

OBSTRUCTIVE SLEEP APNEA SYNDROME – A MATTER OF PUBLIC HEALTH

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Abstract

Obstructive sleep apnea syndrome (OSAS) is a respiratory disease that affects 2-4% of the general population. Because of its clinical symptoms and due to its comorbidities, sleep apnea is a potentially life-threatening disorder, with an enormous negative influence on quality of life and public health. Although these consequences are well-known among Sleep Medicine researchers, Somnology and Sleep Medicine are not considered a new branch in medical specialties. In this article we have outlined some recommendations to address these shortcomings, hoping that the burden of sleep disorders and sleep deprivation can be minimized. These recommendations address four categories: public and professional education; technology; coordination of research initiatives at the Ministry of Health and National Health System; and organization of research, clinical care, and education in academic health centers.

Keywords: sleep apnea syndrome, public health, consequences, sleep medicine, education.

1. Introduction. Definition of sleep and its importance for human activity and health

Sleep is a behavioral state that is a natural part of every individual's life. A person spends about one-third of his/hers life asleep. Nonetheless, people generally know little about the importance of this essential activity. Sleep is not just something to fill in time with when a person is inactive. Sleep is a required activity, not an option. Even though the precise functions of sleep remain a mystery, sleep is important for normal motor and cognitive function. We all recognize and feel the need to sleep. After sleeping, we recognize changes that have occurred, as we feel rested and more alert. Sleep actually appears to be required for survival.

It is not normal for a person to be sleepy at times when he or she expects to be awake. Sleeping problems may be associated with concentrating difficulty, memory lapses, loss of energy, fatigue, lethargy, and emotional instability. The prevalence of sleeping problems is high and has serious consequences, such as drowsy driving or workplace accidents and errors.

Lifestyle factors and undiagnosed or untreated sleep disorders can cause sleeping problems. Lifestyle factors include not getting enough sleep, having an irregular sleep schedule, and using alcohol or certain medications. Of the more than 70 known sleep disorders, the most common are obstructive sleep apnea, insomnia, narcolepsy, and restless legs syndrome. Large numbers of individuals suffering from these sleep disorders are unaware of them and have not been diagnosed or treated for their disorder.

2. Obstructive Sleep Apnea

Obstructive sleep apnea (OSA) is a potentially life-threatening disorder in which breathing is interrupted during sleep (repeatedly stops and starts). Sleep apnea may occur to young or old persons, male or female; even children can have sleep apnea. There are certain factors that put us at increased risk for OSA: excessive weight, a neck circumference greater than 43 centimeters, high blood pressure, a narrowed airway, being male, being older, family history of sleep apnea, use of alcohol, sedative or tranquilizers, smoking and even prolonged sitting.

Repetitive episodes of no effective breath (apneas), very shallow breaths (hypopneas), or adequate breaths but with high airway resistance can occur 20 to 30 times per hour or more. These episodes cause temporary drops in blood oxygen and increases in carbon dioxide levels, which lead to frequent partial arousals from sleep. This awakening is usually so brief that we don't remember it. The frequent arousals result in ineffective sleep and account for the chronic sleep deprivation and the resultant is excessive daytime sleepiness that is a major hallmark of this condition. Limitations in upper-airway dimensions are typically associated with chronic loud snoring. Additional effects include morning headaches, high blood pressure, heart attacks, heart-rhythm disorders, stroke, and decreased life expectancy.

3. Diagnosis and treatment of OSA

Diagnostic criteria for OSA are based on clinical signs and symptoms determined during a comprehensive sleep evaluation, which includes a sleep oriented history and physical examination, and findings identified by sleep testing (polysomnography, usually performed in sleep laboratories, and polygraphy, that can be registered at home) (Epstein *et al.*, 2009, pp. 263-276).

Treatment for adult OSA can include behavioral therapy (losing weight, changing sleeping positions, avoiding alcohol, tobacco, and sleeping pills), use of mechanical devices (continuous positive airway pressure to force air through the nasal passages, or dental appliances that reposition the lower jaw and tongue), and surgery to increase the size of the airway. Positive airway pressure (PAP) is the treatment of choice for mild, moderate and severe OSA, and should be offered as an option to all patients. Alternative therapies may be offered depending on the severity of the OSA and the patient's anatomy risk factors and preferences and should be discussed in detail (Levy *et al.*, 2010, pp. 225-243).

