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QUARTER THREE 2021 / VOLUME 30 / NUMBER 03

# *Noninvasive Neurostimulation Techniques*

## WHAT'S INSIDE



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**1** ResMed AirFit N30i (redesigned cushion) user guide, Jan. 2021. **2** ResMed AirFit N30i (original cushion design) user guide, Feb. 2020. **3** ResMed external controlled take-home study of 236 evaluable current AirFit N30i mask users across the US from May 20 – June 3, 2020. 115 participants trialed and evaluated the redesigned AirFit N30i cushion while 121 participants trialed and evaluated the original cushion design at home for 2 weeks. Participants rated the criteria for AirFit N30i on a Likert Scale of 1-5.

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*By Regina Patrick, RPSGT, RST*

*Aging and neurodegenerative conditions like Alzheimer's disease are associated with changes in sleep features that cause impaired memory and cognition such as slow-wave sleep (SWS), slow oscillations (SOs) and spindles. Recent research indicates administering noninvasive brain stimulation improves memory and increases spindling and SOs, but to what extent remains uncertain.*



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**2019 3rd party blinded sleep lab survey

QUARTER THREE 2021
VOLUME 30 / NUMBER 03

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## CONTRIBUTORS

### EDITOR

Rita Brooks, MEd, RPSGT, REEG/EPT, FAAST

### MANAGING EDITOR

Monica Roselli

### SENIOR WRITER

Regina Patrick, RPSGT, RST

### CONTRIBUTING WRITERS

Robyn Woidtke, MSN, RN, RPSGT, CCSH, FAAST
Kevin Asp, CRT, RPSGT
Karla J. Thompson, BA, RPSGT, CCSH

### ART DIRECTOR

Bill Wargo

### GRAPHIC DESIGNER

Alaina Kornfeld

AAST
330 N Wabash Suite 2000 Chicago, IL 60611
A2Zzz@aastweb.org | www.aastweb.org
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*From the Editor*

# Not So Fast!

***By Rita Brooks, MEd, RPSGT, REEG/EPT, FAAST***

Back in May, the Centers for Disease Control and Prevention (CDC) announced that those who were fully vaccinated for COVID-19 could unmask and return to some semblance of normal. At the time of writing in late August, we are dealing with the delta variant; persistent low vaccination rates; continuing deaths, including in younger people; and probable booster shots. Protect yourselves, your families, friends and patients and get vaccinated!

In this issue of *A$_2$Zzz*, we present some excellent educational pieces, including Regina Patrick's review of transcranial stimulation and its possible role in improving sleep and memory. Robyn Woidtke also discusses Down syndrome, reviewing common comorbidities seen in this population and the connections between these comorbidities and sleep disorders and disruptions.

The focus of Laura Linley's Compliance Corner in this issue is particularly pertinent as the pandemic continues. She takes a deep dive into remote patient monitoring and the associated billing codes, which provides information that all sleep centers and practices can use.

In many areas of the country, children likely haven't been getting back to school as usual quite as quickly or as normal as we anticipated. Our adolescents have likely improved their sleep hygiene over the course of the pandemic and the summer, but with schools reopening at the typical early start times, some sleep hygiene education is in order. Karla Thompson has provided an excellent article on this topic which reviews the research around school start times and provides pertinent information to assist you in building your education plan for this population.

AAST continues to develop new educational programs and use new venues for providing continuing education for sleep technologists. We are also addressing issues that impact us professionally and providing timely information to assist you.

This issue of *A$_2$Zzz* also provides an overview of new and upcoming resources that AAST has developed along with information on the upcoming Sleep Technologists Appreciation Week, planned for Oct. 24–30 this year. I think we are all ready for a little celebration!

Enjoy the waning days of summer and look forward to a cool, crisp and invigorating fall! Sleep well!

—Rita

*President's Message*

# A Heartfelt Thank You

***By Melinda Trimble, LRCP, RPSGT, RST, FAAST***


It's hard to believe that my time as AAST president is now coming to an end. As I wrap up my term, I can't help but feel an immense pride and sense of perseverance for the sleep community and AAST. The past two years have been anything but typical and have had profound impacts on all of our lives. Despite these challenges, there is much to be proud of and celebrate.

## COVID-19 Response

I have been blown away by the support you've all shown for each other and this community during the pandemic. So many of you willingly jumped in and assisted with AAST town halls, webinars and our resources page, offering your expertise on various subjects in a time of uncertainty. Despite being physically distant, I'm proud of the work we've been able to accomplish in these trying times.

## AAST Education

As many of you know, AAST has been expanding educational offerings in an effort to bring the latest research, techniques and updates to members and the sleep community. While it feels like just yesterday I was announcing the launch of the AAST CCSH Designated Education Program, I look back at these past two years and am happy to see that we've been able to launch a number of educational initiatives, including the AAST Advanced Pediatrics Modules Series, the AAST Advanced Sleep Titration e-Learning Course, multiple eBooks and the AAST Webinar Series hosted by the Education Advisory Committee. These initiatives could not have happened without the support and assistance from all of you. I look forward to seeing additional offerings launch in the fall and 2022, including a Fundamentals of EKG modules series.

## Celebrating Sleep Technologists

Please mark your calendars for Oct. 24–30 and join me in applauding the numerous accomplishments made in the sleep disorders centers, laboratories, educational facilities and within AAST this year. AAST has planned a full week of Sleep Technologists Appreciation Week (STAW) celebrations, including social media challenges, blogs, product discounts, an honoree photo album and much more!

As I close this message, I'd like to sincerely thank you all for allowing me to be your president. It has been a pleasure getting to meet, work and talk with so many members who share the same passions for sleep that I have.

A heartfelt thank you,

Melinda

# Instructions for Earning Credit

AAST members who read *A$_2$Zzz* and claim their credits online by the deadline can earn 2.00 AAST Continuing Education Credits (CECs) per issue, for up to 8.00 AAST CECs per year. AAST CECs are accepted by the Board of Registered Polysomnographic Technologists (BRPT) and the American Board of Sleep Medicine (ABSM).

To earn AAST CECs, carefully read the four designated CEC articles listed below and claim your credits online. You must go online to claim your credits by the deadline of **Dec. 31, 2021**. After the successful completion of this educational activity, your certificates will be available in the My CEC Portal acknowledging the credits earned.

## COST

The *A$_2$Zzz* continuing education credit offering is an exclusive learning opportunity for AAST members only and is a free benefit of membership.

## STATEMENT OF APPROVAL

This activity has been planned and implemented by the AAST Board of Directors to meet the educational needs of sleep technologists. AAST CECs are accepted by the Board of Registered Polysomnographic Technologists (BRPT) and the American Board of Sleep Medicine (ABSM). Individuals should only claim credit for the articles that they actually read and evaluate for this educational activity.

## STATEMENT OF EDUCATIONAL PURPOSE & OVERALL EDUCATIONAL OBJECTIVES

*A$_2$Zzz* provides current sleep-related information that is relevant to sleep technologists. The magazine also informs readers about recent and upcoming activities of AAST. CEC articles should benefit readers in their practice of sleep technology or in their management and administration of a sleep disorders center.

