers inside hospitals providing sleep diagnostic and therapeutic services across the countries, and most of these labs were set up during the past ten years. In addition, there are emerging private sleep services too. After the year 2018, there is a 20% increase in sleep services nationwide due to the adjustment of the government policy. Physicians with a pulmonary medicine background account for two-thirds (67%) of the sleep practitioners, others include ENT (25%), dentists, traditional Chinese Medicine, neurology, and psychiatry. In-lab PSG was the main diagnostic tool for sleep disorders, 66% of hospitals are equipped with home sleep test (HST) devices, however, only 14% of them were applied at home, and the majority were used in other wards inside the hospital. The usage of HST has been increasing in recent years [17, 18].

There is a dynamic change in treatment procedures for sleep apnea. The first CPAP machine was used in 1987 in China. Since then, this number increased gradually. A rapid increase was seen in 1995 due to the availability of a CPAP machine made in China. In the early days of the 1990s, the majority of the OSAS patients were treated using ENT surgical procedures, especially UPPP. In recent years, the PAP machine becomes the first choice for most adult OSA patients. However, compared with a big population and the high prevalence, the absolute number of PAP users is relatively low. Dentists got involved in sleep apnea management at the beginning of sleep practice, as people realized that Chinese has a special facial structure as a risk of sleep apnea [5, 6]. Custom-made or commercialized oral appliances are available in the market.

Sleep medicine has not been recognized as an independent specialty yet in China, most of the sleep labs start from dealing with sleep-disordered breathing only, as

CHAPTER 9

Current Practice of Sleep Medicine in Lebanon

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Abstract: There are several major universities and medical schools in Lebanon, including the American University of Beirut School of Medicine & Medical Center, Lebanese American University/Medical Center, Lebanese University, Universite Saint Joseph/Hotel Dieu de France, Beirut Arab University, University of Balamand, Saint Georges University/Medical Center, Holy Spirit University of Kaslik and others. Many of these medical centers and schools of medicine offer a solid medical education as well as post-graduate training in various fields of medicine that are related to sleep medicine. These include Pulmonary and Critical Care Medicine, General/Bariatric Surgery, Neurology, Otolaryngology, Head and Neck Surgery, Dentistry, Oral & Maxillofacial Surgery, Orthodontics, Psychiatry, Nutrition/dietetics and other related specialties.

As will be further elaborated in this chapter, there are multiple particularities related to the diagnosis and management of patients who have sleep disorders in Lebanon. Even though the field is developing, there are certainly opportunities for further advancement and development.

Keywords: Awareness campaigns, CPAP, Insurance reimbursement, Insomnia, Ministry of Health, Multidisciplinary sleep disorders team, Obstructive sleep apnea, Patient education, Polysomnograms, Sleep centers, Uvulo-palatopharyngoplasty (UPPP).

INTRODUCTION

Lebanon has a long history of education in general and particularly medical education. The Phoenician alphabet, a precursor to most modern languages, was launched to the world from Phoenecia, modern day Lebanon, around 2000 BCE by Cadmus of Tyre, whose sister Europa was kidnapped and taken to Europe (Greece more specifically). Europe, the continent was subsequently named after

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her. Beirut hosted the first law school in history (Law School of Berytus: Roman 3rd century AD). Lebanon has witnessed the establishment multiple educational institutions of higher learning, many founded in the 18th century and early 19th, that have spread knowledge and graduated leaders in all fields of science and humanities.

Healthcare Services in Lebanon: are provided by different categories of third party payers.

• A large percentage of the working population are covered by the National Health Social Security (NHSS) and "Mutuelle des fonctionnaires de l'état" corresponding to 23.4% of in and outpatients health expenditure as of 2017, this coverage is valid as long as the person is working and paradoxically it stops at retirement leaving these advanced age persons without medical coverage.

Moreover, because there are always delays in covering new tests or treatments and because sleep Medicine is new in Lebanon, costs of sleep diseases-related tests and treatments are not covered by the local NHSS.

• Ministry of public health and military schemes (Army, Internal Security Forces, General Security, State Security, and Customs) covers 21.4% of in and outpatients' health expenditure as of 2017 and follow NHSS criteria hence they do not cover costs of sleep diseases-related tests and treatments.

• The private sector provides 21.4% of healthcare services through Private insurance or patients self paying particularly in cities and large towns, they cover the costs of tests and treatments related to sleep diseases.

WHAT TYPE OF FACILITIES PROVIDE CARE AND WHAT TYPE OF PRACTITIONERS ARE INVOLVED IN SLEEP MEDICINE?

• Until the year 2000, there were barely no sleep specialists and consequently no dedicated sleep laboratories services. Sleep problems such as insomnia, parasomnias….were generally handled by psychiatrists.

Awareness of the medical community about sleep apnea, which needs a multidisciplinary involvement, was very low.

• With the recent improved understanding and awareness of sleep medicine due to a significant increase of research and publications worldwide; and with the return of trained sleep specialists, several sleep disorders centers and clinics were implemented progressively. Their size is small with a 2-3 beds capacity and sometimes they are co-managed by Pulmonologists and neurologists or Psychiatrists or ENT specialists with an interest in sleep medicine.

The majority of these specialized sleep labs are located in Universities Medical Centers mainly private and in Beirut (11-12 Sleep Centers) and major cities 7-8 (Byblos, Tripoli, Saida, Zahlé, Tyr 1-2 in each town).

The majority of these sleep centers provide clinical diagnosis and suggestions for treatment but frequently no regular follow up and treatment supervision is done. This gap is often filled by the company which sells the machine. This procedure impacts on compliance and long-term results of the treatment.

• Beside these centers several companies located even in remote areas are performing home sleep tests or offering their services to hospitals by non-trained people at much lower prices than the Universities' sleep centers, they are usually commercial companies more interested in selling costly CPAP machines and financial benefits. These practices escape to any quality control and accreditation by scientific societies or regulatory bodies.

• Another aspect of sleep medicine in Lebanon is that despite the limited number of beds in sleep laboratories, the overall occupancy rate is far from being high most probably due to the fact that these centers are private and patients have to pay themselves for the costs.

• Surgical management: The majority of sleep and snoring surgeries are performed by Otolaryngologist/Head and Neck surgeons in the form of Septoplasty, Turbinate Reduction surgery including Radiofrequency and Submucosa Resection, and the traditional Uvulopalato/pharyngoplasty (UPPP). Some Otolaryngologists perform office Radiofrequency treatment to the soft palate and the tongue base (many of these tongue are performed in the operating room). Tongue surgery (reduction), sliding genioplasty, LAUP, and hyoid suspension are not popular at all and hardly performed. Most of these have mostly been abandoned worldwide as well for obstructive sleep apnea. There are few Oral/Maxillofacial surgeons who perform Craniofacial Skeleton surgeries such as Maxillomandibular Advancement procedure, however, rare. There are many dental/orthodondics groups that provide the oral dental mandibular advancement appliance which can be an adjunct to other surgical procedures or is often used on its own in carefully selected cases. The hypoglossal nerve stimulator is not performed yet in Lebanon. There are very few, if any, true organized multidisciplinary sleep disordered teams.

• Bariatric surgery is very popular in Lebanon due to the increasing rate of obesity: the prevalence of obesity in Lebanon in 2019 was 44%, however, awareness about pre and post op evaluation and follow up regarding sleep disorders is low. Multiple centers produce excellent results in bariatric surgery

CHAPTER 10

Sleep Medicine in Armenia

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Abstract: Sleep medicine is a young branch of Armenian medicine. In this chapter, we presented the history of sleep medicine development in Armenia. After brief initial information about Armenia as a country, references to sleep and sleep disorders in medieval Armenian folklore and medicine are given. An overview of the current situation with sleep medicine in Armenia is presented. A special attention is given to the spectrum of sleep-related specialists who work(ed) in Armenia, and to the domains of sleep medicine available. Acknowledgement of world sleep experts who helped and contributed to the development of sleep medicine and sleep research in Armenia follows. Also, we discuss different organizations operating in the field of sleep in Armenia, their activities and pursued goals. Importantly, the main results of a sleep disorders prevalence study in Armenia are presented. At the end, we summarize the problems and issues accumulated in the field of sleep medicine in Armenia.

Keywords: Armenia, Folklore, History, Sleep, Sleep medicine, Somnology.

INTRODUCTION

The Republic of Armenia is a developing parliamentary state with the capital Yerevan and ten regions - administrative divisions called marzes. Armenia is an ancient country geographically located on Armenian Highlands in South Caucasus and served as a connecting state between Europe and Asia for centuries. Prunus armeniaca (Armenian plum), the Latin scientific name for apricot, is one of the symbols of the country and is even represented as one of three colors of the national flag. The population of Armenia is 2.9 mln according to the World Bank's 2019 report [1]. The official language is Armenian which is a separate branch of the Indo-European language group. The Armenian language is widely used also in the Armenian diaspora which refers to the Armenians leaving outside of Armenia. Approximately 7 mln Armenians are living out of motherland in around 100 countries of the world.

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According to the Armenian health system evaluation, the life expectancy in Armenia at birth is higher than the average of the Commonwealth of Independent States (CIS), similar to neighboring Georgia, but it is inferior to the average of the developed European countries.

Armenia's population can receive medical care on two main levels - primary and secondary. The primary level of healthcare is represented by the outpatient clinics. Despite many gaps, the Armenian healthcare system is trying to improve the quality and the effectiveness of patient treatment in this area. This is done through a system of qualification and accreditation programs. The secondary level of medical care includes hospitals and specialized clinics. Usually, the diagnostic methods used on this level are more difficult to access due to relatively low availability and affordability. Currently, the functioning of the Armenian healthcare system improves. The COVID-19 pandemic, despite causing serious load and strain to Armenia's health system, also played a positive role in making it more flexible and diversified.

The study of sleep and its disorders is an important feature for the medical field in any country. Stressing the importance of sleep disorders in the general medical field and relevant medical disciplines brings a lot more success than ignoring its role. Countries with well-established sleep medicine benefit from better public health indicators and improved productivity of employees and students.

Implementing the sleep hygiene rules and conducting sleep importance propaganda inevitably influences the population's general health. Knowing these benefits, a developing country with a low level of physicians' sleep-related qualification and lack of sleep medicine's technical capabilities should seek to develop sleep medicine. Although sleep medicine globally is a rather young specialist field and started to separate as medicine's branch from the late 1970s to early 1980s with standard recommendations of sleep scoring, while by 1990s there already existed a unified internationally accepted classification of sleep disorders [2 - 4]. Armenia had no traditions of sleep medicine before the Soviet Union had collapsed. The country had to develop its own health system thereafter being expectedly focused on more urgent medical fields like cardiovascular, oncology, infectious and surgical fields. Understandably, only after those directions are changed to a better condition the country could have thought about sleep medicine. In this chapter, we are focusing on Armenia's historical and cultural contributions, the development and current situation with sleep medicine in the country, the management of sleep disorders, and the future of sleep medicine in Armenia.

SLEEP AND CULTURE

Sleep has been the focus of humanity's attention since ancient times. To this day, it continues to be one of the most mysterious phenomena in nature and in human physiology. Sleep and various manifestations associated with sleep have been studied for many centuries by a variety of scholars in the field of philosophy, theology, and medicine. It could not help but find its deserved place in the field of art, such as literature, art, and music, *etc.* In different times, sleep and sleep-related manifestations appeared in the work of a variety of authors [5].

Armenian culture is also no exception. Research into Armenian literature revealed one interesting fact related to sleep. In Armenian national epic poem called “The Daredevils of Sassoun” or “Davit of Sassoun”, a characteristic depiction of Klein-Levin syndrome was found and described, which is probably the first-ever description of this syndrome, as the poem dates back to the eighth century C.E [6].

In the 15th century C.E., the Armenian medieval physician and naturalist Amirdovlat Amasiatsi emphasized the role of sleep and the importance of the sleep-wake period for a human being. Amirdovlat was a famous doctor and pharmacist during that period. Having studied his works, one can see that in the Middle Ages medicine in Armenia and the region was quite progressive. In his works, he described human anatomy, hygiene, pathology, and pharmacology. He also has works dedicated to causes of the pathologies and different diseases, symptoms that characterize the clinical picture, treatment, and care of the patient, explored medical features of various plants, their prevalence, location, and application for treatment of diseases. He dedicated a whole chapter to sleep in his “Ogut Bzhshkutyan” (“The Benefits of Medicine”) book and frequently referred to its importance in many other chapters. He wrote his works in Middle Armenian, also in Greek, Arabic, Persian, French, Turkish, and used to refer to the works of other medical scholars (Fig. **1**). Gurunluoglu et al. carried out an important summary of Amirdovlat’s scientific and medical works, presenting his valuable heritage to the international medical community [7].

Such works allow us to conclude that with a deeper and more detailed cultural research of ancient medicine and other fields, we can find a lot of hidden and interesting information about the understanding of sleep function and its disorders in older times.

CHAPTER 11

Current Practice of Sleep Medicine in Turkey

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Abstract: Sleep Medicine is considered a relatively new specialty in medicine. The practice of sleep medicine in Turkey began in the late 20th century. Sleep medicine in Turkey has developed with the opening of several sleep medicine facilities. The Turkish Medical Association and the Ministry of Health oversee the accreditation of sleep centers as well as certify sleep specialists. The diagnosis and proper treatment of obstructive sleep apnea are important when obtaining driver's licenses and serving in the military. The major hurdles that the sleep medicine community faces in Turkey are financial especially in the current, post COVID-19, and Russian-Ukranian war economic crisis. In addition to these barriers, there are also gaps in knowledge and awareness particularly as it pertains to interethnic differences in sleep disorders' susceptibility.

Keywords: Accreditation, Certification, Financial barriers, Sleep Medicine, Turkey.

INTRODUCTION AND HISTORY

Sleep Medicine is considered a relatively new specialty that is still open to significant transformative changes. More advancements in the field are taking place in the developed world and high income countries than in the developing, middle and low income ones.

The practice of sleep medicine in Turkey began in late 20th century. The earliest studies were performed by physicians of various specialties who had specific interest in sleep medicine. In 1992, the Sleep Research Association was first established at Istanbul Univiersity's Cerrahpasa Faculty of Medicine. Five years later, the Council of Ministers renamed it as Turkish Sleep Research Association. Since then, the Association has become one of the largest and most influential scientific organizations dealing with sleep medicine in the country as well as the one with the largest membership. In the charter convention held in 2007, the name

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of the association was again changed to the "Turkish Sleep Medicine Association". Another organization, "The Sleep Association", was also established in the previous year.