When sleep disruption occurs, regardless of the reason, the consequences for the individual and in some circumstances for society can be serious. At present there is only limited recognition of this fundamental fact because of failure to translate advances in sleep science and medicine into educational programs and institutional action directed toward improved public health and safety.

Sleep medicine constitutes an important public health resource because of the widespread and diverse ways sleep and sleepiness are related to public health and safety (Colten and Altevogt, 2006). Health professionals have always had a major role in decisions regarding public health issues. One does not have to look far to find cogent examples of behavioral and societal changes that were initiated by and through the health care system that reduced the prevalence of catastrophic outcomes. Physicians advanced the knowledge of linkages between 'unseen' microbes and disease, which led to improvements in food preparation and waste disposal. Pulmonologists led the way in reducing cigarette smoking. Emergency department physicians helped implement mandatory seatbelt laws. These and many other public health initiatives have saved millions of lives and have improved the quality of life for many more.

Although less discussed, the economics (costs) for diagnosis and treatment of OSAS, as well as road accidents or those work related that appear because of excessive daytime sleepiness or secondary to the decrease of threshold of attention or concentration, is something not to neglect. The diagnostic protocols employed and at the same time the diagnosis costs depend on the use of polysomnography and cardiorespiratory polygraphy. Although the gold standard for OSAS diagnosis is polysomnography (PSG), this method is expensive, not available in all hospitals and frequently has long waiting lists. Respiratory polygraphy (PG) instead is a cheaper and more accessible test and correlates well with PSG. For example, in Romania, the costs for a PSG can easily rise above 200 Euro and it is possible that the patient will have to wait even one month to be diagnosed. Instead, PG is half as expensive, and the waiting list is shorter.

4. Risks and health hazards of OSA

Most people, including many involved in public health and public policy, do not know the fundamentals of homeostatic sleep need and circadian physiology, and most remain unaware of, or choose to ignore, important relationships between sleepiness and human waking performance capacity. Societal ignorance about the importance of sleep stems in part from the relative recency of scientific and medical advances in this area. In addition, our educational systems have been slow to integrate into course work even the most fundamental principles of the field, such as that the effects of chronic sleep restriction on the ability to perform are cumulative, or that adolescents require much more sleep than they routinely obtain, or that driving while sleepy is as risky as driving while impaired by alcohol. Rather, if any sleep material is presented it tends to focus on descriptive information that is largely irrelevant to public health, such as sleep stages or dreaming (Walsh, Dement and Dinges, 2011, pp. 648-656). It can be argued that sleep loss and sleepiness are other 'unseen' threats to public health. It is now appropriate and necessary to develop similar educational and regulatory approaches to improve society's understanding of sleep and sleep disorders and to modernize public policies that affect the quantity and quality of sleep. By communicating what has been learned about the effects of sleep disturbances, sleep loss, and sleepiness on public health and safety, health care professionals can encourage behavior and contribute to the formulation of public policies that promote healthy sleep and prevent sleepiness on the job and during other safety-sensitive activities such as driving (Buysse *et al.*, 2003, pp. 218-225).

Drivers with OSA have a significantly increased risk of traffic accidents than subjects without OSA. According to some statistics almost 20 percent of all serious car crash injuries in the general population are associated with driver sleepiness, independent of alcohol effects (Connor *et al.*, 2002, p. 1125). This may be related to the observation that drivers with OSA present reduced concentration and reaction time. A recent study reported that drivers with sleep apnea have a 7-fold increased risk of injury when compared to healthy drivers (Pandi-Perumal *et al.*, 2006, pp. 863-871). Daytime sleepiness can be deadly. In USA, approximately 100,000 automobile crashes each year result from drivers who were 'asleep at the wheel' (National Highway Traffic Safety Administration, 1998). Crashes in which the driver falls asleep are especially common among young male drivers.

In addition to the high risk of automobile crashes, excessive daytime sleepiness can cause difficulties with learning, memory, thinking, and feelings, which may lead to poor school and work performance and difficulty with relationships. Furthermore, daytime sleepiness leads to errors and accidents at the workplace. Sleepiness and inattention related to sleep loss and circadian rhythms adversely affect workers in many industries, as well as the general public, and lead to public health and safety problems (Walsh, Dement and Dinges, 2011, pp. 648-656).