## READERS OF *A$_2$ZZZ* SHOULD BE ABLE TO DO THE FOLLOWING:

- Analyze articles for information that improves their understanding of sleep, sleep disorders, sleep studies and treatment options
- Interpret this information to determine how it relates to the practice of sleep technology
- Decide how this information can improve the techniques and procedures that are used to evaluate sleep disorders patients and treatments
- Apply this knowledge in the practice of sleep technology

You must go online to claim your CECs by the deadline of **Dec. 31, 2021**.

## READ AND EVALUATE THE FOLLOWING FOUR ARTICLES TO EARN 2.0 AAST CECS:

### Noninvasive Neurostimulation Techniques: Their Potential to Improve Sleep and Memory

***Objective:*** *Readers will review the effects aging has on sleep as well as identify and assess the neurostimulation techniques available for patients, including those suffering from memory consolidation.*


### Down Syndrome, Sleep and Associated Disorders: Discussion Across the Life Span

***Objective:*** *Readers will develop a working knowledge of Down syndrome, including comorbidities and chronic illnesses, as well as identify common sleep needs in this population.*

### Sleep Challenges in Alaska: Winter Versus Summer

***Objective:*** *Readers will identify common sleep disorders in Alaska and review suggestions for combating external factors that come with Alaskan living and solstice changes.*

### The Importance of Educating Children and Teenagers About Sleep Hygiene

***Objective:*** *Readers will review recent research on school start times and summarize the importance of sleep education and hygiene for children and teenagers.*

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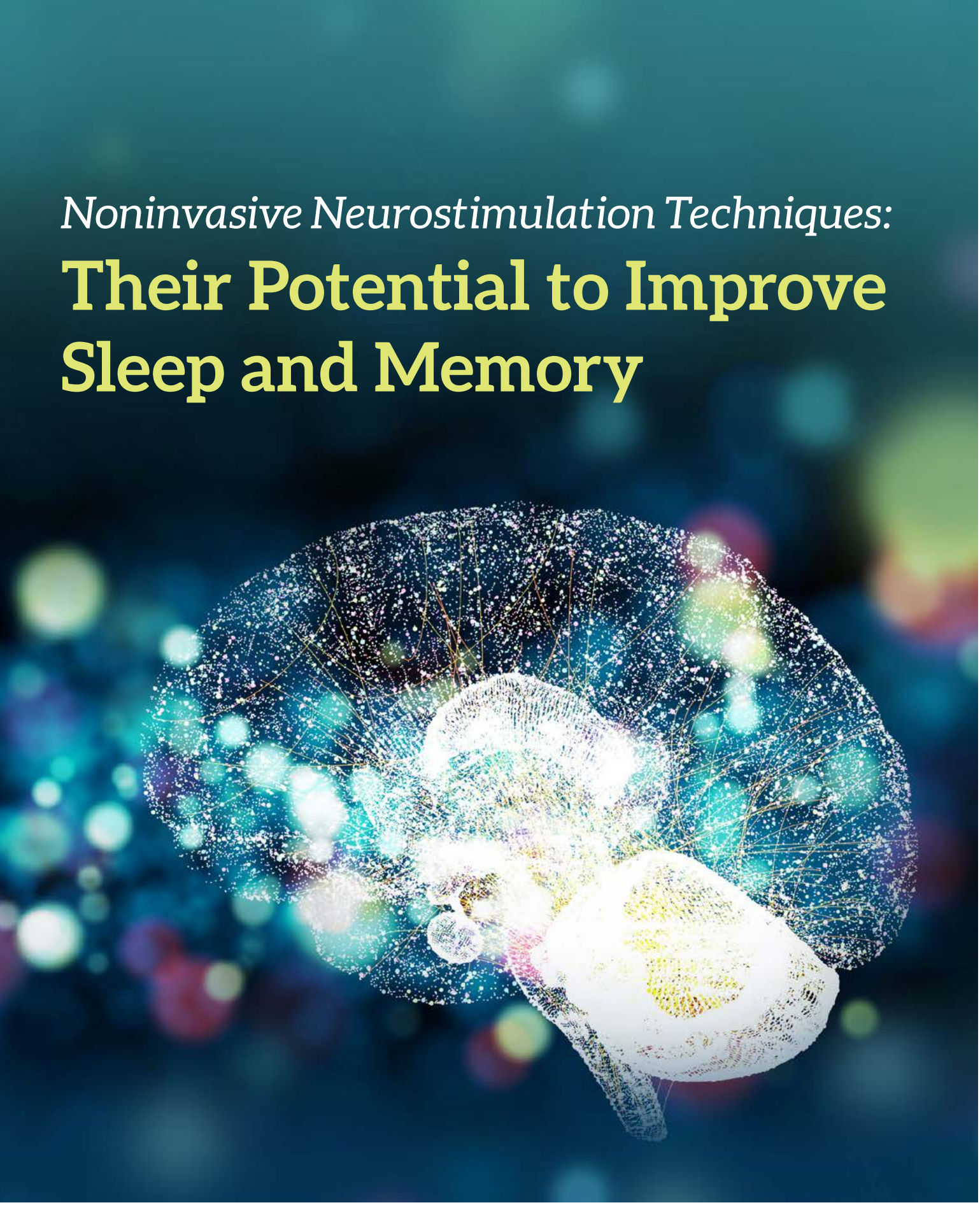
*Noninvasive Neurostimulation Techniques:*

# Their Potential to Improve Sleep and Memory



*By Regina Patrick, RPSGT, RST*

*Read more*

Aging and neurodegenerative conditions (e.g., Alzheimer's disease) are associated with changes in sleep features such as slow-wave sleep (SWS), slow oscillations (SOs) and spindles, and changes in these sleep features have been associated with impaired memory and cognition.[1-8] Some recent research indicates that administering noninvasive brain stimulation (e.g., transcranial magnetic stimulation and transcranial ultrasound stimulation) can enhance SWS, SOs and spindles.[1] These techniques can also improve certain aspects of memory in older adults and in adults with mild cognitive impairment.[9,10]

## Effects of Aging on Sleep

With aging, an individual's brain volume shrinks, particularly in the frontal cortex, which is responsible for cognitive functions such as attention, working memory (i.e., the ability to remember and use information while performing an activity) and social-emotional evaluation of stimuli. Gray matter (i.e., the cortex of the brain) also thins with aging. These changes are thought to occur because neurons shrink in volume; the number of dendrites (i.e., extensions from the neuronal body that convey an impulse from the axon of another neuron into the neuronal body) decrease; myelin (a fatty substance surrounding axons) deteriorates; and the number of connections (i.e., synapses) between brain cells also decreases, which can affect learning and memory.[11]

In addition, as people age, sleep becomes more fragmented, and sleep duration becomes shorter. The amount of SWS and slow-wave activity also reduces with aging, whereas the amount of non-rapid eye movement in sleep stage 1 and stage 2 (NREM1 and NREM2, respectively) increases. The characteristics of sleep features such as SOs and sleep spindles also change with aging.[2] SOs (i.e., a type of slow-wave activity with an electroencephalogram (EEG) frequency of <1 cycle/second or Hz) are generated by the thalamocortical system and have a lower density and amplitude in older adults than in younger individuals. SOs also have a depolarizing phase (i.e., "upstate"), which reflects neuronal activation, followed by a hyperpolarization phase (i.e., "downstate"), which reflects neuronal inhibition. Sleep spindles (i.e., intermittent short bursts of activity with a frequency of 12–15 Hz during NREM2 sleep) are generated by neurons in the thalamic reticular nucleus and synchronized by thalamocortical interactions. With aging, sleep spindles tend to reduce in density, duration, amplitude and frequency.