ACCREDITATION AND PRACTICE

Sleep medicine in Turkey has developed with the opening of several accredited sleep medicine facilities in different parts of the country.

Currently, there are 38 facilities providing sleep medicine services accredited by "The Association of Sleep" and another 56 that are accredited by "Turkish Sleep Medical Association". These clinics or facilities are divided into two categories, academic centers and clinical centers. The first group includes sleep medicine laboratories that reside in universities and teaching/research hospitals. The second group encompases sleep laboratories at state hospitals and private clinics and medical centers.

The physician in charge at the sleep disorders center can be from any primary specialty as long as they demonstrate competency and be certified in sleep medicine. The Training Certificate is awarded according to the criteria set by the body accrediting the sleep center (Table **1**). The sleep associations provide both the didactic and clinical education that constitutes the sub-specialty sleep training (Table **2**). The physician in charge must also be a member of the accrediting association. The Ministry of Health then follows up on subsequent accreditation maintenance processes.

Table 1. Requirement for Accreditation of An Academic Sleep Laboratory.

The Sleep Laboratory Must Be located Within a Medical School or an Academic and Research Hospital.	**The laboratory Should Perform a Monthly Minimum of 20 Diagnostic and 10 PAP Titrations Studies.**
The physician in charge must be certified by and a member of the Sleep Association.	The trainee must submit 100 individual patient studies that they have scored.
The technologist in charge must be likewise certified.	All physicians working at the laboratory should have a minimum of 2 hours a day of training.
The sleep laboratory must have a minimum of 2 beds.	The sleep laboratory should be able to accommodate a variety of sleep complaints and disorders.
The sleep laboratory should be open to run studies and analyze and score records during working hours.	The sleep laboratory should be able to provide samples of daytime studies (MSLT/MWT) that have been conducted and scored on site.

In Turkey, sleep education was not part of the medical school curriculum until 10 years ago. Today, sleep disorders education has been added to the core curriculum

of all medical schools, some even provide up to a total of 24 hours of sleep education spread out over the medical school years.

Table 2. Criteria for Sleep Medicine Certification for Physicians.

Clinical Training Must be Completed Within 2 Years of the Didactic Course.	
The Trainee Must Meet the Following Requirements Within 1 Month	Observe the Scoring of 20 PSGs
	Score 30 PSGs
	Observe the PSG hookup of 5 patients
	Perform 5 PSG hookups
	Perform 5 extended EEG studies to monitör for seizure disorders
	Perform 5 PAP titrations
	Perform 3 MSLT studies.
At the conclusion of the month of clinical training. the physician in charge of the center should assess whether the trainee has gained sufficient experience to be certified and provide a written report to the Sleep Association in that regard.	

Furthermore, because sleep medicine is an interdisciplinary speciality. Further sleep education is also provided during certain specialty training *e.g*. Pulmonology, Otolaryngology, Neurology and Psychiatry.

“The Sleep Association” and “The Turkish Sleep Medicine Association” both offer courses for postgraduate sleep training. There are also 2 year certification programs that offer clinical sleep training . Both associations have close to a thousand members. Apart from these two associations, there are 8-10 smaller ones with 50-100 members each. These Ministry of Health accredited associations provide training for sleep technologist.

The Ministry of Health Certified Training Regulation was ratified and published in the Official Constitution No. 28903 on February 04, 2014. The law regulates the certification and registration of training programs by the Ministry of Health. In order to be covered under the above regulation, the specialty must first be determined as a certified training field. The “Regulation on the Improvement and Evaluation of Quality in Health” was published in the Official Gazette No. 29399 and ratified on June 27th 2015 . The coverage of sleep laboratory standards has 8 distinct sections:

1- Physician in charge

2- Technical Staff

CHAPTER 12

Past, Present, and Future Directions of Sleep Medicine in Thailand

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Abstract: Sleep Medicine is a growing discipline in Thailand. The formal 2-year-sleep medicine fellowship was approved by medical council of Thailand and established under four specialties including internal medicine, psychiatry, pediatrics, and otolaryngology in 2018. Thailand has also established formal sleep technologist courses and certification examinations since 2010. Sleep Society of Thailand was established in 2009 and subsequently other sleep societies were also established. All societies contributed to the development and advancement of sleep medicine in Thailand including the development of national clinical practice guidelines. There are limited numbers of sleep laboratories in the country particularly in government settings. Fortunately, polysomnography conducted at a sleep laboratory in a government hospital

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is covered by most of the health care coverage programs. However, CPAP cost is only covered by the civil service welfare system, limited private health insurance, certain state enterprise or government employees. There has been an increasing number of research in the field of sleep medicine in recent years. However, multicenter, multidisciplinary, longitudinal studies in the field of sleep medicine are still lacking. Internationalization in terms of hosting international conferences and awards by the international sleep society has increased the visibility of Thailand regionally and globally. Collaboration among various disciplines is the key to advancing the field forward.

Keywords: Continuous positive airway pressure (CPAP), Polysomnography, Sleep laboratory, Sleep medicine, Sleep medicine research, Sleep Society of Thailand, Thailand.

INTRODUCTION

Sleep medicine is a relatively new discipline in Thailand. It has recently gained more interest and was recognized as a unique entity by the medical council of Thailand in 2018. Concurrently, a formal 2-year-sleep medicine fellowship was approved under four specialties including Medicine, Psychiatry, Pediatrics, and Otolaryngology. However, there is no formal regulation in terms of board requirements for physicians to practice sleep medicine or interpretation of polysomnography. The same lack of regulation is relevant to practice for sleep technologists in Thailand. The nation established guidelines for pediatric and adult obstructive sleep apnea to standardize medical practice for this common sleep disorder. Fortunately, in Thailand, polysomnography conducted at a government hospital is generally reimbursable for most of the health care coverage. However, continuous positive airway pressure (CPAP) is only reimbursable for the civil service welfare system and some limited private health insurance policy. There is more interest in sleep medicine research in recent years with many publications in an international peer-reviewed journal. Thailand is honored to have hosted many international sleep conferences and received world sleep day activity awards for many consecutive years. This chapter will cover the past, present, and future directions of sleep medicine in Thailand.

THE CURRENT PRACTICE OF SLEEP MEDICINE IN THAILAND

Previously till now, sleep medicine practitioners in Thailand are generally intercalated medical specialty including pulmonologist, neurologist or otolaryngologist for adult obstructive sleep apnea and pediatrician for pediatric obstructive sleep apnea, respectively. Psychiatrists, internists, or general practitioners commonly treat insomnia patients. Other sleep disorders could be treated by one of the aforementioned medical specialties [1].

In 2009, a group of medical practitioners who were internationally trained or certified in sleep medicine or with extended experience in managing sleep disorders established the Sleep Society of Thailand (SST) in 2009 [2]. In order to certify the first group of sleep medicine specialist in Thailand, the American Academy of Sleep Medicine (AASM) provided examination material for the first sleep medicine certification. A total of 10 physicians passed the examination and was the first badge to be certified as sleep medicine specialist in Thailand. Subsequently, SST hosted its own certification examination for physicians who met the prerequisite criteria for a number of polysomnography interpretations, sleep disorder consultations, or demonstrable completion of training from an accredited sleep medicine fellowship program abroad. A total of 41 physicians was certified as sleep medicine specialists by SST (26 internists, 8 otolaryngologists, 6 pediatricians, and 1 psychiatrist). A few institutions have started their sleep medicine fellowship program. Chulalongkorn University established the first of the nation's international sleep medicine fellowship program in 2011. To date, there were 16 physicians completed this international sleep medicine fellowship training program (10 international sleep medicine physicians and 6 Thai sleep medicine physicians). Furthermore, 1-year sleep medicine fellowship similarly has been offered at Siriraj hospital. In addition, a Master of Science (MSc) in sleep medicine has also been available at Ramathibodi hospital and Siriraj hospital [3].

Aiming to advance the field of sleep medicine to international standard, in 2018, SST approached the medical council of Thailand and proposed sleep medicine as one of the recognized sleep specialties in Thailand along with a formal sleep medicine fellowship establishment. Eventually, a 2-year-sleep medicine fellowship was approved under four specialties including internal medicine, psychiatry, pediatrics, and otolaryngology. To date, there are a total of 40, 8, 12, and 45 physicians certified as sleep medicine specialists for medicine, psychiatry, pediatrics, and otolaryngology under the medical council of Thailand, respectively. The formally trained 2-year-sleep medicine fellow from medicine was first enrolled in 2019 and graduated in 2021. The one-year sleep in neurology certification program jointly developed by the Sleep Neurology Association and the Thai Neurological Society was first started in 2020. This transition will continuously increase a greater number of formally trained sleep medicine specialists and likely would advance the care of sleep disorders in Thailand.

The ancillary professions are as important for the practice of sleep medicine. Sleep technologist is one of the major drives of sleep medicine field. An inadequate number of sleep technologists is the major drawback of advancing sleep medicine in Thailand and globally. Since 2010, SST has conducted a 5-day basic level sleep technology course annually. In addition, a 4-day advanced level

CHAPTER 13

Sleep Medicine in Iran: Current Practice, Challenges, and Future Direction

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Abstract: The Iranian Sleep Medicine (ISM) Society, established in 2005, has worked to increase public knowledge of how important sleep is to maintain health in the community and safety on the roads. The ISM has also had a strong role in the implementation of sleep tests and laboratory standards in collaboration with the Ministry of Health, training sleep specialists to diagnose and treat sleep disorders, certifying sleep labs to ISM standards, and conducting much needed research to improve sleep amongst Iranians. In this chapter, we will first introduce the current healthcare system highlighting the practice of sleep medicine in Iran. Next, we identify three challenges in delivering sleep medicine to millions of Iranians with potential solutions. The challenges are: (1) a limited number of trained sleep medicine specialists unequally distributed across all districts; (2) a limited number of certified sleep labs; (3) the need for insurance to pay for the diagnosis and treatment of sleep disorders such as obstructive sleep apnea, narcolepsy, and insomnia. Lastly, we present future directions for Iranian sleep research including much needed population-based studies to assess the prevalence of sleep disorders. While much progress has been made since 2005 to improve sleep health in Iran, we still have much work to do to reach our goal of significantly reducing disparities and promoting sleep medicine all over Iran toward a healthier future.

Keywords: Accident, Cognitive Behavioral Therapy for insomnia, Commercial Drivers, CPAP, Insomnia, Iran, Iran University of Medical Sciences, Iranian Sleep Medicine Society, Isfahan University of Medical Sciences, Journal of Sleep Sciences, Mashhad University of Medical Sciences, Narcolepsy, Oral appliance, Qazvin University of Medical Sciences, Restless legs syndrome, Shahid Beheshti University Medical Sciences, Sleep apnea, Sleep medicine fellowship, Sleepiness, Tehran University of Medical Sciences.

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INTRODUCTION

Iran is a country home to one of the world's oldest civilizations located southwest of Asia and in the Middle East region. The United Nations estimated the population of Iran to be 83,992,949 (2020), making it the world's 17th most populous country. Iran is the second largest country in the Middle East spanning 1,648,195 km2 (636,372 sq mi) [1]. The population density is 49.15 people/km2 (2018 population census) with 74.9 percent in urban areas, most of which is concentrated in the north, north-west and west of the country [2]. Tehran, the capital and largest city, is the economic and cultural hub of Iran, and home to 15 million people that includes the metropolitan area.

Iranian society is ethnically diverse and includes Persians, Kurds, Lurs, Baloch, Azerbaijanis, Arabs, Turkmen and Turkic tribes, Armenians, Assyrians and Georgians [2]. Iran can be described as a young country, with 49 percent of the population below 30 years old, 24 percent below 15 years old, and only 6.1 percent aged 65 and over [2]. Males account for 51 percent of the total population [2]. Currently, the average annual middle-income worker salary is about 800-1600 million Iranian rials or US$ 4000-8000.

DESCRIPTION OF THE HEALTHCARE SYSTEM IN IRAN

Iran's health care system can be divided into three major healthcare systems: governmental healthcare, private healthcare and non-governmental healthcare such as charity organizations [3].

Governmental healthcare can be divided into primary care and hospital care. Primary care is delivered in both rural areas (*e.g.* health houses) and urban areas (*e.g.* health care centers). Hospital care is either academic or community based, offering general and/or specialized health care services. Governmental healthcare is mainly covered by a government insurance system available to all Iranians called "Social Welfare Insurance" affiliated with the Ministry of Welfare and Social Services. Another insurance, "Iranians' Health Insurance" which is affiliated with the Ministry of Health, is available. Hospitals affiliated with these two insurance systems provide health services to their members for little to no co-pay and cover basic healthcare and essential medicines listed on the World Health Organization Model List. Private health insurance can be purchased to supplement government insurance to cover additional health care services and specialized treatment.

Private healthcare includes clinics, offices, and hospitals which are located throughout the country. Individuals or companies may purchase one of several private and complementary insurance to cover health care services that include

basic as well as additional healthcare services that include essential and specialized treatment including some newly approved medications and equipment such as continuous positive airway pressure (CPAP).

Non-governmental healthcare hospitals are funded by charitable donations for people who are unable to afford insurance and make up 20 percent of hospitals according to 2016 statistics. While these hospitals are located throughout the country, they are concentrated in the largest cities [4].

CURRENT PRACTICE OF SLEEP MEDICINE IN IRAN

The primary mission of the Iranian Sleep Medicine (ISM) Society, established in 2005 (ism-society.ir), is to train sleep medicine specialists using a multi-disciplinary approach, promote research in sleep medicine, and educate the community about sleep health. The ISM is represented by physicians from Anesthesiology, Ear, nose, throat surgery (ENT), Internal Medicine, Maxillofacial surgery, Neurology, Occupational Medicine, Pediatrics, Psychiatry, and Pulmonology. At the current time, the chief executive director of ISM is an ENT surgeon and the director is an occupational medicine specialist, both trained in sleep medicine. The ISM board members are currently represented by ENT, Maxillofacial surgery, Neurology, Occupational medicine, Pediatrics, Psychiatry, and Pulmonology. In addition to its primary mission, the ISM together with sleep research centers contribute and participate in international health congresses and events, and is a standing member of the World Sleep Society and participates in World Sleep Day. In 2017, the Occupational Sleep Research Center at Tehran University of Medical Sciences received an honorable mention award for their participation in World Sleep Day. Furthermore, the ISM works to increase public knowledge of sleep to maintain health and safety on the roads. The ISM has worked with the Ministry of Health to advise and implement and certify sleep testing and sleep lab standards as well as help train sleep specialists to diagnose and treat sleep disorders.