Although there are no data available for our country, in USA, more than 800,000 drivers were involved in sleep apnea-related vehicle crashes in 2000, and those events

has costs of \$15.8 billion and 1400 lives (Sassani *et al.*, 2004, pp. 453-458). Further, studies showed that treating all drivers having sleep apnea with continuous positive airway pressure would produce a net savings of approximately \$11 million and save 960 lives each year.

5. OSA in Romania. A comprehensive analysis

In Romania, because of its costs, the number of OSA patients that can afford the treatment is rather low. The reason for this is that the key factor in the overall cost is the cost of the PAP device. It is well-known that the cost of PAP differs greatly from one country to another, depending mainly on whether the device is bought or rented. Strictly speaking, what varies is not the costs but the charges. The cost is the aggregate value of the resources needed to provide a health or clinical intervention (Mar *et al.*, 2003, pp. 515-522). PAP device prices are similar across Europe. The main charge difference among countries appears because some National Health Services rent the devices, usually at higher charges.

Nowadays, in most European countries there are one or more health services that partially cover the costs for OSAS diagnosis and/or treatment. For instance, in the United Kingdom, there is only one Health Company, NHS (National Health Service) which supports the costs for diagnosis of OSA and controls the budget for the devices that patients can get, under specialist recommendation. Hospitals have a budget for OSA treatment, and provide patient care and services. Usually, they bid once a year an amount of devices and they hold those devices in the hospital to provide them to patients. In Germany there are more than 300 Health Companies, only few private ones and they cover the costs for the first polygraphy. If this shows an increased risk of OSAS, they also cover a complete polysomnographic investigation. The Health Companies buy from different dealers the positive pressure devices (CPAP, BiPAP or Auto), other services and accessories (for instance masks, filters) and the patient has to support 10% of the entire costs. In Austria, the National Health System works similarly to that in Germany, but the prices for diagnosis and for treatment devices are smaller. The French Healthcare System offers a small discount for OSA diagnostic procedures. They provide a fixed amount for therapy for a whole year, including weekly services and accessories paid for Homecare Providers. Doctors prescribe recipes for Homecare Providers; they buy devices from different producers and offer home services for OSAS patients. Mainly, they make decisions about what device a patient should get.

In Poland, the National Health Found (NHF) limits the amount of diagnostic procedures per hospital per year, they reimburse a small amount from the diagnostic costs (the polygraphy is enough for getting a recipe, polysomnography is not necessary). 70% of the cheapest machine on the market is paid by the NHF, so, in fact, about 50% of modern devices are paid by the patient. Each recipe must be approved by NHF, only with this approval the patient can acquire a device. Patients can get a new refund every 5 years, till then all accessories costs must be supported by them. Hungary's National Health Insurance Fund reimburses most of the polysomnography

costs. Regarding the treatment, they pay 85% of the cheapest offer they have. If the patient wants a more sophisticated device, he must pay more. Masks can be replaced for a fixed price each year. To receive reimbursement, the patient must provide the Health Insurance Fund with documents about his salary, medical documentation and a personal letter in which he/she requires payment.

There are only 6 countries in Europe with no reimbursement from the National Health Companies (either for diagnosis or treatment): Romania, Bulgaria, Serbia, Bosnia, Albania and Macedonia. In Romania the prices for the PAP devices vary from 60 to 150 Euro/month, if the patient rents the machine, to up to 3000 Euro (depending on the PAP type) if the device is bought. And the worst part is that our National Health Services do not recognize OSAS as a life threatening disease, so they do not support even 1% of the diagnosis or treatment costs.

In recent years many approaches have been made to the Ministry of Health in order to obtain financial support from the National Health Insurance House (Casa Națională de Asigurări de Sănătate, CNAS) in terms of bearing at least some of the costs needed for the diagnosis and/or treatment of OSA. In Romania the problem consists in the non-recognition of Sleep Medicine as an independent medical branch. And as long as this problem is not resolved, there can be no question of signing contracts with the National Health Insurance House in order to obtain financial support funds to cover at least a part of the costs of OSA diagnosis and treatment.