## Electricity Treatments

Scientists have long been interested in using electricity to treat brain disorders. In 1804, Giovanni Aldini reported his experience using what is now called transcranial direct current stimulation.[12] In his self-experiment, he used a voltaic pile to deliver the electrical current. (A voltaic pile consists of several elements, each of which contains a copper disk, which releases electrons, covered by an electrolyte — e.g., salt water-soaked felt — that is then covered by a zinc disc, which accepts electrons.) A rod extended from the pile's top disk to Aldini's head. Thus, a weak electrical current traveled from the voltaic pile to his brain. Aldini described feeling a strong shock against the inner surface of his skull, which increased as he moved the rod from ear to ear, and he experienced insomnia for several days thereafter.

In 2000, Nitsche and Paulus[13] reported their experience in applying a weak, direct current (DC) through the scalp to noninvasively modulate the activity of neurons in the motor cortex of live humans. They found that cerebral neuronal activity could be selectively increased or decreased, depending on whether an anodal electrical current (i.e., the flow of positive ions starts at the anode) or a cathodal electrical current (i.e., the flow of ions starts at the cathode) was applied; anodal stimulation enhances excitability, whereas cathodal stimulation decreases it. For either stimulation method, the neuronal activity lasted a few minutes after the stimulation.

Since the Nitsche and Paulus study, various modalities (e.g., electric current, magnetic field, sound waves) have been used to alter the electrical activity of the brain. Examples of transcranial electrical stimulation (TES) are transcranial direct current stimulation (tDCS), transcranial alternating current stimulation (tACS), transcranial random noise stimulation (tRNS), transcranial magnetic stimulation (TMS) and transcranial ultrasound stimulation (TUS/tFUS).

### Transcranial Direct Current (tDCS)

An anodal current is usually used in tDCS. Many direct current systems use sponge electrodes that are soaked in a saline solution before being applied to the head. More recently, EEG electrodes with conductive gel have been used. The active electrode (usually the anode) is placed over the target region, and the inactive electrode (usually the cathode) is placed opposite it. The current is applied for 10 to 40 minutes, depending on the activation desired, and the current applied can range from 1 milliamp to 4 milliamps.

### Transcranial Alternating Current Stimulation (tACS)

Transcranial alternating current stimulation is applied similarly to transcranial direct current stimulation, except a small pulsed alternating current is delivered through electrodes on the head. Sponge electrodes or EEG electrodes with conductive gel are used. The current applied ranges from 0.2–1 milliamp at a frequency of 0.1–640 Hz.

### Transcranial Random Noise Stimulation (tRNS)

In 2008, German researchers Terney and colleagues[14] were the first team to apply tRNS in humans. In this technique, the same equipment is used as for tACS. However, the alternating current applied to the scalp has a random amplitude and frequency (range 0.1–640 Hz). After stimulation, cortical excitability can last up to 60 minutes. However, this excitatory effect only occurs at the higher frequencies. How tRNS affects brain

*As people age, sleep becomes more fragmented, and sleep duration becomes shorter.*

*A drawback of focused ultrasound is the potential danger of brain heating, as well as the generation of unintended secondary stimulation.*

activity is unknown. An interesting finding is that reversing electrode polarities in tRNS does not interfere with increased cortical excitability (i.e., tRNS-induced cortical excitability appears to be independent of current flow direction).[15]

### Transcranial Magnetic Stimulation (TMS)

In TMS, brief pulses of currents are emitted through a stimulating coil held over a person's scalp at the target brain region. Two types of TMS exist: repetitive TMS and single-pulse TMS. The current flow (lasting <0.001 second) generates a rapidly changing magnetic field around the coil. The currents stimulate neurons on the areas on the cortex close to the stimulation. The stimulatory effects can travel to neurons just below the surface of the brain and to distant locations that are connected to certain networks. The poststimulatory effects last longer with repetitive TMS than with single pulse TMS.

### Transcranial Ultrasound Stimulation (TUS/tFUS)

In transcranial ultrasound stimulation, ultrasound waves are used to induce electrical changes in the brain. Brain regions beneath the transducer (i.e., the device that delivers the ultrasound waves) are activated. In a technique called focused ultrasound, the ultrasound waves are delivered as a continuous wave. However, a drawback of focused ultrasound is the potential danger of brain heating as well as the generation of unintended secondary stimulation. In a more recently developed technique called transcranial pulse stimulation,[16] single ultrashort (3 µs) ultrasound pulses with typical energy levels of 0.2–0.3 mJ/mm2 and pulse frequencies of 1–5 Hz are administered to the scalp. The shorter pulses and lower energy levels avoid the drawbacks of focused ultrasound. Scientists are not sure how ultrasound activates neurons in the brain. A possibility is that the mechanical effect of the waves on a neuron's surface impacts the release of neurotransmitters (e.g., serotonin, gamma-aminobutyric acid) that alter neuronal activation.[16]

## Improving Memory Consolidation

Some research indicates that applying TES during sleep modulates memory consolidation.[17] For example, Cellini and colleagues[18] applied short-duration, repetitive TES during sleep to examine the consolidation of declarative memory (i.e., the ability to remember facts) in healthy young- to middle-aged individuals. The stimulation was delivered at regular intervals (4 seconds at 0.75 Hz oscillating current) during NREM sleep. They found that this stimulation technique, compared to sham treatment (i.e., no stimulation) enhanced memory performance immediately after sleep and 48 hours later. The stimulation also increased the proportion of time spent in non-rapid eye movement sleep stage 3 (NREM3) sleep and increased the overall rate of SOs during NREM2/NREM3 sleep.

Improved memory with noninvasive brain stimulation has been noted in the elderly, as well. For example, in adults with mild cognitive impairment who were, on average, 71 years old, Ladenbauer and colleagues[10] applied a slow-oscillatory transcranial direct current (so-tDCS) during a daytime nap to modulate sleep neuronal activity and sleep-related memory consolidation. They found that the stimulation significantly increased the overall SOs and spindle power, amplified the spindle power during the SO upstate, and resulted in stronger synchronization between SO and spindle power fluctuations in EEG recordings. They further found that visual declarative memory (e.g., the ability to remember the sequence of images in a presentation) improved with the stimulation compared to without the stimulation.

In an animal study, French researcher Lendai and colleagues[19] treated rats with the serotonin-depleting drug parachlorophenylalanine. As a consequence, the animals had frequent arousals and insomnia associated with the loss of serotonin levels. After applying TES to these animals, the duration and number of rapid eye movement (REM) sleep periods increased and the brain's serotonin activity increased, which may have improved sleep.

Spindling and SOs are involved in memory consolidation, and decreases in these sleep features are associated with impaired memory.[1,3] Findings of increased spindling, SOs and improved memory with noninvasive brain stimulation are encouraging. Transcranial electrical stimulation could potentially be used to improve sleep in people with neurocognitive disorders or, when changes in spindling or SOs are detected, the technique could be used to strengthen these features to delay (or prevent) the onset of neurocognitive disorders. However, the extent transcranial brain stimulation improves sleep, cognition and memory remains unclear, and scientists continue to investigate TES techniques to learn exactly how they exert their effect and how to best utilize them as a treatment for impaired cognition and sleep.