The Ministry of Health regulates sleep medicine in Iran in collaboration with the ISM. In 2020, the Ministry of Health implemented standards that trained Sleep Medicine specialists within only eight specialties (ENT, Anesthesiology, Internal Medicine, Neurology, Occupational Medicine, Pediatrics, Psychiatry, and Pulmonary Medicine) and physicians within only aforementioned eight specialties working at an academic sleep clinic are allowed to perform and interpret Polysomnography (PSG), PAP titration studies, Multiple Sleep Latency Test (MSLT), and Maintenance of Wakefulness test (MWT). In addition, they passed new regulations that only sleep labs that comply with the Ministry of Health standards for a sleep lab can perform sleep tests. As of Feb 2021, more than 40

CHAPTER 14

Current Practice of Sleep Medicine in India

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Abstract: The history of sleep medicine dates back to millennia, carrying centuries of wisdom, decades of myths and challenges through the many years of struggle. Having been recognised as a body of knowledge in the last two decades and a formal branch of medicine in modern-day India. The burden of impending clinical practice, research and disproportionate health indices has allowed the tide of sleep medicine to be surfed by multiple specialties. With research interest dating back to 1965, the practice laid its formal beginning with the first sleep lab set up in New Delhi in 1995. The regulatory practices are thin on the ground that impedes the standardization of clinical research, labs or training of personnel in India. Initiatives at the behest of physicians have led to the setup of self-structured regulatory bodies, expanding the network of sleep labs in the country, albeit still very limited in comparison to the size of its populace. Increasing awareness about healthy sleep habits, bridging gaps in research, quality training and standards, improved regulatory frameworks, and translating knowledge from evidence-based medicine will drive the desired public health outcomes as well as the growth of standards and the future of sleep medicine practice in India.

Keywords: History, India, Regulation, Research, Sleep Medicine, Sleep technology, Training.

OVERVIEW

Sleep Medicine is not new to India, yet it is a growing arena of practice. The importance of sleep, sleep hygiene, and approach to sleep disturbances found a significant and detailed presence in ancient Indian texts, dating as far back as 1000 BC [1]. Ancient wisdom combined with a modern understanding of human neuro-physiology lends itself to effective targeted therapies through an integrated approach, which has yet to find impetus in this growing industry.

Research interest in modern sleep medicine dates back to 1965, with its epicenter at the All India Institute of Medical Sciences (AIIMS)[1], New Delhi [1]. AIIMS is

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a premier, center-run tertiary medical institution in India, with the first one situated in New Delhi. Estd. in 1956, it continues in its leading role in fostering research, training and clinical practice in almost all medical specialties.

This is around the same time when medical research in sleep began in other parts of the world. The first polysomnography machine was installed in the Department of Pulmonary Medicine at Safdarjung Hospital[2], New Delhi in 1995 [2]. Safdarjung Hospital is a state-run tertiary medical institution, set up in pre-Independence India, in 1942, to serve as the base hospital for American and allied party soldiers during World War II. With three decades of continued development in the field, the practice has spread its wings across specialties but it has not yet penetrated the hearts of smaller towns, districts or villages in India. It is largely restricted to bigger medical centers in metropolitan cities. Outside of this, sleep medicine facilities are usually attached to a primary specialty. Sleep being a multi-disciplinary branch, has under its umbrella from primary care physicians, physiologists, internists, pediatricians, geriatricians, ENT specialists, anesthetists, psychiatrists, neurologists and pulmonologists. In a growing practice, dentists and surgeons, including bariatric surgeons also have a role to play. Despite the varied practice, sleep disorders go unattended, primarily due to lack of awareness, inadequate infrastructure, lack of trained sleep personnel and a low priority accorded to sleep related disorders. Adequate growth in this space is additionally hindered by a lack of treatment seeking behavior in low income and rural areas, socio-cultural beliefs, availability of over the counter tranquilizers and inadequacy of an effective supply chain management of sleep and related drugs. Bridging gaps in research, quality training, improved regulatory frameworks and translating knowledge from evidence based medicine will drive the desired public health outcomes as well as the growth of standards of sleep medicine practice in India.

EARLY DAYS OF SLEEP MEDICINE PAVING THE WAY FOR SLEEP LANDSCAPE IN INDIA TODAY

Sleep medicine has undertaken a significant journey since the launch of the first sleep lab in 1995, close to three decades ago, at the Safdarjung Hospital, a state-run tertiary hospital and medical institution in New Delhi, the capital city of India [2]. Research inquisitiveness, however, flamed up around 1965 with the team of neuro-physiologists at India's premier tertiary medical institute, All India of Medical Sciences (AIIMS), expanding their wings of knowledge in neural regulation of sleep [3 - 7].

Sleep-based research first started in neuro-physiology, moving to pulmonary medicine and later other specialties. The practice has now found its association with branches as distant as dentistry and surgery. This cross-pollination has

ensured that sleep medicine has grown sufficiently albeit horizontally in the medical field; penetration to vast geographic areas with different socio-economic conditions, though, still remains a huge challenge. The first efforts for increasing awareness were made by the Indian Society of Sleep Research (ISSR) set up in September 1992, kicking off new beginnings in the country for the practice of sleep medicine through international symposia and conferences [8]. With the practice of sleep medicine evolving and spreading its wings, multiple societies and regulatory bodies emerged. Among them were the Indian Sleep Disorders Association (ISDA), which also started the first sleep medicine certification in the country and the Indian Association of Surgeons for Sleep Apnoea (IASSA), which offers sleep medicine courses, certifications and technician training. A recent addition is a two-year fellowship program for physicians by the Department of Psychiatry, AIIMS, Rishikesh[3]. Additionally, a bachelor's degree program has been introduced for sleep Technologists[4]. Privately run certificate courses have also come into the landscape, recently. However, this list is not exhaustive and is slowly expanding given the rise in the recognition of sleep practice in the country. The influence is growing with this network expanding to various parts of the country at the behest of more and more physicians following suit, whether they are based in private practice or in state-run teaching and research hospitals.

DISTRIBUTION BETWEEN STATE AND PRIVATE PROVIDERS

Emerging to be one of India's largest sectors owing to the population of the country, healthcare is growing at a brisk pace with increasing coverage and expenditure by both private and state providers. At the level of the government, healthcare in India is a "State" subject even though the recent Finance commission bench recommends putting it on the concurrent list - calling for a higher degree of shared responsibility between the National government and constituent state governments. Decision-making and policy implementation in the health sector are a shared responsibility between the union and state governments (in India's federal structure), though the final prerogative and implementation are managed at the "State level" [9]. Public health is a state matter as each state has the responsibility of ensuring primary and emergency healthcare services to all its people. Centrally, the Ministry of Health and Family Welfare (MoHFW) is entrusted with driving overall policy, and provisions in healthcare and national health programs.

Healthcare is widely distributed amongst public and private providers across the country. The bulk of the balance is tilted towards provision by private setups of varying degrees from hospitals, nursing homes to clinics, in tiered cities and

CHAPTER 15

Sleep Medicine in Nepal: Practice Differences, Resources and Gaps in Knowledge

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Abstract: The Federal Democratic Republic of Nepal is one of the most beautiful and stunning Himalayan countries in the world where health care needs of the majority of the population are delivered by a hybrid system of public and private sectors. Public does not perceive sleep disorders to be as critical as other health problems because they remain unaware of the serious consequences of sleep deprivation and sleep disorders. Multiple segments of the Nepalese population are awake across all hours of the 24-hour day because of the large proportions of people working as migrant workforce across the globe in different time zones. Current data reveals a high public health burden of sleep loss and sleep disorders are among them yet these disorders are frequently ignored, readily treatable, and unrecognized health problems in Nepal.

Sleep medicine remains an interdisciplinary field crossing different specialties but in Nepal, it has become almost a subspecialty of pulmonary medicine in the past few years. Nepal does not have sufficient healthcare resources to deliver the appropriate care to patients with sleep-related disorders because of an inadequate number of physicians trained in sleep medicine. Sleep disorders and sleep medicine as a specialty are under-recognized by both the public and health professionals. The government should rethink policies and redesign the programs to address the evolving syndemic of sleep disorders, metabolic syndrome, and tobacco smoking in Nepal and incorporate sleep medicine in undergraduate and postgraduate medical curricula to address the gap in the clinical care of patients with sleep disorders in Nepal.

Keywords: Medical Curriculum, Nepal, Sleep Disorders, Sleep Medicine, Syndemic.

INTRODUCTION

"Sleep health" is explicitly defined and measured; five dimensions of sleep have been identified. Four measures of quality: satisfaction, alertness, timing,efficiency

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and one duration. The quality and quantity of sleep and/or their association with health and quality of life at the population level are affected by technological, demographic, cultural and geographical disparities [1]. The public health burden of sleep loss is immense and sleep disorders are among the most common yet frequently overlooked, readily treatable and frequently unrecognized health problems in low-income countries like Nepal [2, 3]. Surprisingly, there is a lack of high-quality national data about sleep health, and sleep medicine. With reference to locally published data, this review aims to discuss the unmet healthcare needs, the potential causes of treatment gaps from the perspective of pulmonary medicine and the present position of sleep medicine as a specialty in a low-income country like Nepal. To address this information gap, the present review was guided by the following research questions: what is Nepal's geopolitical profile (health care system, age and income distribution)? What is the socio-ecology of Sleep in Nepal? What are the local epidemiological data, what are the existing facilities for providing care to patients with sleep disorders, what about access, barriers and disparity? What is the current status of Sleep Medicine? What type of practitioners is involved in sleep medicine? Are there any practice guidelines, professional societies, or regulatory bodies? What is the research situation? What are the challenges and unique needs of sleep medicine in Nepal?

NEPAL: COUNTRY PROFILE (INCLUDING A BRIEF DESCRIPTION OF GEOPOLITICAL DATA AND HEALTH CARE SYSTEM)

The Federal Democratic Republic of Nepal is one of the most beautiful and stunning Himalayan countries in the world. It has a population of 30 million and a surface of 147,516 km^2 distributed between three regions: the capital of Nepal is Kathmandu. The country consists of three topographic regions: the Himalayan Mountains in the north the middle hills (Mid-hills), and the Terai plains in the south. Its elevation ranges from 60 meters (m) above the sea level in the southeastern Terai to the highest point on earth, Mount Everest at 8,848.86 m. It has eight of the world's ten tallest mountains and contains more than 240 peaks over 6,096 m above sea level. Most Nepalese live either on the country's fertile plains or in the hills, only less than 7% of the population lives in the remote mountainous regions. Nepal is home to people from more than 100 ethnic groups, most of whom share the official Nepali language [4].

Nepal is one of the Low Middle Income Country (LMIC), Nepal's gross domestic product (GDP) per capita for 2016 was $729 in US dollars (USD) and ranks 197/229 countries by its GDP per capita (purchasing power parity adjusted). Agriculture accounts for 34 percent of GDP despite employing 70 percent of the population. Life expectancy at birth in 2016 was 70 years (68 years for males, 71

years for females) according to the World Bank. Nepal's steady increases in GDP as well as the healthcare resources were strained after the 2015 earthquake [5].

In Nepal, healthcare is delivered by a hybrid system of public and private sectors and includes predominantly modern healthcare with some traditional Ayurveda health care and other alternative medicines. The healthcare needs of the majority of the Nepalese population are covered by the public healthcare system which includes hospitals, primary healthcare centers and health posts in the rural area. Recent political reforms in Nepal have decentralized power to federal, state and local to facilitate access to health services. The private health care system consists of private clinics in suburban areas and some huge state-of-the-art super specialty hospitals in urban areas [5, 6]. However patients need to pay nearly 100% of the health care costs out of pocket irrespective of what health care system they access. Social Health Security coverage started to be implemented since 2015, nevertheless, Nepal does not have an organized national public health insurance system.

Nepal's life expectancy for both males and females combined is 70.9 (95% UI: 69.8–72.1) years. Life expectancy increased from 59 to 73 years for females, and 58 to 69 years for males, between 1990 and 2017. Ischemic heart disease (16.4% of total deaths), chronic obstructive pulmonary disease (COPD) (9.8% of total deaths), diarrheal diseases (5.6% of total deaths), lower respiratory infections (5.1% of total deaths) and intracerebral hemorrhage (3.8% of total deaths), were the top five causes of death in 2017. The rise of NCDs is partly due to the changing age structure and lifestyle changes such as increased sedentary behavior, tobacco use, changes in eating habits, and harmful use of alcohol [5 - 7].

Despite these considerable challenges and with limited resources, Nepal has made remarkable progress in reducing poverty, increasing access to education and improving the health status of its people, and achieved many of the Millennium Development Goals (MDGs) by 2015. While the country is making progress towards federalism, the COVID-19 pandemic has deeply affected the economy in diverse ways, including the overall management of the health sector and its functionality [8].

Social-ecology of Sleep in Nepal

Human sleep is remarkably social in nature and sleep health is a complex product of cultural and social influences independently of diseases. Sleep in real world is driven by many of the same factors that drive health-related behaviors, such as diet and exercise [9]. For example co-sleeping defined as sharing the bed, is influenced by maternal attitudes: sleeping with a child is considered to increase the probability of his/her survival. The advent of globalization, competition (24/7

CHAPTER 16

Sleep Disorders in Syria

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Abstract: Although there is no data on the prevalence of sleep disorders in the Syrian population, extrapolating from neighboring countries like Lebanon, Jordan, Iraq, and other Arab and Mediterranean countries, sleep disorders including sleep-disordered breathing are common. Non-Communicable diseases account for two-thirds of deaths. Hypertension, obesity, diabetes, and tobacco smoking are among the highest in the region. There is a strong association between NCDs and sleep-disordered breathing. Most sleep disorders in Syria are undiagnosed and untreated due to the absence of or very low access to sleep specialists and sleep testing, the absence of national policies, and low awareness within the medical community and among the public. The long conflict in Syria, which began in 2011, has resulted in a complex humanitarian emergency, with 6.7 million internally displaced people and 6.5 million refugees out of a total estimated population of 22.5 million. The conflict and the resultant destruction of the health infrastructure have led to a severe public health crisis, which has further impacted the health of the population. There is low access to sleep education, testing, and treatment, mostly in major urban centers, although the demands are increasing. There are ample opportunities to improve the practice of sleep medicine, in spite of the long conflict and war, if local champions, NGOs, national authorities, and medical societies adopted already-available resources, guidelines, and regulations, incorporated creative means and telehealth, and followed the recommendations of the World Health Organization on Sleep and Health.

Keywords: Syria, Sleep medicine, SDB, Insomnia, The Syrian crisis, Conflict, Displacement, Attacks on healthcare, Human resources, War, Post-crisis recovery, NCDs, Telehealth, Online training, Psychological trauma, PTSD, Refugee health, COVID-19, Operation Breathe.