At the beginning of 2011, in the Romanian Official Monitor, the Order no. 120/2011 on the completion of the Minister of Health Order no. 418/2005, approving the National Catalogue of Further Education programs in order to obtain certificates by doctors, dentists and pharmacists, as well as Methodological Norms for their organization and development was published. This order refers to obtaining certificates of complementary training in general management of respiratory sleep disorders (level I for general practitioners and level II for all the medical and/or surgical branches). Interested physicians are trained both theoretically and practically by some experienced Romanian physicians with high international recognition (trainers in Sleep Medicine). After attending these e-learning courses, every participant should sustain a written and practical exam, after which they can work in a Sleep Laboratory.

Also, at the beginning of 2011 the long and difficult process of the existing Sleep Labs accreditation has started. The accreditation of clinical sleep laboratories is essential to ensure and improve patient care. The accreditation process examines and certifies the staff and facilities of the laboratory that constitute the Sleep Medicine Centre (SMC). Accreditation of a sleep laboratory is achieved by a 2-step process, firstly a questionnaire is completed, and then a site inspection visit is conducted by a panel of independent, experienced sleep physicians. The Accreditation Commission consists of three members of the Somnology Section of the Romanian Society of Pneumology (Societatea Română de Pneumologie, SRP). They will check the application and the standard operation of the centers and give a response within three months since the date of application (Societatea Română de Pneumologie).

At the present time there are five accredited Sleep Laboratories, two in Bucharest, one in Cluj-Napoca, one in Timișoara and one in Oradea. Also many doctors of different specialties (from general practitioners to pneumologists, ENT-ists, neurologists, internists, and endocrinologists) were enrolled and attended the SRP e-learning courses to obtain a certificate of complementary training in Sleep Medicine. Yet, no exam was sustained in order to obtain this certificate.

The challenge that the sleep specialists face is to develop methods to translate the body of sleep medicine knowledge into messages and strategies directed toward reducing or resolving the economic, social, health, and safety issues associated with insufficient or disrupted sleep. Inclusion of such messages at all levels and in all forms of education is essential if the knowledge of sleep science is to positively influence public health. Lessons from other areas of medicine that led to major societal policy and behavior changes, and subsequently to improved public health, are instructive. For example, changes in societal behavior and institutional policies have now made it possible to limit the public health impact of communicable diseases. Similarly, changes in public policy have reduced motor vehicle crash fatalities and injuries due to alcohol. Fighting the most common cause of lung cancer required public health programs to warn consumers about the dangers of smoking and policies to create smoke-free environments. Considering the various areas of life in the 21st century that are especially vulnerable to sleepiness, it is apparent that untoward outcomes caused by sleepiness will persist until key scientific principles are translated into action for the improvement of public health.

Sleep researchers and clinicians must encourage many components of society to promote individual and institutional behavior change (e.g., increasing habitual sleep duration, planning work schedules with consideration of human biology). Also, research efforts must be hastened to provide detailed information on the prevalence of sleep-related mishaps and on the economic and personal consequences of inadequate sleep. This information is vital for designing approaches and targeting resources where they will be most likely to advance public health and safety (Landrigan *et al.*, 2004, pp. 1838-1848).

Evidence is accumulating that sleep disorders and restriction may be contributing factors not only to the many errors and accidents but also to certain highly prevalent disease states that are major public health concerns, such as diabetes, obesity, and hypertension (Grandner *et al.*, 2012, pp. 427-433). For each of these societal concerns, sleep science must be translated to the general public, to biomedical researchers, and to those in policy positions for better public policy and the betterment of public health. Education and recognition of true risk are necessary first steps toward improved public health and formulation of effective public policy. The health impact of inadequate or disrupted sleep should be known as well as people know the negative effects of poor nutrition, inadequate exercise, or smoking. All opportunities should be taken to translate sleep science to engender behavior change of the general public. Communication of sleep science to researchers in other biomedical areas is also necessary to encourage the

interdisciplinary approaches most likely to produce rapid advances in understanding sleep-related morbidity and its prevention.

There is also ample precedent for health professionals to assume responsibility, both individually and collectively through their professional organizations, to take action to improve the public health and safety. This includes societal health in its broadest sense: the reduction of risk and the enhancement of life quality. It is the responsibility of health professionals and biomedical organizations to foster knowledge transfer to the public, to industry, to policy makers, and to others in a position to influence public health and safety. By translating the scientific body of knowledge about sleep and its disorders, we may promote behavior change and the formulation of good public policy and as a result improve public health.