**REGINA PATRICK, RPSGT, RST,** *has been in the sleep field for more than 20 years and works as a sleep technologist at the Wolverine Sleep Disorders Center in Tecumseh, Michigan.*

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# Down Syndrome, Sleep and Associated Disorders: Discussion Across the Life Span

*By Robyn Woidtke, MSN, RN, RPSGT, CCSH, FAAST*

Sleep disorders, as well as sleep problems, are extremely common in individuals with Down syndrome (DS), with many issues presenting at birth and persisting throughout the life span. Ensuring that sleep assessment is included throughout the life continuum for patients with DS is quite important, as sleep issues may contribute to behavior and cognitive issues or good sleep may contribute to better functioning. Knowledge and appreciation about this condition, as well as treatment options related to sleep and associated disorders for the individual and families, are essential for the sleep health professional, as the sleep problems we face as a society are exacerbated in individuals with DS. Similar to the lack of sleep inquiry in the general population, it may be that much more needs to be done to address this significant issue in this population.

## Overview of Down Syndrome

According to the U.S. Centers for Disease Control and Prevention (CDC),[1] DS is one of the most common chromosomal disorders and affects about one out of every 700 babies, or about 6,000 babies in the U.S. per year, with about 200,000 living with DS at any given time. There is a higher risk with older maternal age; however, as more deliveries are realized in women younger than 35 years old, the number of DS births are higher in that age group.

Screening may consist of maternal blood sampling and sonograms. They are usually performed for all pregnant women, and diagnosis can be made prenatally at various time points — chorionic villi sampling at 10-12 weeks, amniocentesis at 14-20 weeks and percutaneous umbilical cord sampling at 18 weeks. There are times in which the diagnosis may not be made until after birth. In any instance, the family will need support and counseling regarding the diagnosis and engagement with social services and other specialists as soon as possible to ensure smooth transitions into childhood and beyond.[1-4]

There are three variants of DS. The most common is trisomy 21, which occurs when there is an additional copy of chromosome 21 (i.e., three instead of two). Translocation occurs in about 3% of individuals — in which chromosome 21 is attached to another — and mosaic, in which some, but not all, of the cells have an extra chromosome 21. Mosaicism is the least common of the variants, and these individuals may have less disability than those with the other types. The average life span of individuals with DS has increased over time from about 25-30 years of age to around 60 years of age.[1-4]

## Comorbidity and Chronic Illness

There are higher levels of a variety of comorbidities in people with DS than in the general population. These include congenital heart defects, pulmonary hypertension, diabetes and thyroid dysfunction, vision and hearing deficits, gastroesophageal reflux, and sleep disorders.[1-5] Cognitive ability may also be impacted by associated comorbidities in many individuals, such as comorbid autism in adults with DS.[6]

One of the most common problems, particularly in children, is a poor immune system response.[7] As we know, poor sleep/sleep deprivation from any cause may exacerbate a compromised immune system. Poor immune response contributes to frequent colds and congestion, potentially leading to pneumonia. Respiratory infections and complications can impact not only the family, but also affect the health care system, as patients with DS who need to be hospitalized usually take longer periods of time to recover and may experience ongoing morbidity and mortality.[8] Thyroid dysfunction and obesity may also contribute to sleep issues, especially since the obesity rate in individuals with DS is significantly higher than in typically developing (TD) children, although overall obesity is on the rise.[1-4]

*The prevalence of sleep disorders is very high in people with DS, including behavioral sleep issues, insomnia and obstructive sleep apnea (OSA).*

Not limited to medical conditions, age-related mental health issues may arise. According to the National Down Syndrome Society,[6] in early childhood, these can manifest as anxiety, oppositional behavioral issues, rumination, disruptive activity and hyperactivity. In adolescents and young adults, depression, anxiety and obsessive-compulsive behavior

may be exhibited, as well as social withdrawal. Adults with DS can also experience mental health issues such as anxiety, social withdrawal and dementia, and have a higher incidence of Alzheimer's disease.[9] Mental health issues may contribute to poor sleep and, as such, they should be addressed and treated.

In a literature review by Gandy et al.,[10] researchers found that of the comorbid conditions they researched — sleep disorders, cardiopulmonary, thyroid and seizures — sleep disorders ranked highest in contributing to cognitive impairment in individuals with DS. Improving sleep, therefore, may be a modifiable factor in enhancing patient outcomes.[5]

## Focus on Sleep

The prevalence of sleep disorders is very high in people with DS, including behavioral sleep issues, insomnia and obstructive sleep apnea (OSA). OSA has a significantly higher prevalence in people with DS, compared to the general population, estimated to be 31%-71% compared to 1%-5% in children. There are some estimates as high as 100% in adults.[11, 12] Reasons for the increased prevalence of OSA can be attributed to multiple features of DS including hypotonia, mid-face hypoplasia, tracheal issues and macroglossia, which can predispose the individual with DS for OSA.[11-13] Obesity is known to adversely affect sleep and contribute to OSA as well.[11] The added burden of comorbidity from OSA is also present, which can create complicated care regimens.

*Treatment options for individuals with DS are similar to those of the general OSA population and consist of adenotonsillectomy as first-line therapy in children.*

The 2011 American Academy of Pediatrics Clinical Report — Health Supervision for Children with Down Syndrome[1] is quite specific in its recommendations for regular intervals of assessment of sleep and associated disorders, in particular OSA, throughout the child's life, beginning within the first six months of birth and onward with a polysomnogram (PSG) by age 4. However, a 2016 article by Esbensen et al.[14] found that only 47% of patients had a PSG which presents a clinical practice gap. (A 2019 article by Knollman[15] found after the 2011 guideline was published, more PSGs were conducted at an earlier age.) Additionally, a study in Canada[16] found that OSA is persistent throughout childhood; however, repeat PSG was not often performed and, if performed, there was a higher incidence of OSA in the population. In addition, in three out of four individuals, OSA persisted following tonsillectomy and adenoidectomy, furthering the need for ongoing longitudinal sleep assessments.

In some studies, tonsillar hypertrophy and body mass index (BMI) were not associated with an increase of OSA in children. This seems counterintuitive[11] but, when taken into the context of the multifactorial inputs, which may be additional causes such as those noted above, it is wise to assess and include other potential sources that may have a contribution to OSA. Additionally found on PSGs were higher amounts of hypoventilation, desaturation and central sleep apnea;[9] therefore, it is important to use PSG whenever possible and ensure monitoring of CO2 is included.

Treatment options for individuals with DS are similar to those of the general OSA population and consist of adenotonsillectomy as first-line therapy in children. However, in approximately 50% of patients that present with persistent OSA, continuous positive airway pressure (CPAP), rapid mandibular expansion and other surgical techniques are often used.[17-18] Adherence to CPAP by people with DS is quite similar, or may be better than, the general population. Hill et al.[18] studied adult patients with DS and the use of CPAP. Although the participants had overall low adherence, there were improved outcomes in sleepiness, behavioral and emotional outcomes, and cognition. In a retrospective by Kang et al.[19] of patients with developmental disability (DD) compared to individuals who are TD, those with a DD demonstrated better adherence than the TD. However, the literature is somewhat limited and mixed in this regard, and more studies need to be done to assess CPAP use and interventions to enhance use, therefore alluding to the potential to improve outcomes.