AN OVERWHELMING CRISIS

The Syrian conflict that started in 2011 has resulted in a complex humanitarian emergency. The Syrian crisis, now in its eleventh year, has created an unprecedented strain on health services and systems due to the protracted nature

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of the warfare [1], the targeting of medics and health care infrastructure, the exodus of physicians and nurses, the shortage of medical supplies and medications, the unprecedented and enormous displacement of populations internally and externally, and the disruption of medical education and training.

The movement which was a part of the Arab Spring in 2011, turned into the biggest refugee crisis of the modern world, with millions of Syrian fleeing their neighborhoods and cities and becoming refugees in other countries, and over six million internally displaced, and enormous destruction to the infrastructure, healthcare system, social status of the population, economic crisis, and an increasing need for humanitarian support from the international community.

BEFORE THE CONFLICT

Before the current war, Health indicators improved consistently in the Syrian Arab Republic over the past three decades before the war [2] according to data from the Syrian Ministry of Health with life expectancy at birth increasing from 56 years in 1970 to 73.1 years in 2009; infant mortality dropped from 132 per 1000 live births in 1970 to 17.9 per 1000 in 2009; under-five mortality dropped significantly from 164 to 21.4 per 1000 live births, and maternal mortality fell from 482 per 100 000 live births in 1970 to 52 in 2009 [2].

The Syrian Arab Republic was in an epidemiological transition from communicable to non-communicable diseases with the latest data showing that 77% of deaths were caused by non-communicable diseases [2]. Total government expenditure on health as a percentage of Gross Domestic Product was 2.9 in 2009 [2]. Despite such a low public investment, access to health services has increased dramatically since the 1980s, with rural populations achieving better equity than before [2].

Despite the apparently improved capacity of the health system, a number of challenges persisted including inequities in access to health care between urban and rural areas, between the poor population and the wealthy, between refugees and displaced population and host communities, between loyal populations to the regime and populations that were perceived as opposing to the regime, and between the capital and other cities.

Other problems include poor quality of care, lack of health insurance for most of the population, inadequate national policies, lack of medical research, corruption and nepotism, the brain drain that was exacerbated due to a decade of war and economic deterioration, worsening economy, lack of vetted data, lack of transparency, inadequate utilization of capacity, inadequate coordination between providers of health services, uneven distribution of human resources, high

turnover of skilled staff and leadership, inadequate number of qualified nurses and allied health professionals. In the past two decades, there has been an uncontrolled and largely unregulated expansion of private providers, resulting in uneven distribution of health and medical services among geographical regions. Standardized care and quality assurance and accreditation are major issues. A study done during the last pandemic revealed that mortality rates among critically ill patients admitted to the intensive care units with severe 2009 H1N1 influenza A was 51% in Damascus compared to an APACHE II-predicted mortality rate of 21% [2].

At the start of the civil war in 2011, NCDs represented nearly two-thirds of the burden of death and disability in Syria.

THE IMPACT OF THE WAR ON THE HEALTHCARE SECTOR

Prior to the conflict, Syria's health system was comparable with that of other middle-income countries; however, the prolonged conflict has led to a significant destruction of the health infrastructure. The lack of security and the direct targeting of health workers and health facilities have led to an exodus of trained staff leaving junior health workers to work beyond their capabilities in increasingly difficult circumstances. This exodus together with the destruction of the health infrastructure has contributed to the increase in communicable and non-communicable diseases and the rising morbidity and mortality of the Syrian population [3]. Strengthening the health system in the current and post-conflict phase requires the retention of the remaining health workers, incentives for health workers who have left to return as well as engagement with the expatriate Syrian and international medical communities.

The health sector was hit hard by this war [4], up to 50% of the health facilities have been destroyed and up to 70% of the healthcare providers fled the country seeking safety, which increased the workload and mental pressure for the remaining medical staff [5]. The international community failed to prevent the destruction of the health infrastructure [4], which resulted in the collapse of Syria's healthcare system and left millions of internally displaced people [IDPs] in desperate need of medical assistance.

Within a decade, the life expectancy of resident Syrians has declined by 11 years. Over the first 11 years of the conflict, at least 350,200 civilians died from injuries incurred in the violence from March 2011 to March 2021 according to the United Nations although other estimates put the number around 650,000 deaths due to injuries [6]. One in 13 of those who died in the conflict was a woman and about 1 in 13 was a child. Although there is no exact data, it is estimated that more than twice as many civilians, including many women and children, have probably died

CHAPTER 17

Current Practice of Sleep Medicine in Nigeria

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Abstract: Sleep is an important physiological function that contributes significantly to the health and well-being of people worldwide. In Nigeria, the most populous country in Africa, sleep problems have been reported across various age groups from childhood to the elderly population. It is therefore noteworthy to access and report the state of sleep medicine practice in Nigeria as well as the strengths, weaknesses, opportunities, and threats to the establishment of a successful sleep medicine program in the country.

Sleep problems appear to be on the rise in the Nigerian population. This may be due to an increase in the prevalence of some risk factors for sleep disorders. It can also be attributed to the growing interest in sleep research and clinical sleep medicine practice by a wide range of specialists. However, the practice of sleep medicine in Nigeria appears to be significantly limited by the poor manpower development, lack of sleep societies/organizations, lack of training programs, lack of equipment and sleep laboratories, limited treatment options, inadequate funding, poor national awareness, and political will. The increasing political unrest and brain drain of health professionals constitute a major threat to the availability of human resources.

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The practice of sleep medicine in Nigeria is faced with challenges as well as diverse opportunities. Thus, sleep medicine practice in Nigeria has the potential to grow rapidly and contribute significantly to the global picture if given attention. The growing interest of Nigerian researchers in Sleep medicine, especially in the last decade, as well as the large population of Nigerians, many of whom have risk factors for sleep disorders, suggest that Nigeria may be a significant contributor to the global burden of sleep disorders. Therefore, we suggest concerted and coordinated efforts to enhance the strengths and opportunities highlighted while minimising or eliminating the challenges to improve the practice of sleep medicine in Nigeria.

Keywords: Nigeria, Sleep disorders, Sleep medicine program, Sleep practice, Sleep training.

INTRODUCTION

Nigeria has a land area of 923,768 km (356,669 mi), making it the world's 33rd-largest country [1, 2]. It is the most populous country in Africa and the seventh most populous country in the world with an estimated 206 million inhabitants [3]. The majority of the population is young, with 42.5% between the ages of 0–14 years [4]. Sleep disturbance, especially in the adolescent, may be associated with excessive daytime sleepiness, impaired neurocognitive function, and a host of others leading to suboptimal performance. Sleep disturbances also increase with age such that up to 50% of elderly individuals report at least one form of sleep disturbance [5].

Sleep is a basic biologic function that is essential for life and occupies one-third of people’s lives [6]. It has been shown that adequate sleep helps to improve memory and learning, increase attention and creativity, enhance healing and repair of cells, clear out toxins that accumulate in the brain, and improve the proper functioning of the immune system [7 - 9]. Modern medicine has demonstrated that sleep has essential physiological functions, and sleep disorders have deleterious effects on many bodily functions [10, 11]. Cardio-metabolic disorders such as hypertension, diabetes, obesity, and coronary artery disease are among the deleterious effects associated with these sleep disorders and can have a bidirectional relationship [12, 13]. Although sleep medicine is considered a relatively new specialty, interest in sleep and sleep disorders has existed since the beginning of mankind. The specialty has grown, and the number of sleep specialists is on the increase in Nigeria. Nevertheless, sleep medicine is still underdeveloped, particularly in the areas of clinical service, education, training, and research. This is due to factors such as the limited number of well-trained sleep specialists and other specialists like neurologists or pulmonologists; unavailability of accredited sleep labs in the country; lack of awareness of and the trivialization of sleep disorders; unavailability of sleep societies in Nigeria; no

authorized body for sleep medicine training and certification; and lack of motivation even among medical practitioners. There are only about 4 well-established sleep laboratories in Nigeria that are privately owned and run. The sleep laboratories are only in one state (Lagos) and the Federal capital territory (Abuja) out of the 36 states in Nigeria serving more than 200 million inhabitants. This is grossly inadequate and reflects the level of underdevelopment in the field of sleep medicine in Nigeria. There are no sleep societies, no government-owned sleep laboratories, and no sleep medicine-related courses offered in any of the tertiary institutions in Nigeria.

From previous studies [14 - 17], it appears that sleep disorders are common among Nigerians, and the demand for sleep medicine services is currently rising with an expected exponential increase in the nearest future. It is surprising though that awareness about sleep disorders and their serious consequences is low even among health care workers, health care authorities, and the general public in developing countries like Nigeria. The growth and the recognition of sleep medicine in developed countries can be attributed to many factors, including the recognition of an increasing number of sleep disorders, the increasing evidence linking sleep disorders to serious medical problems, the availability of training programs for sleep medicine, and the increased awareness of the general public about sleep disorders and their consequences [18].

Sleep Disorders in Nigeria

A review of the literature revealed insomnia to be the most common sleep disorder in Nigerian adults presenting to the outpatient clinic and in women attending antenatal care clinic with a prevalence rate of 27.3% and 47.3%, respectively [19, 20]. Komolafe *et al.* (2015) also reported the prevalence of sleep disorders in people living with epilepsy (PWE) to be as high as 82% with parasomnias being the most common disorder among them [21]. Parasomnias are quite common among adolescents with a lifetime prevalence of 725 per 1,000 for the occurrence of any parasomnia and an incidence of 211 per 1,000 [22]. Incidence estimates show that all parasomnias persist into adulthood at reduced rates. Alcohol intake and long duration of night sleep predisposed subjects to a higher occurrence of parasomnias. A systematic review by Mume (2010) to identify studies that reported the epidemiology of sleepwalking disorders revealed the estimated lifetime prevalence of somnambulism to be 6.9% [14]. Recent studies that assessed obstructive sleep apnea (OSA) revealed the prevalence of OSA among Nigerian adults to be 23.2% [23, 24], 19% [25], and 18% [26] which were strongly associated with moderate to severe obesity. None of these studies utilized polysomnography to objectively assess and confirm OSA. Anyanwu *et al.* (2015) also reported that the prevalence of sleep-disordered nocturnal enuresis

CHAPTER 18

Sleep Medicine and Surgery in Egypt: Evolution, Clinical Practice, Education and Research Services

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Abstract: All through Egyptian history, starting from the pharaohs, passing by the Coptic and Islamic eras up to modern Egypt, there have been different interests in healthy sleep and sleep hygiene. Myths about sleep medicine are common among cultures and in Egypt, lack of public awareness about sleep disorders makes most patients undiagnosed or ignorant about whom to consult about their symptoms. In this chapter, we aim to provide the reader with the current state of the art of sleep medicine in Egypt. We conducted a literature review, furthermore the opinion of sleep experts in Egypt was collected and stated in detail, and additionally Egyptian sleep centers were invited to answer a survey in order to collect information about the equipment and trained personnel presented in this chapter. There are three types of Egyptian medical education streams including, the public, private and Al-Azhar medical schools, in which undergraduate and postgraduate medical students can join and earn their degrees but there are no specialized degrees in sleep medicine yet, exact details about medical education in Egypt are provided below. Egypt has numerous health care system providers or sectors: public, private and financing agents' parastatal providers. Nevertheless, sleep studies remain expensive for the Egyptian public and most insurance companies do not fund it, which makes the expenses of polysomnography the duty of the patient to pay from his own pocket. Egyptian sleep laboratories are governmental and private labs, the governmental labs usually exist in university hospitals, financial and educational hassles make accreditation of these labs by AASM difficult. We provided statistics describing these labs and the type of equipment they use. We tried to discuss the clinical and research sleep status in Egypt, additionally, we tried to suggest solutions for these challenging issues.

Keywords: Egypt, Polysomnography, Sleep education, Sleep medicine.

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INTRODUCTION

Egypt is the land of civilization since the beginning of the history. In Egypt, you can find different cultural and religious variations throughout different historical eras. The oldest civilization in the history lived in Egypt (the ancient Egypt or pharaohs). Since the dawn of human civilization, Ancient Egyptians were great physicians and the best in the world, their medical knowledge and practice were the base of all medical practices and medical education in all other successive civilizations. They were concerned about sleep nature, sleep disorders and dreaming with its interpretations. Not only pharaonic Egypt but also Islamic Egypt had great concern about sleep. Sleep hygiene tips and sleep stages, *etc.* are part of Islamic religious practices. In the modern era, Egyptian doctors follow international guidelines and accompany the scientific development all over the world.

The data in this chapter was collected through three main methods:

The first: we did literature review using the relevant keywords by main search engines and database: Google, Google Scholar, Scopus, MEDLINE (PubMed), SAGE Research Methods, and ScienceDirect. We also scanned the official data available from governmental websites that issue official reporting *e.g.*: the Egyptian Central Agency for Public Mobilization and Statistics (CAPMS) and medical schools' records in different universities.

The second: was the opinion of two Egyptian sleep experts about the current situation of clinical practice, medical education and research of sleep medicine and surgery . We had to use this because we have a knowledge gap in the published work about this topic.

The third was conducted by communication with the known Egyptian sleep experts through WhatsApp application or direct phone calls for each known sleep laboratory head in different cities of Egypt as well as website visits, we asked them to fill up two semi-structured questionnaires, conducted through Google form. The first survey was about the type, the place, work force and available services of the sleep laboratory as well as the load of patients per year. The second survey was conducted to get the sleep physician expert (somnologist) and researchers' opinions about the sleep medicine service practice facilities, barriers and challenges as well the educational and clinical information sources, national societies or guidelines and lately the needs for the development of sleep medicine clinical and experimental studies. Results of the surveys will be discussed later in this chapter.

EGYPT IN WORDS

Geographical Position and Population

Egypt has a unique strategic geographical position, it lies in the eastern north part of the African continent, on its northern coasts lies the Mediterranean Sea and on its eastern coasts lies the Red Sea. The land area is around one million km^2. According to the central agency for public mobilization and statistics (CAPMAS), the number the of Egyptian population in January 2020 was around 100 million with approximately equal genders and around 74% are 35 years old or younger [1]. The official religion is Islam (Sunni). Muslims (predominantly Sunni) constitute 90% of the population, while Christians (majority Coptic Orthodox) 10% [2]. Ethnic Egyptians account for 91% of the total population [3]. The official language is Arabic (Modern Standard) and the Egyptian Dialect or accent is the most widely spoken among Egyptians. English is generally understood [4].