On the other hand, there are too few professionals dedicated to sleep problems to meet the size and importance of the problem and there are too few educational programs that have the potential to increase the workforce of health care practitioners and scientists to meet even current demands. The appropriate training of personnel involved in the assessment of patients and their sleep studies is paramount. For example, in UK, training in sleep studies is essential in the specialist registrar (SpR) programs for respiratory medicine, anaesthesia, and ear-nose-throat (ENT) surgery. Those intending to run a specific sleep service require a minimum of 12 months, and all respiratory trainees should spend three months, within a specialist referral center (Royal College of Physicians of London, 1993). A specialist center would need to treat at least 100 new patients with CPAP a year to allow a SpR to see at least 25 cases during a three month attachment (Scottish Intercollegiate Guidelines Network, 2003).

Training for the support staff, such as specialist technicians and nurses is equally important. At present, training is best acquired through an apprenticeship, although there is an increasing number of specialist courses designed for support staff. The magnitude of the effect of sleep pathology is shocking even to experts in the field of somnology and sleep medicine (Colten and Altevogt, 2006).

6. Policy proposals for tackling OSA in Romania

What can be done? We have outlined some recommendations to address these shortcomings, in the hope that the burden of sleep disorders and sleep deprivation can be minimized. These recommendations fall into four broad categories: (1) education (public, professional); (2) technology; (3) coordination of research initiatives at the Ministry of Health and National Health Insurance House; and (4) organization of research, clinical care, and education in academic health centers (Colten and Altevogt, 2006).

6.1. Education

To a greater extent than most scientific and medical disciplines, the field of somnology and sleep medicine cuts across many clinical and basic research disciplines, including but not limited to pulmonology, cardiology, dentistry, endocrinology, epidemiology, geriatrics, molecular biology, neurology, neuroscience, nursing, otolaryngology,

pediatrics, pharmacology, psychiatry, and psychology. Investment in sleep-related research has grown dramatically over the past 10 years; however, the growth in research and training programs have not kept up with the rapid pace of scientific advances (Colten and Altevogt, 2006). In the past, the interest was low in terms of sleep-related programs, fewer research project grants were funded, and the number of new grants awarded was small.

In USA, starting in the mid-1990s, the American Academy of Sleep Medicine (AASM) began to accredit sleep fellowship training programs. These are 1-year programs for medical doctors, which may be taken after completion of a residency (e.g., internal medicine, neurology, otolaryngology, psychiatry, or pediatrics or fellowships such as pulmonary medicine). In 2003, the Accreditation Council for Graduate Medical Education (ACGME) approved AASM's application for transferring its fellowship training program to ACGME. AASM had actively sought approval in order to further elevate the standards for training and education. The newly established ACGME accreditation program began in June 2004. Accreditation criteria cover such areas as curriculum, qualifications of faculty, fellow competencies, scholarly activities, duty hours, and evaluation. They estimated that by 2011, eligibility for board certification in sleep medicine will require attending an ACGME-accredited fellowship program in sleep medicine. In 2006 there were 24 ACGME-accredited fellowship programs and approximately 50 AASM accredited programs. Since its inception, the AASM (or its predecessor organization) certified specialists by a specialty examination. By 1991, the AASM formed an independent body to serve that function, the American Board of Sleep Medicine. Certified professionals are known as diplomats in sleep medicine. The number of diplomats rose from 21 in the late 1970s to 3250 in 2005 (Colten and Altevogt, 2006).

Also, AASM has standards for sleep centers, which include standards dealing with three broad functions: (1) accreditation of sleep centers and laboratories; (2) accreditation of sleep fellowship training programs; and (3) certification of specialists in sleep medicine. In 2005, the AASM accredited a total of 900 sleep centers and laboratories. There are two types of accreditation. One type, which accounts for the vast majority of accreditations (832 of 900), is a sleep disorders center. The centers are described as having a 'comprehensive or full-service sleep disorders program' (American Academy of Sleep Medicine, 2006). The other type of accreditation is for a more limited laboratory, for sleep-related breathing disorders only.

Now sleep medicine presents an even greater challenge for a field that requires growth in scientific workforce and technology. Thus, there must be incremental growth in this field to meet the public health and economic burden caused by sleep loss and sleep disorders. It is important that research priorities continue to be defined for both short-term and long-term goals.