## Sleep, Cognitive Function and Behavioral Issues

Sleep and sleep problems greatly contribute to not only cognitive deficits but also to daytime behavioral issues. As we know, a lack of sleep creates a whole host of physiologic dysfunction in individuals that are TD, including reduced immune response and declines in executive function and working memory. Because individuals with DS have a longer time frame to reach developmental milestones,

the importance of adequate sleep is increasingly important.

Sleep disruption is known to adversely impact both cognitive and behavioral issues. Through education and use of techniques to improve sleep, the sleep health community can help parents and DS patients to better address these issues.[20]

Lastly, do not forget the parents and caregivers. Their sleep, health and well-being may also be impacted. In the early years, the caregivers may have to address a multitude of issues regarding comorbidity, find adequate resources for support and attend to many provider visits for various issues. The stress of immediate care, as well as the knowledge of the long-term issues, may place significant strain on families. In the midst of navigating health care, sleep health is often forgotten.

On a personal note, individuals with DS are a blessing, a source of joy and wonder, and provide us with a unique perspective on life. My niece has DS. She just graduated from high school. The world is her oyster, but she is our pearl.

**ROBYN WOIDTKE, MSN, RN, RPSGT, CCSH, FAAST,** *became enamored by the field of sleep in 1985. She began her career in sleep in the neonatal field before transitioning into sleep clinic administration roles and eventually the medical sleep device industry. Woidtke holds a master's degree in nursing science and a bachelor's in clinical research administration. She has authored numerous publications and lectured on a variety of sleep-related topics and is currently the principal at Sleep for Nurses, a sleep-focused educational endeavor specifically developed for practicing nurses.*

## Down Syndrome Resource

**ndss.org/resources/obstructive-sleep-apnea-syndrome**

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# Sleep Challenges in Alaska: Winter Versus Summer

*By Kevin Asp, CRT, RPSGT*

Alaska is a land of extremes, especially when it comes to the unique patterns associated with the cycle of day and night. When summer fades to fall and fall fades to winter, the sunlight fades out as well. With these intriguing patterns of day and night come sleep challenges for those who reside in the state. As a sleep technologist, especially if you live and work in Alaska, it's vital to understand the sleep challenges of those living in "The Last Frontier" and be equipped with a few tips and tricks to getting a full night of sleep — even when the sun is shining bright at 3 a.m.

## Why Is the Sun Always Shining During the Summer?

Alaska is closer to the Earth's northernmost axis, bringing it much closer to the sun when the Earth tilts one way on its axis but much farther away when it tilts in the opposite direction. The tilting of the Earth's axis causes what is known as a solstice.

During a solstice, the sun reaches its highest or lowest position in the sky, appearing to stand completely still in the eyes of astronomers. Because of its location on Earth, Alaska experiences both a summer and a winter solstice.

### Summer Solstice[1]

A summer solstice, commonly referred to as midsummer, occurs each year when one of the Earth's poles experience a maximum tilt in the direction of the sun. This event occurs two times per year: once in the northern hemisphere and once in the southern hemisphere.

Depending on the hemisphere in which you reside, a summer solstice will occur on either June 20 or June 21. Often referred to as the "midnight sun," the summer solstice in Alaska brings about days filled with rays of sunshine and little to no hours of nighttime.

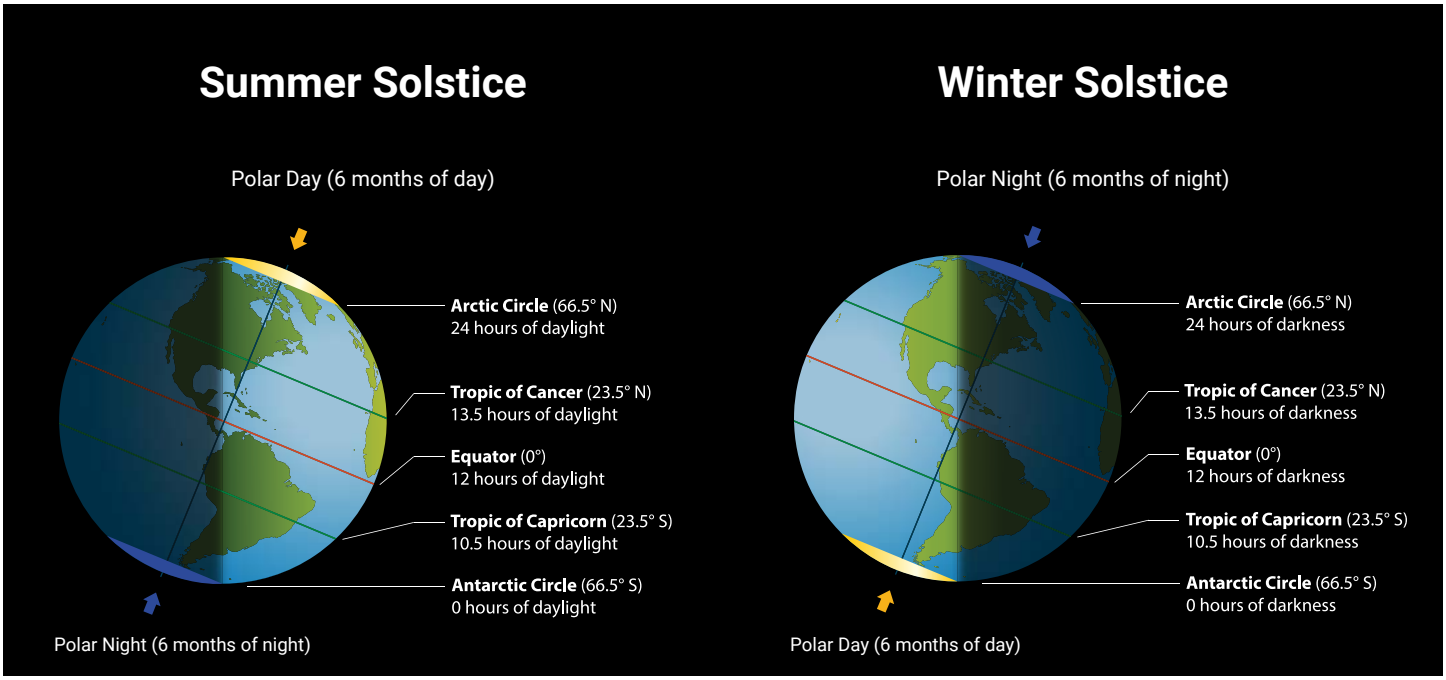
### Winter Solstice[1]

A winter solstice, also known as a hiemal solstice or hibernal solstice, occurs when one of the Earth's poles reaches a maximum tilt away from the sun. As with the summer solstice, this event occurs twice per year, one time in each hemisphere.

A winter solstice occurs on Dec. 21 or Dec. 22, bringing about shorter days and increased darkness. Individuals living in Alaska are thought to act as bears throughout the year, as they are on the go all summer long but tend to "hibernate" during the winter months.

## Sleep Disorders in Alaska

The solstices have much more of an effect than just that on the environment surrounding Alaskans. They affect overall mood and health, impacting things like the ability to fall asleep and stay asleep throughout the night.