Medical Education System

Undergraduate Medical Education (UGME)

For doctors to attain a medical degree with a clinical practice license, Egypt has three types of medical schools: public (governmental, non-profit schools), Al-Azhar (the oldest continuously operating university in the world and the main Islamic religion teaching university in the world plus all non-religious scientific knowledge), and private (with profit aim). Before 2018, Egyptian medical schools followed the French model, which consists of a six-year program featured as a preclinical–clinical dichotomy and a 12 months internship program, English is the language of instruction. The program was a discipline-based curriculum, in which large-group lectures and apprenticeship approaches to clinical teaching were the main methods of instruction, except at Suez Canal medical faculty which applied an integrated curriculum that features project-based learning. An alternative model using student-centered teaching approaches, *e.g.* The PBL parallel track at Mansoura Faculty of Medicine began in 2006, the integrated curriculum at Alexandria Faculty of Medicine in 2009, the modular parallel track at Ain Shams University in 2014, and the Integrated Program of Kasr Al-Ainy (IPKA) in 2015. After the Egyptian Parliament issued a statement that the number of years required for a medicine bachelor's degree has been reduced to five years and will be calculated through credit hours and an integrative system combining basic science with clinical studies then it will be followed by a 2-year internship to follow the requirements of world's federation of medical education [5 - 8].

CHAPTER 19

Practice of Sleep Medicine in Zambia

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Abstract: Zambia, a southern African country with a resource-strained healthcare system that for the past three decades has been tailored to fight the HIV pandemic, is grappling with an increasing non-communicable disease burden. The practice of sleep medicine in Zambia, with sleep disorders being a cause of some of the cardiovascular and motor-vehicle-related morbidity and mortality, has long lagged behind the significant HIV-related disease burden. Sleep disorders in Zambia have therefore remained under-researched, and unquantified and thus are not considered a significant clinical problem.

Against a background of scarce specialized sleep practitioners, the absence of a specific regulatory framework for the practice of sleep medicine, and the absolute lack of equipped sleep centers, the diagnosis of sleep disorders is based on the use of validated clinical risk questionnaires. The availability of treatment devices in the country is also scarce. Further, population-wide and practitioner knowledge-gaps have exacerbated the stagnation of the practice of sleep medicine and research. These deficiencies however present an opportunity to finally harness the practice of sleep medicine and the conduct of sleep-related research, and make them a priority.

Keywords: Sleep disorders, Sleep medicine, Sleep research, Zambia.

INTRODUCTION

Sleep disorders have been on the rise globally, accounting for significant morbidity and mortality [1]. A seventh of the world's population is estimated to have obstructive sleep apnoea, which is the commonest form of sleep disorder [2]. Obstructive sleep apnoea (OSA) has had profound footprint on the global rise in non-communicable disease morbidity and mortality. Sleep disordered breathing and obstructive sleep apnea have been found to be independent risk factors for systemic hypertension [3, 4], heart failure and stroke [5, 6], while obstructive sleep apnea is associated with a significantly increased risk of motor vehicle accidents [7].

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Africa is unlikely to be an exception to the rising global burden of sleep disorders and obstructive sleep apnoea, given the high prevalence of obesity in sub-Saharan Africa [8], and the rise in obesity and its associated co-morbidities [9]. Further, Africa is the leading continent in both cardiovascular disease and motor vehicle accident-related morbidity and mortality [10]. That some of this morbidity and mortality is attributable to sleep disorders, is beyond question, given the weight of global evidence to this effect [10, 11]. However, in the face of a greater burden of infectious diseases on the continent, sleep disorders have long been under-researched, and unquantified. They thus have remained under-recognized as a distinct clinical entity on the continent [12]. This has further worsened sleep-disorder-attributable morbidity and mortality.

Zambia is a land-locked country in southern Africa with a population of 17.86 million), spread across its 752,000m^2 land mass. This population is mostly concentrated in the urban cities that have the attraction of job opportunities for the country's predominantly youthful population [13]. It is a lower middle-income country, with an economy heavily dependent on copper mining and a gross national income (GNI) per capita of US$1,300 (/country/zambia?view=chart).

The public healthcare system in the country is decentralized, comprising three levels; hospitals, health centers and health posts. The hospitals are separated into primary (sub-district or district), secondary (provincial or general) and tertiary (central or specialist or university). The three levels are linked by a referral system with the latter at the top [14].

Zambia is implementing a universal healthcare package for its citizens, to mitigate the burden of paying for life-saving treatments by individuals. The government-run health facilities therefore offer a basic healthcare package. Services included in the basic healthcare package are provided free-of-charge or on a cost-sharing basis, depending on the location of the healthcare facility (rural or urban) and the level of the system (primary, secondary or tertiary). In rural districts, these services are free. However, this is challenged by the chronic under-funding from the national budget which results in inadequate services. Recently, a national health insurance scheme was launched to supplement government funding, but its benefits are yet to come to full fruition. Alongside the public healthcare system exists private healthcare facilities that are mainly concentrated in the urban areas. Specialized medical care is offered mainly in the tertiary level healthcare facilities in the public sector, and to a lesser extent in the private healthcare facilities.

This chapter aims to give a synopsis of the practice of sleep medicine in Zambia. It is divided into three parts; the current practice of sleep medicine in the country,

the challenges to practice of sleep medicine, and finally highlighting the possible interventions to filling existing research and clinical gaps.

CURRENT PRACTICE OF SLEEP MEDICINE

The practice of Sleep Medicine in Zambia is nearly exclusively done at the University Teaching Hospital (UTH) in Lusaka, a 1700-bed facility national referral tertiary-level hospital. It is the only hospital in the public sector with specialist Neurology and Respiratory clinics, respectively, which are the points of referral for patients with sleep disorders.

The UTH, and by default the whole country, has five Neurologists and one Pulmonologist. The Neurology team has two foreign and four local Neurologists. Three of the Zambian Neurologists are products of a local Neurology Residency program which was launched in 2018, as a collaboration by the UTH, several academic medical centers in the USA and the US National Institute of Neurological Disorders and Stroke [15]. The program is ongoing and has residents in training. The Pulmonologist at the UTH was trained in The Netherlands, and runs (with Internal Medicine Residents in rotation) the Pulmonology clinic that sees the majority of patients with sleep disorders, predominantly obstructive sleep apnoea. There are future plans to develop a Pulmonology training program, in partnership with academic centers in the West.

In view of the fact that both the Neurology and Pulmonology services are in their infancy, the practice of sleep medicine is yet to fully develop, following years of long neglect. In priority, sleep medicine fell far behind both other non-communicable, and infectious diseases, particularly the HIV-related ones. HIV, given its high burden in morbidity and mortality in the past 30 years, has been of greater priority for the healthcare system. However, since the provision of free antiretroviral treatment in the country beginning in 2004, HIV-related morbidity and mortality have declined and life-expectancy has increased [16, 17]. As people live longer, they have more opportunity to be in gainful economic livelihoods, which have brought with them lifestyle-related non-communicable diseases (NCDs) such as obesity and cardiovascular conditions [17]. The rising NCD epidemic has borne a tremendous and increasing burden on the thin specialized human resource available to manage these diseases in this setting, not to mention the absence of equipment.

Zambia has no dedicated sleep laboratory or other diagnostic equipment, either in the public or private healthcare sector. Polysomnography or home sleep study facilities or gadgets are absent. Therefore, diagnostic workup comprises mainly the use of sleep questionnaires for OSA. This is wrought in poor specificity.

CHAPTER 20

Sleep Medicine in Brazil

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Abstract: Sleep Medicine has only recently become a medical specialty in Brazil. There are few qualified professionals in this field, and they are mainly concentrated in metropolitan areas. Access to the diagnosis and treatment of sleep disorders is not yet homogeneous for the entire population. In Brazil, there is a public health system called the *Sistema Único de Saúde (SUS)* that offers free and universal health access to all. Although it can be difficult and time-consuming to access a sleep assessment, *SUS* offers free diagnosis and treatment for sleep disorders. However, private clinics and hospitals provide more treatment options and faster access compared to the public sector, but at a high cost. Sleep Medicine is not yet a mandatory discipline in medical training, and most specialized courses and professional development in sleep are not free. With respect to the sleep research being carried out in Brazil, most basic research is concentrated on the effects of sleep deprivation, and clinical research into the health consequences of sleep disorders and possible interventions. Modern society is increasingly subject to sleep restriction and the consequences of sleep disturbances. As a result, sleep has attracted more attention and interest from the media and the general population. Sleep Medicine in Brazil has experienced a significant expansion in knowledge over the last 20 years, and the prospects are positive in relation to future research and the training of specialized professionals.

Keywords: Brazil, Bruxism, Diagnosis, Insomnia, Latin America, Polysomnography, Professional associations, Public health system, Questionnaires, Restless legs syndrome, Sleep, Treatment.

TEXT

Geopolitical Data

Brazil is the largest country in Latin America and the fifth largest in the world in terms of size, with an area of 8.5 million square kilometers. It is divided into five regions (north, northeast, midwest, southeast and south) and 27 federative units. According to the Brazilian Institute of Geography and Statistics (Instituto

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Brasileiro de Geografia e Estatística), Brazil has a population of 211.8 million distributed among 5,570 municipalities. In the latest United Nations report, Brazil was considered the sixth most populous country in the world, has a human development index of 0.699 and currently occupies the 73rd place in the world ranking. Among the municipalities, the metropolitan area of Sao Paulo stands out, with approximately 21.5 million inhabitants (about 10% of the Brazilian population), and is among the 10 most populous metropolitan areas in the world. The official language of the country is Portuguese and the annual per capita income is USD 8,920.76 according to the World Bank.

Fig. (**1**) shows the distribution of the Brazilian population by sex and age. It is noteworthy that in Brazil the demographic census is carried out every 10 years, the last one being carried out in 2010, and a census was scheduled to be carried out in 2020, but has been postponed due to the SARS-COV 2 pandemic. Thus, we present the projection for 2020 created by the Department of Informatics of the Ministry of Health.

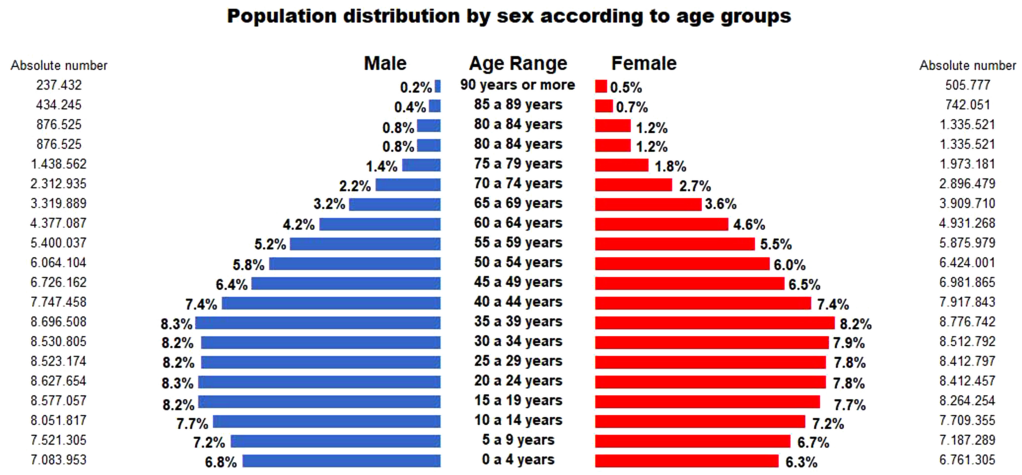

Fig. (1). Population distribution by sex and age groups according to the DATASUS projection for 2020. Source: DATASUS, 2021.

Brazilian Public Health System

The 1988 Brazilian constitution established a public health system called the Unified Health System (in Portuguese the *Sistema Único de Saúde* - *SUS*), which provides free universal health care. Any citizen can access the service, as can foreigners in Brazil who need health assistance. The Brazilian Health System is one of the largest public health systems in the world. *SUS* serves more than 190 million people, 80% of whom depend exclusively on this system for their health

care, and is financed through taxes, public resources and other supplementary sources of finance.

SUS is organized into three main parts:

1) Primary care, provided by the Basic Health Unit (*Unidade Básica de Saúde – UBS*), which is responsible for routine care, vaccination, prenatal care and prevention actions, including actions in the community and home visits;

2) Secondary care, provided by the Emergency Care Unit (*Unidade de Pronto Atendimento*), which is responsible for the care of intermediate complexity in outpatient clinics and hospitals;

3) Tertiary care, provided by large hospitals, which are responsible for complex care, including high-cost procedures and those using state-of-the-art technology such as transplantation and cancer treatment.

SUS also provides a range of other services that include pharmacy services, immunization, hemotherapy, organ transplantation and a human milk bank. In *SUS*, especially at the level of the *UBS*, health service delivery is focused on the Family Health Strategy program (*Estratégia da Saúde da Família*). The data contained in *SUS* databases guides the actions of public policy.

The standard procedure used by *SUS* in relation to diagnosis and treatment initially consists of the patient being seen at a *UBS* and, if necessary, referred to a specialized health service for treatment; one of the areas of specialized health is sleep assessment and the treatment of sleep disorders. However, few Brazilian cities offer polysomnography (PSG), the gold-standard sleep assessment, funded by *SUS*, and those that do have high demand with wait times in months, making access difficult for the population.

Sleep Education and Knowledge Diffusion in Brazil

Although Sleep Medicine is recognized as a medical specialty, it is not an essential component of medical school or health sciences curriculum. Few Brazilian universities teach sleep medicine in their health-related courses. The *Universidade Federal de Sao Paulo* was a pioneer in integrating sleep medicine into its undergraduate curriculum. However, there are only about 20 sleep medicine training sites in the whole country, with the majority being concentrated in the southeast region. There is a relatively low demand among newly graduated doctors to study this specialty, which is possibly related to their low exposure to Sleep Medicine during their medical training [1].

CHAPTER 21

Sleep Medicine in Argentina

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Abstract: In this chapter we describe the history, research, education, and practice of sleep medicine in Argentina, pointing out the importance of the role of public policies in the development of sleep medicine grounds. With the drawbacks of a developing or "emerging" country, sleep medicine in Argentina has been growing up in the past decades. This fact allows us to be optimistic despite the unfavorable scenarios that our country usually goes through. Sleep medicine in Argentina is still rather young in the field of medicine and needs much more effort to consolidate as a specialty.

Keywords: Argentina, Accreditation, Demographics and practice, Health system, Research, Sleep medicine.