A well-coordinated strategy to improve sleep-related health care is required, owing to the public health burden of sleep loss and sleep disorders coupled with the low awareness among the general population, health care professionals, professional societies, and policy makers. Increasing the awareness and improving the diagnosis

and treatment of sleep disorders requires a multipronged effort that includes three key components: public education, surveillance and monitoring of the burden of sleep loss and sleep disorders, and training for health professionals.

The lack of public awareness should prompt a multimedia public education campaign that also targets elementary, middle, and high school students as well as undergraduate college health education programs about the impact of inadequate sleep. Professional education will be enhanced by integrating the teaching of sleep medicine and biology into medical, nursing, and pharmacology curricula and into residency and specialty fellowships (Colten and Altevogt, 2006). Strategies to facilitate careers in somnology will be needed to meet the demand for sound science and expert clinical capacity to take care of the health problems related to sleep disorders.

Compared to other fields the current number of clinicians and scientists in the field is not sufficient, given the public health burden of sleep loss and sleep disorders. New investigators and clinicians knowledgeable about sleep-related research and clinical care are needed. Further, National Health Insurance House or any private foundations have not sufficiently supported the development of an adequate workforce. To strengthen the interdisciplinary aspect of the field it is not only important to attract new investigators to the field, but also to expand the number of trained scientists in other relevant disciplines electing to focus on sleep-related research.

Time devoted to sleep-related material in health and life sciences curricula is inadequate given the magnitude of the morbid effects that sleep disorders have on the most common diseases (e.g. obesity, hypertension, heart attack, and diabetes) and accidents. Focused training about sleep can positively influence the performance of health care providers. That is why postgraduate, residency, and fellowship training programs, as well as continuing professional development programs, must include this content. The curriculum should expose students in the fields of medicine and allied health fields to the etiology, pathophysiology, diagnosis, treatment, prevention, and public health burden of sleep loss and sleep disorders.

On the other hand, most large-scale public health education programs and campaigns to date have focused primarily on diet and exercise and have not included adequate information about sleep. However, the time is right for the development of a sleep campaign. There is a beginning public awareness of the importance of sleep owing to recent articles in the popular press and television programs. Two concurrent strategies are required to increase awareness among the general public: a multimedia public education and awareness campaign, and improved education and training programs to increase awareness among health care professionals.

The implication of media (TV and newspapers) is essential. In Cluj-Napoca, every month, Associate Professor Dr. Doina Todea has TV and press interventions, speaking to people about sleep apnea and other sleep disorders, about the gravity of an undiagnosed and untreated sleep pathology. We advise all persons that are heavy snorers or have breathing difficulties during sleep and excessive daytime sleepiness to contact our doctors for an appointment, because they probably suffer from a sleep disorder.

6.2. Technology

Given the cumbersome nature and cost of the diagnosis and treatment of sleep disorders and sleep loss, the resultant inequities with regard to access, and in order to ensure future quality care, greater investment in the development of new, and validation of existing, diagnostic and therapeutic technologies is required. Polysomnography, the 'gold standard' procedure for the diagnosis of most sleep disorders, is not readily available for everyone who needs it. These procedures employ simultaneous monitoring of numerous physiological parameters including brain wave activity, eye movements, muscle activity (chin and legs), heart rate, body position, and respiratory variables, including oxygen saturation. The test is typically performed overnight in a sleep laboratory with a technician in attendance, requiring an individual to sleep in the laboratory. Thus, this procedure necessitates facilities that accommodate overnight testing (beds and monitoring areas), highly sophisticated equipment, trained staff who are willing to work night shifts, and physicians trained in sleep medicine.

Although there may currently be cost-effective ways to manage sleep disorder, the capacity to diagnose and treat all individuals does not currently exist. In many health care systems and communities, waiting lists may be as long as 10 weeks (Rodsutti *et al.*, 2004, pp. 694-699). Although this is not a problem that is unique to the field, long waiting lists cause significant delays in diagnosing and treating individuals (Banno and Kryger, 2004, pp. 253-255). This is of particular concern for individuals with sleep disorders that lead to an increased chance of injury. For example, undiagnosed severe OSA can lead to death or serious harm of self or others due to crashes (George, 2001, pp. 508-512).