Sleep cycles are commonly affected by an environmental agent that provides the stimulus setting or resetting of a biological clock of an organism known as a zeitgeber. The environmental agent associated with the sleep cycle is the occurrence of light and dark.[2] The extremes of light and dark environments that come with living in Alaska can disrupt the body's natural ability to produce or stop producing the hormone melatonin, which helps regulate sleep.

Residents living in Alaska experience sleep disturbances due to the exposure to days that seem to be filled with either light or dark for most of or all 24 hours in the day. Among these disturbances, the most common are insomnia and circadian rhythm disorders.

### Insomnia[3]

Insomnia is a very common medical condition affecting up to 70 million Americans each year. While there is no known cure for this sleep disorder, there are treatment options.

Insomnia may be associated with depression, anxiety, chronic illness or, for those living in Alaska, irregular patterns of day versus night. Symptoms of insomnia include difficulty falling asleep, difficulty staying asleep and waking without feeling well-rested.

Treatment options for those suffering from insomnia include improving sleep habits, behavioral therapy, identifying and treating underlying causes and, in some cases, sleeping pills may be prescribed by a licensed physician.

### Circadian Rhythm Sleep Disorders[4]

A circadian rhythm is your body's biological alarm clock. Your circadian rhythm is controlled and housed within the superchiasmatic nucleus of the hypothalamus in the brain. Life in Alaska is associated with extreme exposure to both light and dark, which is commonly the root of a circadian rhythm disorder.

Circadian rhythm disorders pose quite the health risk to an individual. Not only does this condition leave you feeling exhausted and unable to fall asleep, but it also may lead to anxiety, depression, heart conditions and hypertension.

Treatment options for circadian rhythm disorders in Alaska include bright light therapy, improved regular sleep hygiene and blackout shades.

## Combatting the External Factors of Alaskan Living

A full night of sleep is underrated by many, but it plays a vital role in your overall health and well-being. Poor sleep habits can lead to medical conditions, such as heart disease, hypertension and obesity. The following tips and tricks have been proven to help one fall asleep and stay asleep, even throughout those long summer days and dark winter months.

It may seem impossible to combat the extremes of light and darkness that come with living in Alaska, as the rotation of the Earth can't be changed, but there are things you can do to achieve a better night's rest, whether it is summer or winter in Alaska.

**Keep bedrooms dark and cool.** Keeping your sleep environment dark and cool can aid in allowing you to experience a full night of restful sleep. Experts recommend keeping your sleeping environment between 60 and 67 degrees Fahrenheit to help you fall asleep faster and stay asleep throughout the night.[5]

**Use blackout curtains.** The summer months in Alaska come with more hours of light than darkness, making it harder to fall asleep. Blackout curtains, when appropriately sized, are designed to block the sunlight out of your bedroom, providing you with a dark space to fall asleep. They also help to reflect heat in the summer months, as areas such as Fairbanks, Alaska, can reach the mid to upper 90s.

**Get outside and be active.** It is reported that approximately 10% of Alaskans suffer from seasonal affective disorder (SAD) during the winter months.[6] The prolonged exposure to days filled with darkness play a significant role in this disorder. You must get out and keep up with an active routine during the winter months to combat SAD.

**Reach out for support.** Reach out to friends, indulge in self-care and do not be afraid to ask for professional help if you find yourself slipping into depression.

**Take advantage of light therapy.** The use of light therapy is another way to combat the effects of seasonal affective disorder. A SAD lamp has been proven to improve the overall mood of the individual using it. It is recommended to use a lamp with a 10,000-lux bulb for approximately 30 minutes per day to receive the full effect.

**Utilize seasons advantageously.** Most importantly, embrace the changes in the environment around you. Each season is unique; therefore, it should be enjoyed to the fullest. Consider taking your family out for a picnic in the summertime and enjoy a cozy fire with s'mores during the winter months.

*Treatment options for circadian rhythm disorders in Alaska include bright light therapy, improved regular sleep hygiene and blackout shades.*

By understanding the sleep challenges of those who live in Alaska and arming themselves with tips to manage them, sleep technologists can provide support and education to their patients in this unique sleep environment.

**KEVIN ASP, CRT, RPSGT,** *is the president and CEO of inboundMed and enjoys helping sleep centers across the globe grow their business through his unique vision and experience of over 27 years in sleep medicine.*

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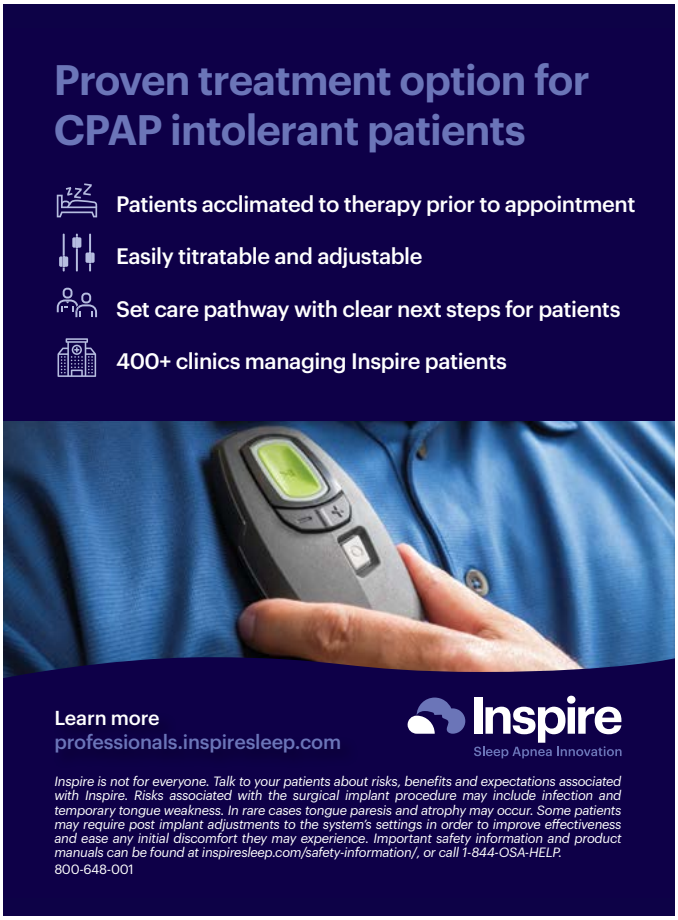

# The Importance of Educating Children and Teenagers About Sleep Hygiene

***By Karla J. Thompson, BA, RPSGT, CCSH***

With the close of summer comes the return to school for children and teenagers. For many, school might look a little different due to the coronavirus pandemic; however, whether school is taking place in a traditional setting or via an online format, it is important for children and teenagers to understand and maintain a healthy sleep schedule.

Maintaining a regular sleeping schedule becomes increasingly difficult as children get older and extracurricular activities increase. In addition to their full social schedules, as children become teenagers, they "experience delayed patterns of melatonin secretion and a slower buildup of homeostatic pressure during wakefulness."[1] Due to these changes, the circadian rhythm is delayed, causing teenagers to fall asleep and wake up later.