INTRODUCTION

Eighteen years ago, the first survey carried out by a group of Argentine researchers, explored the presence of sleep disturbances and the attitudes towards the problem that people who suffered in urban areas of Latin America (LA) (Mexico City, Buenos Aires, São Paulo). At present times, we can affirm that: in our country, around 20% of the general population sleeps little or badly, and this percentage goes up to 50% or more in groups considered at risk, in which the consequences of sleep deprivation will surely be manifested on the physical, mental and social health [1, 2]. At this point, in the twenty-first century, we must ask ourselves, which are the debts we have regarding sleep medicine in our country, and what are we doing to solve them? Among others, the occurrence of

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sleep alterations related to working conditions in the adult population, and the approach of sleep alterations in vulnerable populations stand out. In this chapter we describe the history, research, education, and practice of sleep medicine in Argentina, pointing out the importance of the role of public policies in the development of sleep medicine grounds.

A BRIEF STORY OF THE SLEEP MEDICINE

Although previously some researchers began to explore different aspects of sleep and its disorders, we could say that sleep medicine as we know worldwide emerged in Argentina in 1982, when the first laboratories began to work with professionals trained in sleep laboratories of the USA and European countries according, mostly, with standards of the Association of Sleep Disorders Centers (ASDC) and the Diagnostic Classification of Sleep and Arousal Disorders in 1979 [3].

More recently, in 1995, the Argentinean Sleep Society (AAS) was born, gathered by the interest of joint work for the knowledge of sleep and wake and its disorders. This was a product of the association of basic researchers in the field of sleep and chronobiology, neurologists, pneumologists, and pediatricians who worked at that moment in our country. The primary purposes of AAS included, among others, the following: 1) To gather all professionals whose activity is linked to the area of sleep and the sleep and wake cycle, normal or pathological, as well as to the diagnosis and treatment of related disorders, either at an experimental or healthcare level; 2) To encourage the exchange of scientific experience in this specialty, among their members as well as with other professionals, through congresses, periodic scientific meetings, dissemination, and edition of specialized scientific publications and; 3) To promote education and training in the field of sleep, being able to grant training certificates for the practice of the specialty; 4) To promote and enable the development of teaching centers, and different activities related to the field of research, diagnosis and treatment of normal and pathological sleep and those related to professional practice (Statutes of the Argentinean Sleep Society Civil Association, 1995).

In 1999, and contemporaneously, to the evolution of the American Sleep Association (ASDA) to the current American Academy of Sleep Medicine (AASM), the AAS was renamed the Argentine Association of Sleep Medicine (AAMS) in consonance with the emergency, -worldwide and in our country-, of sleep medicine as specialty/subspecialty.

ACCREDITATION SYSTEM OF PHYSICIANS ON SLEEP MEDICINE

In Latin América, the growth of sleep medicine has been important in recent decades. Good evidence for this is the growing number of member societies of the Latin American Federation of Sleep Societies (FLASS) [4]. Currently, there are members of the FLASS: The Mexican Society for Sleep Medicine and Research, the Uruguayan Sleep Association, the Chilean Sleep Medicine Society, the Peruvian Sleep Medicine Association, the Venezuelan Academy of Sleep Medicine, Sleep Medicine, Sleep of Panamá, the Brazilian Association of Sleep, the Ecuatorian Association of Sleep Medicine, the Argentine Association of Sleep Medicine, Sleep Medicine of Costa Rica and the Colombian Association of Sleep Medicine. FLASS is currently initiating a common certification system for Latin America. In 2018, according to FLASS rules, the AASM, initiated the process of accreditation taking into account three different instances: 1) A process of homologation of worthy sleep personalities in our country, 2) Regular Accreditation Process in Sleep Medicine and 3) an Extraordinary Accreditation Process in Sleep Medicine as a common path for the uniformity of our work at the national and regional level. Currently, instances number 2 and 3 are the formal procedures with which physicians are accredited in sleep medicine by the AAMS with the recognition of FLASS. Soon, we hope to be able to follow a similar procedure with members of different health areas related to sleep medicine, *i.e.* psychologists, dentists/orthodontics, and kinesiologists, with which, at least, with some of them, we have reciprocity agreements among societies that will facilitate joint work favoring to develop sleep medicine in all the areas involved.

EDUCATION

Analysis of LA training programs reveals that Brazil offers a sleep medicine residency and Mexico includes sleep training in the neurophysiology specialty and both countries offer sleep medicine certification. Sleep societies of Colombia and Argentina have developed their certification processes according to the FLASS guidelines [4]. Indeed, there are remarkable differences in sleep society consolidations, training programs, available certifications, terminology, regulatory entities, and requirements in LA. This is the main reason for considering great importance to standardize the training and accreditation system. We consider that the vehicle for achieving the purpose of having a common way of integration and application of sleep medicine in our continent is the FLASS and in the future, the World Sleep Society. Having said that, let us review the present situation of training in sleep medicine in our country. Currently, in Argentina, physicians interested in training in sleep medicine carry out their training in first-level centers, generally on a part-time schedule. They can take recognized courses of one year in sleep medicine and/or international postgraduate diplomas or master's

CHAPTER 22

Sleep Medicine in Portugal

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Abstract: Sleep science and sleep medicine have seen massive growth in the last century in the world, and Portugal is not an exception. In the last 20 years, we have assisted an exponential increase in sleep disorders due to the increase in obesity, lifestyle (24/7 society), massive media utilization, and individual, family, and social commitments. Simultaneously, the scientific community, population, and media have focused on sleep and sleep disorders leading to a progressive need to invest in Sleep Medicine, at the clinical, research, and educational levels.

Despite the increase in diagnostic and treatment capacity of sleep disorders, the National Health Service, and private groups still do not fulfill the real needs. Still, in Portugal, sleep and its disorders are not fully taught in pre-graduated education. Additionally, sleep medicine is not an individual medical specialty and is shared by several medical specialties, such as Pneumology, Pediatrics, Psychiatry, Neurology, Otorhinolaryngology, Maxillofacial surgeons, and Dentistry, among others. Training programs of the different clinical specialties do not offer sleep medicine even as an option being mandatory only in the pulmonology curriculum.

Considering the importance of sleep for physical, mental, and social health, the growth of sleep disorders and their individual, familiar, social, and economic impact, sleep medicine should be one of the focuses of health development and investment in this century.

This chapter focuses on the historical insights and current development of Portuguese Sleep Science and Sleep Medicine fields.

Keywords: Insomnia, Multiple Sleep Latency Test, Polysomnography, Public health system, Sleep therapies, Sleep medicine, Sleep apnea.

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DEMOGRAPHIC AND GEOPOLITICAL DATA

Portugal is a country located on the Iberian Peninsula, in southwestern Europe. It has the twelfth biggest population (10.145 million inhabitants) and the thirteenth largest territory (92 211.9 km^2) in the European Union [1].

Portugal has been a member of the European Union since 1986. In 1999, it was one of the founding members of the euro area. The economy of Portugal was ranked 34th in the World Economic Forum's Global Competitiveness Report in 2019 [1].

The official language is Portuguese. The Portuguese language is widely diffused across the world. The community of Portuguese Language Countries has nine member states on four continents, including Brazil (with around 210 million inhabitants) and Angola (around 25 million inhabitants) [1].

The local authorities in mainland Portugal are 3092 parishes, within 308 municipalities, within 5 administrative regions. The constitution enshrines the principle of administrative decentralization and the financial autonomy of local authorities. The tasks of municipalities and parishes are associated with the fulfillment of the needs of local communities, for example regarding socio-economic development, spatial planning, utilities, sewage collection, culture, the environment, *etc* [1].

Portugal has two autonomous regions, namely the Azores and Madeira. By the reason of their geographical, economic, social, and cultural characteristics and the island populations' historic aspirations, they are granted a specific form of autonomous organization. They enjoy extensive legislative powers and define their own policies [1].

PORTUGUESE PUBLIC HEALTH SYSTEM

The Portuguese National Health Service (NHS) is the set of institutions and services, which are dependent on the Ministry of Health, warranting access to health care for all citizens, within the limits of human, technical and financial resources available [2].

It is a service whose core features are to be:

A. Universal and provide comprehensive global care or guarantee its provision.

B. Tendentially free, considering the economic conditions of the citizens.

C. Fairness, mitigating the effects of economic, geographic and any other inequalities in access to care, aiming to ensure the implementation of the state's responsibility in providing health care to individuals, family and to the community [2].

The traditional dichotomy between primary and differentiated health care proved to be not only incorrect, from a medical point of view, but also a source of dysfunctions, from an organizational point of view. Hence, the creation of integrated healthcare units which enable the essential articulation between personalized groups of primary care health centers and hospitals [2].

The growing demands of populations in terms of quality and readiness to respond to their health concerns and needs suggested that the management of resources should be made as close as possible to their recipients. Hence the creation of Health Regions, operated by administrations with decentralized competencies and attributions.

In Portugal, there are 5 health regions:

1. North, headquartered in Oporto

2. Center, in Coimbra

3. Lisbon and Tagus Valley, in Lisbon

4. Alentejo, in Évora

5. Algarve, in Faro

Regional Health Administration (RHA) is responsible for planning, distributing resources, guiding, and coordinating activities, managing human resources, technical and administrative support, as well as evaluating the functioning of institutions and services providing health care [2].

A Local Health System (LHS) is a set of health resources, articulated and organized according to a geographic-population criterion, implemented both in urban and rural areas, responsible for the care to be provided to individuals, families, and social groups, with the ability to coordinate available resources.

An LHS is made up of the set of:

1. Health Centers

2. Hospitals

CHAPTER 23

Sleep Medicine in Austria

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Abstract: Austria has had a long tradition of sleep and dream science since Sigmund Freund published his psychoanalytic theory of personality at the turn of the twentieth century. Sleep medicine today, however, is a multidisciplinary specialization and training in Austria lasts about 18 months. Exploring the impact of sleep on daily activity, Austrian scientists are especially interested in the role of sleep disorders as an independent risk factor for neurological, psychiatric, and vascular diseases and their therapeutic management.

When the Austrian Sleep Research Association (ASRA) was founded in 1991, CPAP therapy for sleep apnea had already celebrated its 10th birthday and had become a standard therapy covered by all public health insurance. Quite in contrast, in the field of insomnia, cognitive behavioral therapy for insomnia (CBT-I) has been established in international therapy guidelines, but for sleep-disturbed patients, affordable rapid access to this therapeutic option is still a challenge in our country.

Since 1998, the ASRA has been offering voluntary accreditation based on a quality check process to sleep centers. More recently, a sleep training plan was introduced to obtain a sleep physician diploma by the Austrian Medical Chamber.

Keywords: Board certification, Cognitive behavioral therapy (CBT-I), CPAP adherence, Home sleep apnea testing (HSAT), Insomnia, LORETA, Neuroimaging, Quality management, Memory consolidation, Narcolepsy, Parasomnia, Practice guidelines, Reimbursement, SIESTA project, Sleep apnea, Sleep center, Sleep coaching, Sleep specialist, Sleep staging, Telemedicine.

INTRODUCTION

Sleep Medicine is a heterogeneous area that plays a role in a number of clinical disciplines such as neurology, psychiatry, pulmonology, pediatrics, internal medicine, ENT, and psychology.

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Compared to Germany and other western European states, Austria is a small country, which counts approximately 9 million inhabitants and covers an area of about 84.000 square kilometers. The capital is Vienna with about 1.7 million inhabitants. Statistics show that about 14.4 percent of Austria's total population is between 0 and 14 years of age, and 19 percent are 65 years and older. Life expectancy at birth is roughly 82 years. In 2016, on average some 1.898 million people (~ 22.1% of the population) with foreign background were living in Austria. The gross domestic product (GDP) per capita is about 50 000 USD, constantly increasing.

CURRENT PRACTICE OF SLEEP MEDICINE

Patients face three main problems in sleep medicine. First, they don't know what is normal, and what can be done. Second, they get used to their problems and accept them by ignoring the symptoms, or regarding them as age-dependent. And finally, especially nonorganic insomnia needs to be treated individually by cognitive behavioral therapy. This is often a very time-consuming process, which is not adequately covered by insurance. Thus, patients often just receive symptomatic hypnotic drug therapy. However, GPs are not very well educated in sleep medicine. They generally do not attend sleep meetings, which are designed for specialists. The reason is not a lack of interest, but a lack of time, as their daily routine is very time-consuming, especially in rural areas. GPs usually prescribe medication for acute insomnia or continue prescribing drugs following a specialist's recommendations.

If serious problems persist, the patient will be assigned to a specialist. If the primary sleep complaint is insomnia, hypersomnia, or a sleep-related movement disorder, they will be referred to a psychiatrist or neurologist. The situation is quite different with sleep-related breathing disorders. In case of snoring or signs of sleep-disordered breathing, patients are mainly sent to a pulmonologist or an ENT specialist. If polysomnography (PSG) is necessary, the patient will be referred to a specialized sleep center. But there are long waiting lists for PSG. Although CPAP is an efficient therapy, some patients do not consider it an attractive option and require motivation/coaching to get used to it.

As most diagnostic and therapeutic procedures are covered by the public health insurance system, access to medical testing and treatment is no problem in Austria. The bottleneck, however, is to find the best specialist and to be patient if you are on a waiting list. It is obvious that specialists are concentrated in big cities and there is a lack of them in rural areas. And considering being a farmer who cannot leave his place when it is time to harvest or feed the cows, there are still limitations concerning access to health care and considerable differences between

employees and self-employed or between people living in the country and the urban population.

Currently, we have around sixty sleep centers in Austria. They are usually run by a public hospital, and investigations are covered by public health insurance. Most of them focus mainly on the management of sleep-disordered breathing. About half of them have voluntarily undergone a quality check procedure and have been accredited by the ASRA. Direct referral by GPs is not intended, but possible. As waiting lists for a PSG are very long, the ASRA primarily recommends patients to see a specialist, who then decides if a PSG is necessary. If sleep apnea is suspected, a home sleep apnea testing (HSAT) is recommended, also to assess the urgency of treatment needed. Waiting time for a polysomnography (PSG) is 4-6 months or more.

Due to Covid 19 restrictions, all patients must be tested before admission to a hospital. The patient referred for PSG shows up in the afternoon and leaves the next morning. Results are then discussed with the patient later by phone, telemedicine, or in person if necessary. As many patients do not speak German quite well, the biggest problem is language barriers. Thus, it is much easier to explain the results and therapeutic options in person.

To become a sleep technician, you have to undergo specific training and acquire also technical knowledge at College for Biomedical Analytics, whereas nurses working in sleep centers do not have this special education and need to be trained onsite.

The cooperation with homecare providers (HCP) in Austria is quite good. Nevertheless, therapy options for sleep apnea like oral appliances or hypoglossal nerve stimulation are not covered on a regular base.