Limitations in providing overnight diagnostic sleep laboratory services are attributed to a number of factors (Colten and Altevogt, 2006). Direct costs associated with having a polysomnogram performed are high. In addition, there are high expenses to sleep laboratories, including costs related to the initial investment in equipment (hardware and software) and information technology needed to manage large amounts of digital data. There are considerable personnel costs related to dedicating one to two trained technicians to each patient for a 10- to 12-hour period (for orientation, hookup, and minute-by-minute monitoring) and for scoring of studies (2 to 3 hours per study), overhead for space (which traditionally has used in-patient hospital space), and costs related to consumable supplies used for monitoring. In addition, many patients are reluctant to undergo somewhat intrusive monitoring and to spend one or more nights away from home. The latter is of special concern to individuals with home care (of their children or parents) responsibilities.

These factors have contributed to an interest in developing portable, and perhaps simpler, less costly and less intrusive devices that can be used in a patient's own home, with the goals of improving access and decreasing the cost of sleep studies. Improvement in portable monitoring techniques will likely enhance access to sleep diagnostic services. With the inadequate availability of sleep centers and sleep technicians, access to portable diagnostic screening procedures and streamlining initiation of treatment would clearly

be advantageous, helping lower health costs and shorten waiting lists. In selected patient populations, portable monitoring in conjunction with inpatient split-night polysomnography or unattended auto-titration of nasal CPAP could prove to be the most cost-effective and rational approach to most patients with a clinical profile for moderate to severe sleep apnea syndrome.

6.3. National Health System

In USA, for instance, health insurance, whether private or public (e.g., Medicare or Medicaid), is a driving force in health care delivery. Health insurance coverage drives the types of services that are offered and the incentives under which physicians operate. Health insurance coverage also influences who has access to services and how consumers select and use them (Hillman, 1991, pp. 138-146; Miller and Luft, 1994, pp. 1512-1519).

Health insurance coverage also influences the quality of care, often in unintentional ways. For example, fee-for-service health insurance may promote overuse of services – ones may not be necessary or that may expose patients to greater harm than benefit. Conversely, managed care may promote potential underuse of services from which patients might benefit (Institute of Medicine, 2001). A major recommendation of the Institute of Medicine (IOM, 2001) report, *Crossing the Quality Chasm*, was to use health insurance as a means to ensure development of programs in quality improvement. Payment policies, the report recommended, should be used to reward higher quality of care. The concept of using payment methods to reward better quality of care already has taken hold in many areas of medicine. It also is occurring in sleep medicine. In several regions, private health insurers require as a condition of reimbursement that sleep studies be conducted in accredited laboratories or centers (Colten and Altevogt, 2006).

In Romania, the National Health Insurance House (Casa Națională de Asigurări de Sănătate, CNAS) supports the treatment costs of a lot of illnesses. For example diabetus melitus therapy is entirely covered by CNAS. Some of cancer drugs are also supported by CNAS. Even in pneumology field, oxygen therapy (oxygen home treatment for respiratory failure) is partially reimbursed by CNAS. Nevertheless, since sleep apnea and the other sleep disorders are not seen like a life threatening diseases, there is no support for these patients.

What could be done about that? First of all, Somnology and Sleep Medicine should be recognized by the National Health Insurance House as a new branch of medical specialties, and therefore the costs for the diagnosis and treatment of sleep apnea and other sleep disorders should be supported integrally or at least partially by this institution.

Second of all, our National Health Insurance House and Ministry of Health should try to involve more in this new area of medicine. They should even form a national center on sleep disorders research, whose role should be coordinating research in all sleep fields. This national center should take a more proactive role in promoting integration of research disciplines pertinent to somnology and sleep disorders, and should promote training programs that increase the pipeline of highly qualified investigators.

Also, this center should establish a somnology and sleep medicine career development program. This program should support trainees for a significant number of years, spanning research training in fellowship and research career development as a faculty member. It should also facilitate midcareer training opportunities and research education grants.

Existing training grants or large research programs in disciplines related to somnology or sleep medicine (e.g., internal medicine, neurology, psychiatry, psychology, otolaryngology, nursing, epidemiology, neuroscience, health services research) should allow for the addition of a sleep medicine trainee.