According to the American Academy of Sleep Medicine (AASM), "teenagers 13 to 18 years of age should sleep eight to 10 hours per 24 hours on a regular basis to promote optimal health."[1] However, multiple studies report that teens continuously average less than eight hours of sleep per night.[2]

It's reported that the percentage of high school students who get enough sleep has decreased from 25.4% in 2017 to 22.1% in 2019.[3] Chronic sleep loss wreaks havoc on the body, both physically and mentally. In adolescents and teenagers, chronic sleep loss has been associated with an increased risk of obesity, metabolic dysfunction and cardiovascular morbidity.[4] Moreover, when these health issues begin in the teenage years, there is an increased likelihood that these issues will lead to poor health as the individual ages.

Studies have also shown that chronic sleep loss leads to a decline in academic performance along with decreases in motivation or drive and an increased risk of anxiety or depression.[4] Fewer than 15% of U.S. high schools start their days at 8:30 a.m. or later, and 42% start at 8 a.m. or before.[5]

In the START study conducted by the University of Minnesota, in which researchers looked to determine the effects of delaying school start times on adolescent sleep, it was discovered that students at schools that delayed start times received an average of 43 more minutes of sleep on school nights, slept less on weekends — accumulated less sleep debt — and had similar bedtimes when surveyed two years later.[5] However, the average amount of total sleep time for these students was eight hours and five minutes — barely within the recommended eight to 10 hours.

Lo et al.[6] published the findings of a similar study in which 375 students in grades seven to 10 were studied to evaluate the short- and long-term effects of a 45-minute delay in school start times. After one month, researchers found that participants' time in bed increased by 23 minutes. At the nine-month follow-up, total sleep time increased by 10 minutes. The researchers noted that despite the East Asian sentiment of "trading sleep for academic success," delaying school start times was successful because of the combined efforts between the parents and teachers to encourage the students "to use the opportunity to get more sleep." It is simply not enough to delay school start times if teenagers aren't educated on sleep health in a positive way.

In an effort to align school start times with teenagers' normal circadian rhythms, organizations such as the AASM and the American Academy of Pediatrics (AAP) have released policy statements recommending that high schools implement start times of 8:30 a.m. or later.

*In adolescents and teenagers, chronic sleep loss has been associated with an increased risk of obesity, metabolic dysfunction and cardiovascular morbidity.*

## Sleep Education in Action

Tan et al.[7] published the results of a study in which a small sample of adolescents ages 10 to 18 years with sleep problems were subjected to one-on-one counseling sessions about sleep hygiene and then followed said adolescents for 20 weeks to observe sleep hygiene, sleep quality and daytime symptoms. Researchers concluded that there were significant improvements in sleep hygiene and sleep quality, as well as a reduction

in daytime symptoms of sleepiness. However, the researchers had several limitations, including a small sample size. The 90-minute food, emotions, routine, restrict, environment and timing (FERRET) program was geared toward adolescents and consisted of a simple rating system.

Blunden et al. hypothesized that sleep education programs do work, but the changes are rarely sustained because the programs lack the proper focus. "Delivery of sleep education in schools is clearly not sufficient if we are to achieve sleep behavior change, given that sleep and sleep hygiene practices occur within the family. Family inclusion in sleep education programs is paramount … as children age, however, the influence of peers becomes increasingly important with less parental jurisdiction … This interplay between 'significant others' such as family and peers, and how these groups view the importance awarded to good sleep is paramount to achieving behavior change. Sleep behavior change must be considered important, not just by the individual but by their family, their peers and their school community."[8]

Educating adolescents about sleep will involve more than the school and administrators. Having a local sleep specialist present on sleep is effective for launching a program, but it will take an investment from the entire community to make the program successful. Teachers will have to commit to not only encouraging students to practice sleep hygiene but also ensure that their curriculum accommodates this request. Parents will have to reinforce sleep hygiene and schedules at home.

*Sleep education should begin at an early age so that it becomes a lifestyle and not something that is dreaded by the youth.*

Sleep education should begin at an early age so that it becomes a lifestyle and not something that is dreaded by the youth. Toddlers see naps as punishment, and it is not until one reaches adulthood that naps are truly appreciated. Sleep is the easiest thing you can do for your health. Ideally, schools should support schedules that coincide with adolescent circadian rhythms. Barring that, parents, teachers, administrators and health care professionals should work together to educate themselves and their community about the benefits of sleep health.

## For a proposed definition of sleep health, see:

**Daniel J. Buysse, MD, Sleep Health: Can We Define It? Does It Matter?, Sleep, Volume 37, Issue 1, January 2014, Pages 9–17, https://doi.org/10.5665/sleep.3298**

**KARLA J. THOMPSON, BA, RPSGT, CCSH**, *is the sleep lab supervisor at the G.V. (Sonny) Montgomery VA Medical Center in Jackson, Mississippi. Starting her career at the University of Mississippi Medical Center, Thompson has worked as a sleep technologist since 2008. She currently serves as a board member for the Mississippi Sleep Society and as a volunteer for AAST.*

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# Compliance Corner

*By Laura A. Linley, CRT, RPSGT, FAAST*

## A Look at Remote Patient Monitoring and Associated Procedure Billing Codes

At the time of writing this article, the declaration of a public health emergency (PHE) on COVID-19 has just been extended another 90 days, according to a Department of Health and Human Service (HHS) announcement posted July 19, 2021.

As an industry, we have been watching this closely, as it has propelled sleep medicine providers into looking at options on how to not only manage patients with telemedicine, but be reimbursed for remote patient monitoring (RPM). There have been a lot of questions on proper use of billing codes for remote visits and the documentation needed to support these visits. I would like to spend some time reviewing information on the remote monitoring codes, specifically the ones appropriate for sleep centers. This seems to be a moving target, and it is expected that the Centers for Medicare & Medicaid Services (CMS) will continue to update and clarify the use of RPM.

Over the last several years, CMS has worked to expand reimbursement codes for RPM and has continued to help providers respond to the growing shift in demand for virtual care services. In December 2020, CMS released its 2021 Medicare Physician Fee Schedule final rule with a correction document published on Jan. 19, 2021, where CMS clarified requirements for real-time interactions and time for reviewing data — the non-face-to-face management rendered — during a calendar month.

It is important to note that the use of these codes varies from state to state and, presently, we do not have a good history of utilization. It is imperative that facilities looking to bill for remote monitoring work with their local Medicare Administrative Contractors (MACs) and private payers to determine the most appropriate code(s) for reporting remote monitoring services, as payer requirements differ.

Sleep physicians and centers often assess positive airway pressure (PAP) efficacy and compliance through remote physiologic monitoring of PAP device data. Codes 99091, 99457 and 99458 are physiologic monitoring current procedural terminology (CPT) codes that can capture the work that is already being done by sleep physicians when they review compliance data and assist with patient therapy management in between their face-to-face visits.