Home sleep apnea testing is provided by a number of specialists like pulmonologists, ENT or sleep medicine specialists and is thus more easily accessible compared to standard inpatient polysomnography. Sleep laboratories are usually centered in cities, whereas outpatient HSAT can be conducted almost anywhere. Actigraphy is available only in specialized sleep centers and is not covered by health insurance.

CPAP devices can only be prescribed by a sleep center and are covered by public health insurance. They can be bought or rented. However, for continued coverage, healthcare providers ask for compliance data. Compliance is usually very good once the patient has come to accept the device, and people feel better using the CPAP on a regular basis. In my office, the non-responder rate over time is less than 5%, and low responders are between 10% to 20%. The reasons for this good

CHAPTER 24

Practice of Sleep Medicine in the United Kingdom (UK)

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Abstract: The practice of sleep medicine in the UK has made considerable progress over the past 3 decades. This has been driven by the invention of CPAP and the development of OSA services, but other factors related to National Health Service innovations and healthcare professional developments have also been important. Key challenges remain in service provision, education and research, and in resolving regional equalities in access to care.

Keywords: Association for Respiratory Technology and Physiology, ARTP, BLF, British Thoracic Society, British Sleep Society, BSS, BTS, British Lung Foundation, Continuous positive airway pressure, CPAP, Getting It Right First Time, GIRFT, Marmot, National health service, NHS, Obstructive sleep apnoea, OSA, Regional Inequality, Sleep medicine.

INTRODUCTION

The healthcare services in the United Kingdom (UK) are provided by the National Health Service (NHS) and funded by the taxpayer. Only around 11% of the population have private health insurance [1]. Private policies often provide limited coverage and sleep medicine can be overlooked. Therefore this chapter will focus on sleep medicine provided by the NHS. The NHS was created in 1948 and brought together a heterogeneous collection of local and regional healthcare providers into one organisation. It has gone through a number of changes and restructuring since its inception. However, two of the NHS's founding principles have not changed: to make healthcare equally accessible to all and free at the point of care [2]. Each devolved nation (Wales, Scotland and Northern Ireland) has its own NHS (Health and Social Care for N. Ireland). Each has its own governance and varies slightly in its organisation and policies. Unfortunately, while there will be NHS data available for each nation, much of the available inf-

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ormation regarding sleep medicine is limited to England. A detailed breakdown of the similarities and differences of each country's sleep medicine 'scene' is not possible. However, it will be made clear in this chapter where data and other information refer to England alone or to the UK. Even then there are significant gaps. In those cases the author has given his own impression formed through personal experience and professional networking.

CURRENT PRACTICE OF SLEEP MEDICINE IN THE UK

When it comes to considering the current state of sleep medicine obstructive sleep apnoea (OSA) is an obvious starting point. The prominence of OSA might overshadow other sleep disorders, but the development of highly effective treatment for this prevalent and impactful condition has undoubtedly fuelled the growth of sleep medicine. For the UK the publication of guidance by the National Institute for Health and Care Excellence (NICE) in 2008 [3] that recommended continuous positive airway pressure (CPAP) for moderate to severe OSA was probably a key driver for the development and expansion of sleep services.

Most OSA services in the UK are provided by respiratory departments within secondary and tertiary care hospitals. Lead clinicians usually work in partnership with respiratory physiology laboratories, although some units have evolved to operate separately. As in other countries, sleep services in the UK are not the exclusive preserve of respiratory physiology or its parent speciality. Many services have been founded by pioneering enthusiasts, sometimes from other clinical backgrounds, such as anaesthesia, neurology or otolaryngology. While some services are truly multidisciplinary, in other areas there are separate services operating for respiratory and non-respiratory sleep, although collaboration is common.

Much of the data regarding UK sleep services has been gathered from surveys conducted by various stakeholders. They give useful insights into UK sleep medicine at different timepoints but it is important to recognise their limitations. Any survey is only as good as the response rate and the representative accuracy of the population targeted. For example the Association for Respiratory Technology and Physiology (ARTP) is the national professional body for respiratory and sleep physiologists [4]. From time to time, it conducts surveys of its members. Registration with the ARTP is not mandated for sleep labs or individuals. When reporting their findings, the ARTP has recognised that they will have missed some services operating outside of respiratory physiology departments, particularly those concentrating on non-respiratory sleep.

The last two ARTP surveys relevant to this topic were published in 2012 [5] and 2018 [6]. Results from the 2012 ARTP survey indicate a significant amount of

OSA service provision being undertaken by clinical physiologists. The survey received responses from 156 of 251 respiratory function labs known to the ARTP. Most of these (143) were based in England and 109 reported undertaking sleep diagnostics, although this was limited to oximetry in just under a third of those labs.

In 79 labs, clinical physiologists were undertaking autonomous sleep diagnostics. Almost all autonomous practitioners were deemed 'regulated'. It is not clear from the 2012 report what that meant. However, the vast majority had postgraduate qualifications in healthcare science, albeit not in sleep medicine. Simple overnight oximetry was much more likely to be carried out by sub-degree level staff, presumably deferring interpretation to higher grades and medical colleagues. Slightly fewer labs (76) in the 2012 survey reported physiologists working as autonomous CPAP providers. However, most of these were 'regulated' and the large majority (74%) had postgraduate healthcare science qualifications. Much of the remaining activity from those labs reporting sleep activity was probably still undertaken by respiratory function lab staff at various grades, but presumably under medical oversight.

Those labs and sleep services not captured by ARTP surveys are likely to be run in a variety of ways. It is not unusual for CPAP to be provided by nurses or physiotherapists, probably influenced by local service set-up including non-invasive ventilation provision. The 2018 ARTP workforce report (survey undertaken in 2015-16) had a different focus and a much lower response rate (28%) than the 2012 survey. However, it gave anecdotal examples of units where various disciplines including nurses, physiotherapists and doctors delivered both diagnostic and therapeutic aspects of their sleep services [6].

Surveys carried out by other stakeholder organisations may have gained a fuller picture of UK sleep services. In 2012, the British Lung Foundation (BLF) explored the availability of sleep services. They worked with the ARTP but also the British Thoracic Society (BTS), which is the national professional society for respiratory medicine. They also linked with other relevant professional and charitable organisations and patient groups. They created a cross-country working group including all devolved states. The BLF survey identified 289 sleep units. Of these, 50 were reported to be undertaking polysomnography (PSG) [7].

More recently, the GIRFT (Getting it Right First Time) NHS England improvement program reported on respiratory medicine services [8]. GIRFT aims to improve the quality of care and deliver efficiencies by sharing the best practices and identifying variations between NHS services. The report includes respiratory sleep services within NHS England. GIRFT data sources were heterogeneous and

CHAPTER 25

Sleep Medicine in Iceland – The Challenges of a Subarctic Small Nation

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Abstract: The practice of sleep medicine within Iceland has been shaped by its position as a sub-arctic Nordic nation with a small population and a strong tradition of sleep research.

The major facility providing clinical diagnostic and therapeutic sleep services is the Landspitali - The National University Hospital of Iceland. Sleep studies are mainly conducted as home sleep apnoea testing with video hook-up instructions and electronic questionnaires. In the context of the COVID-19 pandemic, the majority of positive airway pressure therapy initiation took place at the home of the patient with auto settings and remote follow-up.

Sleep medicine service challenges include inferior access for rural areas, funding limitations, the COVID-19 pandemic and low sleep education at a national level for both the general population and specifically healthcare staff.

The unique clinical and research knowledge gap of Iceland requires studies on the health effects of living at such a northern latitude. The high hypnotic and antidepressant use of Icelanders as well as the high prevalence of restless legs syndrome symptoms may be at least in part contributed by latitude. The 1-1.5 hour discrepancy between the solar clock and the local clock may also cause social jet lag in Icelanders but this needs to be studied further. Finally, social factors such as the high energy drink consumption of Icelandic teenagers and the high screen time made possible by the 99% internet penetration and a mobile connection percentage that exceeds the total population level may contribute to the short sleep length found in Icelandic teenagers.

Keywords: Auto--positive airway pressure (AutoPAP), COVID-19, Daylight savings time (DST), Delayed sleep time, Height, Home sleep apnea testing (HSAT), Iceland, Icelandic Sleep Research Society, Insomnia, Light exposure,

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Obstructive sleep apnea (OSA), National electronic health records, Remote short sleep, Restless legs syndrome (RLS), Rural, Seasonal affective disorder (SAD), Social jet lag, Subarctic, Telemedicine, Video instructions.

INTRODUCTION

The Icelandic environment to study sleep is unique in many aspects. This includes our sub-arctic latitude (64-66° North) with light exposure varying highly from ~4 hours in December to ~21 hours in June [1, 2]. The relatively isolated population of 370.000 inhabitants has a high willingness to participate in research and longitudinal follow-up, high educational status, and a very high level of digital knowledge [2, 3]. When coupled with the national electronic health records, this allows for state-of-the-art quality research studies on different topics related to sleep and health. *e.g.* a recent publication showing that obstructive sleep apnoea (OSA) is an independent risk factor for having a poor outcome due to COVID-19 after adjustment for age, gender and importantly, body mass index [4]. In this study, all adult community-dwelling Icelanders who had been diagnosed with COVID-19 were cross-referenced against OSA diagnosis from the centralized national registries and the original clinical sleep studies checked for accuracy.

The Icelandic Sleep Research Society was officially founded in 1991 [5]. The society is very active both within Iceland and within the Assembly of National Sleep Societies of Europe (ANSS) with ~100 members which is per capita the highest number of members among the Associated National Sleep Societies in Europe [6]. The members are a mixture of medical doctors of different specialties, psychologists, biologists, nurses, engineers, computer scientists, sports scientists, and others with a sleep focus in their work.

Icelandic sleep researchers have for many years participated in international research projects, including research supported by the National Institute of Health in the United States and the European Union, with an emphasis mostly on clinical sleep research as well as some basic sleep research [7]. The utilisation of clinical sleep services especially for OSA is high, with one study showing about 4% of Icelanders, 40 years and older on current treatment [8].

THE CURRENT PRACTICE OF SLEEP MEDICINE

The health system is primarily publicly funded, delivered between public hospitals and private clinical practices, with small co-contributions from individual patients. The majority of sleep studies are performed within the public system, although a substantial minority access sleep studies through either research institutions, or private medical clinics. Within the broader context of the 2019 Health Policy to 2030 (laying out a road map for all Icelandic health

services), sleep medicine is undergoing a period of reorganisation to better unify services around the country, and to develop uniform quality standards for the Icelandic Health Insurance, the national insurance agency [9].

The major facility providing clinical diagnostic and therapeutic sleep services is at the Landspitali - The National University Hospital of Iceland [LSH], in the capital, Reykjavik [10]. The sleep unit falls under the broader Respiratory Medicine and Sleep Department, reflecting that from the early 1980s, respiratory physicians have taken the lead in sleep medicine within the unit. Iceland's small size requires most medical practitioners to undertake specialty training abroad, and medically the unit is currently headed by an Australian-trained sleep physician, and staffed by respiratory physicians and an ear-nose and throat [ENT] doctor, who variously undertook specialty training in the United States, the United Kingdom, Sweden, and Norway. LSH operates a three-bed lab for in-patient sleep studies including video polysomnography and multiple sleep latency tests [MSLT], as well as utilising home polysomnography and [much like our Nordic neighbours] heavily utilises home sleep apnoea testing [HSAT] [11]. LSH is also responsible for overseeing almost all positive airway pressure [PAP] therapy within Iceland, from continuous PAP through to home life support ventilators for ventilator-dependent patients. Finally, all sleep studies and treatment of children are performed at the Children's Hospital of LSH in collaboration with the sleep unit. A special service for children with behavioural and other sleep problems is available and very popular, especially with parents of children under the age of three.

HSAT is also available at numerous other sites throughout Iceland, whether through a direct partnership between LSH and local health stations, or overseen by regional hospitals. A number of studies are also performed in privately run centres, the majority of which are funded through the same public system as hospital studies. HSAT studies throughout Iceland are mainly performed with the use of video hook-up instructions, with an equally low failure rate and similar quality as the in-person instructions conducted previously [12]. This is an important step towards telemedicine-based way of diagnosing OSA, is less costly and time-demanding for sleep staff, and allowed these services to mostly continue despite the COVID-19 pandemic. Finally, all patients referred to the sleep unit, answer an extensive electronic questionnaire *via* the secure web application, REDCap [13], on their sleep and daytime functioning as well as risk factors, similar to the Sleep Apnea Genetics International Consortium [SAGIC] questionnaire described here [8].

PAP initiation and follow-up were done prior to 2019 mostly with one daytime visit to the hospital [either as an individual or group appointment – the latter

CHAPTER 26

Practice of Sleep Medicine in Lithuania

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Abstract: Lithuania is a small country with a relatively short (31 year) history of independence in the modern era. Complicated history and geopolitical situation determined gaps in many socioeconomic spheres compared to other western European countries 30 years ago. Nevertheless, the country's ambitious goals and direction towards democratic values resulted in high recent socioeconomic ratings and acknowledgment among other European Union, NATO and Organisation for Economic Co-operation and Development members. The chapter presents short Lithuania's geopolitical and healthcare system data, the current practice of sleep medicine, the practitioners involved, the availability of diagnostic tools and medications to treat common sleep disorders. It discusses challenges to the practice of sleep medicine: patient access to care, resource limitations and financial hardships, clinical and research knowledge gaps.

Keywords: Driving regulation, Insomnia, Lithuania, Research, Sleep apnea, Sleep disorders, Sleep medicine.

INTRODUCTION

Geopolitical Data

Lithuania, officially the Republic of Lithuania, is a small country (with area of 65.286 km^2) in the Baltic region of Europe. Situated on the eastern shore of the Baltic Sea, to the southeast of Sweden and Denmark, Lithuania is bordered by Latvia to the north, Belarus to the east and south, Poland to the south, and Kaliningrad to the southwest. The capital and largest city is Vilnius.

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On 11 March 1990, a year before the formal dissolution of the Soviet Union, Lithuania became the first Baltic state to proclaim its independence, resulting in the restoration of the independent State of Lithuania. It is a republic based on parliamentary democracy. Lithuania joined the North Atlantic Treaty Organization (NATO) in 2004, European Union (EU) in 2004, Schengen in 2007 and Organization for Economic Co-operation and Development (OECD) in 2018. On 1 January 2015, the euro became the national currency [1].

Lithuania has an estimated population of 2.8 million people in 2020. One-third of the resident population lives in rural areas. Lithuanian life expectancy at birth was 76.4 (71.5 years for males and 81 for females) in 2019, the difference between rural and urban residents was not significant (74.8 and 77.3 respectively) [2].