6.4. Organization of academic health centers

Today, Romania has only a hand of sleep laboratories. Only ten of these centers have both polysomnography and polygraphy equipment. In Cluj-Napoca there is only one accredited Sleep Laboratory, located in 'Leon Daniello' Pneumophtisiology Clinical Hospital, conducted by Associate Professor Dr. Doina Todea, with the help of Dr. Loredana Roșca, Dr. Andreea Herescu, and Head Nurse Crina Zegrean. There are four more centers in Bucharest, two in Iași, one in Timișoara, Galați and Ilfov. Our specialists attend courses in Romania and abroad, and now they train other doctors in the science of Somnology and Sleep Medicine. For example, in Cluj-Napoca, every year, we organize various courses (especially for medicine students and for general practitioners) and workshops, for specialized medical doctors, to teach them the basics about sleep disorders, (primary sleep apnea syndrome), how to diagnose and treat this pathologies.

Within academic health centers new and existing sleep programs should be organized as interdisciplinary sleep programs that encompass the relevant basic and clinical disciplines. The complexity of these programs should vary in accord with the capacity and goals of each center.

As we discussed it before, individuals with obstructive sleep apnea typically require recognition by a primary care physician, and diagnosis and treatment from a sleep specialist who is a pulmonologist, neurologist, psychiatrist, or otolaryngologist. Following, or concurrent with, diagnosis and treatment, the chronic nature of a sleep disorder also may require being seen by a specialist (e.g., endocrinologist for diabetes and obesity, cardiologist for hypertension). Patient and family education, primary care, follow-up and support are often provided by nurses with expertise in the field. Therefore, proper treatment of chronic sleep loss and sleep disorders requires multidisciplinary care. However, there has been very little education of health care professionals about the pathology, etiology, or treatment of chronic sleep loss and sleep disorders.

Efforts to enhance the training and education in somnology and sleep medicine at all levels of medical education continue to face important challenges. These happen because somnology and sleep medicine is still a relatively new field, cutting across many traditional disciplinary boundaries. Therefore, there is a need to implement a cohesive, interdisciplinary, and centrally organized sleep medicine curriculum.

Also, the importance of sleep to good health is often underappreciated; hence, it is underrepresented in the medical curriculum. And last but not least, somnology and sleep medicine is a budding interdisciplinary field; sleep and circadian rhythms interact and influence nearly every organ system. A coordinated curriculum that includes content related to somnology and sleep disorders is needed in every related teaching block.

What else can we do? A research network is of particular importance in the field of Somnology and Sleep Medicine, because of the need for a coordinated interdisciplinary research approach to basic and clinical research, clinical care, public education, and training. This network would improve the efficiency and capacity to research on rare sleep disorders. The Somnology and Sleep Medicine Centers would promote collaborations among all sites conducting research relevant to somnology and sleep medicine. Similar to cancer centers, these centers would act as local, regional, and national resources for the scientific community and the community at large. This will require coordination among all participating centers. Although online technologies greatly enhance the nearly instantaneous sharing of ideas across the nation and globally, the research network envisioned by the committee would involve not only a strong virtual component but also a structured plan for periodic and regular meetings and workshops to set priorities and strengthen interactions.

7. Conclusions

To summarize what we discussed in this article, we should remember the following:

- The negative public health consequences of sleep loss and sleep-related disorders, especially sleep apnea syndrome are enormous.
- Obstructive sleep apnea is a potentially life-threatening disorder.
- Sleep medicine constitutes an important public health resource because of the widespread and diverse ways sleep and sleepiness are related to public health and safety.
- Sleepiness and inattention related to sleep loss increase the risk of car accidents and affect workers in many industries, as well as the general public, and lead to public health and safety problems.
- The costs for diagnosis and treatment of OSAS, as well as road accidents or those work related are immense.

Some recommendations are needed to bring Somnology and Sleep Medicine among the most important medical fields, in order to be recognized by the Ministry of Health and by other appropriate bodies. The following activities should be promoted:

- increase awareness of the burden of sleep loss and sleep disorders among the general public;
- improve surveillance and monitoring of the public health burden of sleep loss and sleep disorders;
- expand awareness among health care professionals through education and training;

- develop and validate new and existing diagnostic and therapeutic technologies;
- expand accreditation criteria to emphasize treatment, long-term patient care, and chronic disease management strategies;
- strengthen the national research infrastructure to connect individual investigators, research programs, and research centers; and
- increase the investment in interdisciplinary sleep programs in academic health centers that emphasize long-term clinical care, training, and research.

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