Notably, the data from devices used in conjunction with CPT Code 99091 do not have to be from a device as defined by the U.S. Food and Drug Administration (FDA). There is no set number of conditions that must be monitored to meet criteria related to CPT Code 99091. However, providers cannot report CPT Code 99091 in conjunction with CPT Code 99457 or 99458.

| CPT Code | Description |
|---|---|
| **99091** | Collection and interpretation of physiologic data (e.g., electrocardiogram (ECG), blood pressure, glucose monitoring, PAP utilization) digitally stored and/or transmitted by the patient and/or caregiver to the physician or other qualified health care professional, qualified by education, training, licensure/regulation (when applicable), requiring a minimum of 30 minutes of time, each 30 days.<br><br>Notably, the data from devices used in conjunction with CPT Code 99091 do not have to be from a device as defined by the U.S. Food and Drug Administration (FDA). There is no set number of conditions that must be monitored to meet criteria related to CPT Code 99091. However, providers cannot report CPT Code 99091 in conjunction with CPT Code 99457 or 99458.<br><br>Providers can be reimbursed $59.19 (non-facility and facility) for these services. |
| **99457** | Remote physiologic monitoring treatment management services that are 20 minutes or more of clinical staff/physician/other qualified health care professional time in a calendar month requiring interactive communication with the patient/caregiver during the month.<br><br>CPT Code 99457 is billable once in a calendar month, regardless of the number of parameters being monitored, and will be reimbursed $51.61 (non-facility) or $32.84 (facility). |
| **99458** | This is an add-on code for CPT Code 99457 and can't be billed as a stand-alone code. This code can be utilized for each additional 20 minutes of remote monitoring and treatment management services provided.<br><br>Providers can be reimbursed $42.22 (non-facility) or $32.84 (facility) for services rendered. As with CPT Code 99457, services are billable once per calendar month. Additionally, to be billable, the initial provider encounter must occur in the physician's office or another applicable site of the practitioner's normal office location. |

The American Academy of Sleep Medicine (AASM) FAQ page and the Board of Registered Polysomnography Technologists (BPRT) Certification in Clinical Sleep Health (CCSH) Reimbursement Guide address the use of these CPT codes. There is significant interest in how a sleep technologist with the CCSH credential can assist the sleep physician with monitoring patient adherence to therapy. The main issue to consider here is making sure the CCSH is an acceptable non-physician provider credential in the state where the service is taking place. I expect to see clarification on this as sleep providers begin to bill for these services.

# Compliance Corner *continued*

***By Laura A. Linley, CRT, RPSGT, FAAST***

CPT Code 99091 requires prior consent from patients. Practitioners must obtain beneficiary consent for the service and document it in the patient's record. For new patients or existing patients who have been seen by the billing practitioner within a calendar year, the service must be initiated during an in-person visit.

CPT Code 99457 is subject to a required "treatment plan" and not a "care plan." This is notable as the chronic care management (CCM) codes require a comprehensive care plan to be developed and in place.

To be eligible for reimbursement, only a physician or qualified health care professional (QHP) can enroll a beneficiary in the program. Services can be billed as "incident to" under general supervision — meaning the physician does not need to be on-site when integral patient services are provided by clinical staff. Practitioners must obtain consent for the service and document accordingly in the patient's record.

Further, CPT Code 99457 is not limited to treatment management services for a specific number of chronic conditions. If the patient is enrolled in multiple programs by multiple physicians for various conditions, each provider can bill separately for each program; however, they can't share equipment reimbursement for the same or similar device.

Providers can now bill CMS for both interactive communications and remote care services rendered under CPT Code 99457 or CPT Code 99458. As such, each 20-minute code can be comprised of chart review, care planning and patient messaging, as well as real-time audio communication. Providers should include all notes on beneficiary encounters and provide all related information (e.g., device interrogations, calls made to the patient and their duration, time spent reviewing data, interaction with patient records, etc.).

To bill these codes, sleep technologists and sleep centers should consider the following:

- The patient must opt-in for the service;
- The device must meet the FDA's definition of a medical device;
- The device must be supplied for at least 16 days to be applied to a billing period;
- The service must be ordered by a physician or other qualified health care professional;
- The data must be wirelessly synced so that it can be evaluated; and
- The data monitoring services may be performed by the physician, a QHP or by qualified clinical staff, depending upon state law. (A QHP is qualified by education, training and licensure/regulation [when applicable]. Clinical staff cannot independently bill for these services.)

Documentation of the visit, including the considerations just listed, is required in the patient's chart.

The chart below breaks down the key differences between CPT Codes 99091 and 99457.

| 99091 | 99457 |
|---|---|
| Reimburses only for physician or QHP | Available for physician or QHP reimbursement<br>(Either may report the use of clinical staff under general supervision) |
| Data does not have to be from a device as defined by FDA | Data must be from a device as defined by FDA |
| 30 minutes of time, each 30 days<br>Includes time spent assessing, reviewing and interpreting data along with time communicating with the patient | 20 minutes or more in a calendar month<br>Includes time spent assessing, reviewing and interpreting data along with time communicating with the patient |
| Any type of communication between patient and provider | Requires interactive, live communication between patient and provider |

*Source: https://validic.com/your-guide-to-reimbursement-for-remote-patient-monitoring/*

Another concern is your cybersecurity. Take a careful look at patient privacy exposures; confirm there are proper safeguards in place to prevent hackers from accessing patient data and proper consents are on file. It is expected that health care providers conduct telehealth in private settings such as in a private office, and patients should not receive telehealth services in public or semipublic settings. If telehealth cannot be provided in a private setting, the health care provider should continue to implement reasonable Health Insurance Portability and Accountability Act (HIPAA) safeguards to limit incident use or disclosures of protected health information (PHI). An example of a reasonable precaution could be lowering your voice and not using a speakerphone or recommending that the patient move a reasonable distance from others when discussing their health. Patient consent for a virtual/telehealth visit must be on file.

Despite some remaining uncertainties, the CMS final rule advances the ability of RPM services to drive revenue and improve the patient care experience. Remote CPT coding guidelines may differ from CMS coding guidelines as they relate to reimbursement services. Both payment eligibility and coverage policy are determined by individual insurers or third-party payers. We will continue to monitor CMS for any rule changes or guidance on RPM and the effects for our industry.

# Exciting Things Coming This Fall

***By AAST HQ***

As summer comes to a close and we move into the fall, AAST is excited for what the next few months will bring. From education to celebrations, you won't want to miss out on what we have in store.

## Education

We'll soon be launching the Fundamentals of EKG module series, which will cover topics such as cardiac anatomy and physiology, and cardiac arrhythmias. Additionally, the AAST Education Advisory Committee will be hosting another webinar for members and nonmembers. Webinar information and the registration link will be made available on the Educational Offerings page as the fall progresses. To view past educational webinars, click here.

Don't forget to check out the newly released AAST Enhanced CCSH Designated Education Program Recorded Modules. AAST members receive a discounted rate on the modules — be sure to log in to your member account before purchasing.

## Sleep Technologists Appreciation Week

Mark your calendars for Sleep Technologists Appreciation Week (STAW) 2021, taking place Oct. 24–30! Year after year, the sleep community continues to surprise and delight us, and we want to make this year's celebration better than ever.

Join us as we applaud the numerous accomplishments made in the sleep disorders centers, sleep laboratories, educational facilities and within AAST this year.

We've got a full week of celebrations planned from social media challenges to blogs and product discounts. Be sure to watch our STAW webpage for the latest details and visit our STAW store for 2021 swag.

We look forward to celebrating with you and the entire sleep community this October!


*AAST Enhanced CCSH Designated Education Program Recorded Modules*


*Fundamentals of EKG*


*AAST Webinar Series*


*Sleep Technologists Appreciation Week 2021*