Lithuania is a developed country with a high Human Development Index (HDI). A country scores a higher HDI when the lifespan is higher, the education level is higher, and the gross national income per capita is higher. The Human Development Report 2020 by the United Nations Development Program was released on 15 December 2020, and calculated HDI values based on data collected in 2019. Lithuania ranked in 34th place [3].

Lithuania provides free state-funded healthcare to all citizens and registered long-term residents. The Lithuanian health system is organized around a single insurance fund providing health coverage to nearly the entire population (98% in 2018) [4]. The Ministry of Health, which governs the National Health Insurance Fund (NHIF), formulates health policies and regulation and is responsible for licensing providers and health professionals, as well as for approving capital investment in healthcare facilities. Compulsory Health Insurance is obligatory for Lithuanian residents. Contributions for people who are economically active, are 9% of income. Emergency medical services are provided free of charge to all residents. Private healthcare is also available in the country. In 2003–2012, the network of hospitals was restructured, as part of wider healthcare service reforms. It started in 2003 with the expansion of ambulatory services and primary care. Decentralization of the healthcare system was achieved by segregating primary healthcare (family physicians), secondary healthcare (physicians-specialists), and tertiary healthcare levels (high specialization university clinics) [4].

Lithuania has a high number of doctors compared to the EU average (4.6 compared to 3.6 per 1000 population in 2017), of which slightly over one-fifth are general practitioners (GP). At the same time, the number of nurses is slightly lower than the EU average (7.7 *vs*. 8.5) [4].

Lithuania's spending on health care is among the lowest in the EU. In 2017, current health expenditure accounted for 6.5% of Gross Domestic Product (GDP),

the fifth lowest in the EU and substantially lower than the EU average of 9.8%. In terms of spending per person, Lithuania spent 1605 Eur (adjusted for differences in purchasing power) in 2017 – slightly more than half the EU average of 2884 Eur per person. Furthermore, only about two-thirds (67%) of health expenditures are publicly funded, a significantly lower share than the EU average (79%). Out-of-pocket (OOP) payments cover the remaining third of healthcare spending [4].

The proportion of Lithuanians reporting unmet needs for medical examination and treatment is relatively small. Only 1.5% of the population reported barriers in access to care in 2017 due to waiting time, costs or distance to travel. In addition, the difference across income groups was relatively small [4]. In 2018, Lithuania ranked 28th in Europe in the Euro health consumer index (EHCI). EHCI is a comparison of European healthcare systems based on waiting times, results and generosity. The ranking included 37 countries measured by 48 indicators. It claims to measure the "consumer friendliness" of healthcare systems [5].

Nevertheless, some healthcare effectiveness measures are not satisfying in Lithuania. Lithuania has one of the highest mortality rates from preventable and treatable causes in the EU. Over 8500 deaths could have been avoided in Lithuania in 2016 through effective public health and prevention interventions, and a further 5000 through more effective and timely health care provision [4].

Lithuania's mortality rate by suicide in 2017 was still the highest reported in the EU. It remains an important cause of death, particularly among men. In recent years, the authorities have launched a number of suicide prevention campaigns that led to a 45% decrease in the number of deaths between 2000 and 2016.

In 2017, only 44% of the Lithuanian population reported perceiving themselves to be in good health – the lowest rate in the EU. As in other countries, people with higher incomes are more likely to report being in good health: two-thirds of those in the highest income quintile considered themselves to be in good health, compared with only one-quarter of those in the lowest quintile. This income gap in self-reported health is the second highest in the EU [4].

Historical Background

The origins of sleep medicine in Lithuania could be traced back to the early XIXth century [6]. It was the time when Lithuania was a part of the Russian empire, and Vilnius University (VU), founded in 1579, was the largest institution in the empire, based on student numbers and university departments. As czar Alexander I (1777–1825), a supporter of limited liberalism, wanted to transform Vilnius with its university into a gateway from the Russian Empire to an enlightened Europe, certain reforms were enacted. The number of departments at

CHAPTER 27

Current Practice of Sleep Medicine in The Czech Republic

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Abstract: Prof. Bedrich Roth founded sleep medicine in our country 70 years ago. However, the inter- and multidisciplinary nature of sleep medicine developed several decades later, in the early 1990s, with the cooperation of pulmonologists, neurologists and psychiatrists. This led to the foundation of the Czech Sleep Research and Sleep Medicine Society (short title Czech Sleep Society) in 2001. At present, the Society includes 215 members and plays a leading role in the current practice of sleep medicine in the entire country. Activities include accreditation/certification procedures, educational programs, annual national meetings, the development of guidelines and recommendations for different sleep disorders, promoting research and many other endeavors. The society also collaborates with other medical societies in discussions with state health care authorities and health insurance companies. Health insurance companies cover sleep medicine care by means of a DRG system for hospitalizations, and a point system for outpatient care. The majority of sleep medicine care is centralized, and medications are largely covered (*e.g.* modafinil and natrium oxybate are available to patients free of charge). Positive airway pressure devices are lent to patients by health insurance companies if treatment criteria for sleep breathing disorders are met and compliance is fulfilled. The absence of acknowledged specialization or sub- specialization in sleep medicine by the Czech Ministry of Health is the main challenge to be overcome.

Keywords: Czech Sleep Society, accreditation process, education, certifications, guidelines, research, sleep medicine, health insurance.

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INTRODUCTION AND HISTORY

Sleep medicine has a long history in our country [1 - 3]. The founder of this field was Prof. Bedrich Roth who started with clinical descriptions of narcolepsy and hypersomnia in the early 1950s and established the first polysomnographic lab in Central Europe in the early 1960s at the Department of Neurology in Prague. Prof. Roth collected the largest cohort of patients in the world suffering from excessive daytime sleepiness in the 1970s and 1980s. At the same time, Prof. Helena Illnerova from the Academy of Sciences became well-known for her experimental research in chronobiology and circadian rhythm, and Dr. Jaroslava Dittrichova from the Department for Mother and Child Care for clinical pediatric research. However, the evolution of true multidisciplinary sleep medicine began after falling of communism in the 1990s. Since 1991, Prague neurologists followed by other specialists including pulmonologists, ENT physicians and psychiatrists, have held annual meetings devoted to sleep disorders. The Czech Sleep Research and Sleep Medicine Society (short title Czech Sleep Society) was formed in 2001 [4]. In cooperation with the Slovak Sleep Society, the Society organizes annual Czech and Slovak Sleep Congresses and collaborates with other medical societies. In 2004, Prague hosted the 17th ESRS Congress with 1,300 delegates and in 2017, the World Sleep Congress was organized in Prague with 2,700 participants from 76 countries. The local convener of both events was Prof. Nevsimalova.

CURRENT PRACTICE OF SLEEP MEDICINE

The Czech Sleep Society plays a leading role in the current practice of sleep medicine in the Czech Republic. The society board has 7 members, and a further 3 members are elected as a Revision Commission. The online elections are repeated every 4 years. Dr. Vyskocilova has represented the Czech Sleep Society as a president for several voting periods, Prof. Nevsimalova is the Vice-President, and Prof. Ludka is the scientific secretary and a member of the Assembly of National Sleep Societies (ANSS) in ESRS.

The Czech Sleep Society presently has 215 members.

The accreditation process inspired by ESRS rules started in 2005 [5, 6]. The process is completely managed by the Society and the status of an accredited Sleep Center is recognized by health insurance companies but not by state authorities. The validity of accreditation is 5 years, and reaccreditation must be repeated every 5 years. According to ESRS recommendation, 3 main categories of Centers have been distinguished since 2019. Presently, 4 centers fulfill the highest requirements for Center type I, 13 workplaces fulfill requirements for Center type II, and 23 workplaces requirements for Center type III. ESRS recommendation

was slightly modified for our practice (Fig. **1**). Referral centers for diagnosis and therapy of sleep disorder breathing with the highest specialization were ranged into Centers type II, while units of monitoring and therapy of sleep disorder breathing were ranged as sub-specialized Centers type III. A great majority of sub-specialized centers involve pulmonology or ENT units that are focused on sleep-breathing disorders. The density of Centers is not uniform; the highest network is located in the capital city – Prague.

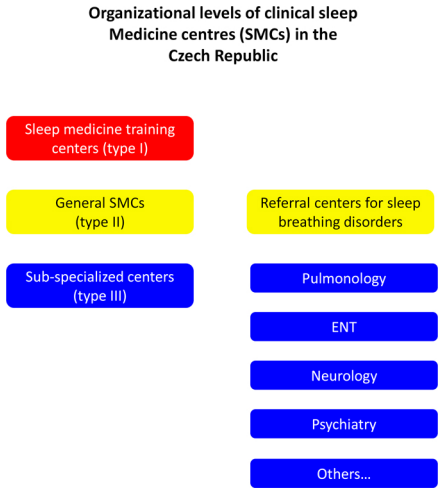

Fig. (1). A modified scheme illustrating the organization levels of clinical sleep medicine centers in the Czech Republic.

Since 2006, the society has organized ***biennial theoretical courses*** in sleep medicine ***followed by theoretical and practical examinations*** [7, 8]. Successfully completing the examination is essential for attending accreditation. In the past 5 years, practical courses for technicians have begun to be organized as well, and there must be at least one certified technician at each accredited center who has completed this course and passed the exam.

The Sleep Society has submitted and published ***guidelines*** (or recommendations) for (1) issuing driving licenses to subjects with sleep apnea, (2) sleep breathing disorders in adults as well as in children (indication for CPAP, BiPAP, surgical options), (3) home non-invasive ventilation, and (4) clinical standards for the diagnosis and therapy of narcolepsy. ESRS and AASM standards were taken into consideration as a model when our guidelines were developed.

Several ***branches*** participate in the progress of our Sleep Society. The most effective is the surgical section that joined forces with ETN sleep specialists in the Czech Society of otolaryngology, head and neck surgery and assured a common

CHAPTER 28

Practice of Sleep Medicine in Russia

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Abstract: Somnology in Russia is a competency area for medical doctors from different disciplines. Most of them are cardiologists involved in private clinics located in the central and western parts of the country in the major cities. Some factors limit the development of somnology: differences between the regions, absence of legislative and regulatory absence of documents, lack of sleep-related services in the medical standards of health care, no insurance reimbursement, undergraduate sleep-related programs, and high cost of diagnostic and treatment equipment. Several professional societies focus on the development of different fields - clinical, fundamental, pediatric somnology, chronobiology and dream research. The postgraduate activities for medical doctors include different lectures online, web-based interactive educational modules on sleep disorders within the continuing medical education system, regular seminars in the major medical centers; certified (within other medical specialties) short training courses on sleep-disordered breathing and non-invasive ventilation and longer 36-72 hours courses in sleep medicine. The members of sleep-related societies perform various public activities all year round and in relation to the World Sleep Day. Diagnostic features of sleep practice include the unique use of rheopneumogram in Holter monitoring for very rough screening of apneas during sleep. Initiation of non-invasive ventilation therapy is more often started at home with the use of auto-CPAP machines. Various instrumental methods developed in Russia for insomnia treatment lack strong evidence. Support of the governmental institutions would help to solve present issues with regulatory standards in education and treatment in sleep medicine.

Keywords: Sleep, Sleep Medicine, Sleep Disorders, Russia.

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SLEEP MEDICINE IN THE RUSSIAN FEDERATION: STATE OF THE ART

Currently, somnology in Russia is recognized as a competency area (and not as a separate specialty or a subspecialty), and medical doctors specialized in different disciplines can provide medical care in the field of sleep medicine after additional training in the field (see *Education in somnology in the Russian Federation)*. The variety of different medical specialties involved in sleep medicine healthcare and services reflect the multidisciplinary nature of somnology. These specialties include internal diseases, neurology, psychiatry, cardiology, pulmonology; otolaryngology (ENT), endocrinology, psychology and others. Based on the variety of clinical specialties presented among the members of the sleep-related societies, the most common specialists involved in sleep-related health care are neurologists, cardiologists, general physicians, pulmonologists, ENT specialists, and endocrinologists. The characteristic feature of sleep medicine in Russia is a rather high number of cardiologists involved in sleep-related healthcare compared to other countries.

The development of sleep medicine in Russia is limited by a number of factors:

− No recognition of somnology as a separate specialty or subspecialty;

− The absence of legislative and regulatory documents;

− The inconsistencies in the current legislative documents;

− The lack of sleep-related services in the medical standards of health care;

− No insurance reimbursement;

− Low awareness of medical doctors and patients (the situation has been changing in the last decade);

− High cost of diagnostic and treatment equipment;

− Low interest of hospital administration and local authorities;

− Great differences between the regions.

Despite the absence of official recognition, sleep labs (the majority are medical offices of respiratory care providing continuous positive airway pressure (CPAP) therapy to sleep apnea patients) are widely spread throughout Russia mostly located in the central and western part of the country in the big cities and lacking in the small ones. Sleep-related health care is provided in more than 100 sleep

labs located in more than 50 cities of the Russian Federation (Fig. **1**). In big cities, including Moscow, St, Petersburg, Novosibirsk, Rostov-on-Don, Yekaterinburg, Irkutsk and others, there are larger specialized, multidisciplinary clinical and research sleep centers and laboratories, while in the smaller cities and towns, sleep-related health care is usually provided in non-specialized clinics.

Fig. (1). The distribution of centers/clinics which provide sleep-related services in Russia.

PROFESSIONAL SLEEP-RELATED ASSOCIATIONS IN RUSSIA

There are several professional societies in the sleep field in the Russian Federation. Clinical sleep medicine in Russia has been developing since the 1980s (the biggest impact made by the Academician A.G. Chuchalin and Professor Alexander Vein and their medical schools), and the first somnological society was organized by Professor A. Vein in the late 1990s [1]. After his decease, the society disintegrated into several associations. The Russian Society of Somnologists [2] was reorganized from the Somnology Section of the Pavlov Physiology Society of the Russian Academy of Sciences. Currently, the RSS is the official member of the Assembly of National Sleep Societies (ANSS) which is affiliated with the European Sleep Research Society (ESRS) (since 2012). The main purposes of RSS include the consolidation of specialists in different fields and building a real bridge between fundamental and clinical science by promoting research on sleep and related areas, by improving professional education and health care for patients with sleep problems, by constant scientific exchange and spreading knowledge on sleep and sleep medicine among general population and

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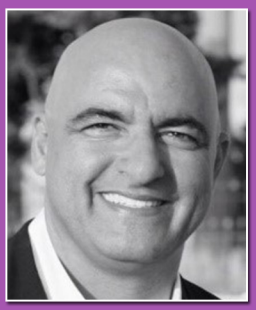

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