ACTIGRAPHY IN ACTION

by Stephanie Richardson

With all of the emphasis on new guidelines for portable monitoring for sleep testing during the past few years, very little attention was paid to actigraphy. That all changed in 2007, however, when the American Academy of Sleep Medicine released updated practice parameters for the use of actigraphy in sleep assessment.

Also helping actigraphy gain a foothold in sleep diagnostics was the American Medical Association's classifying it as a Category I reimbursable CPT code. Until 2008, actigraphy was listed as a non-reimbursable Category III procedure. In a nutshell, this means that actigraphy has officially moved from an experimental procedure to an accepted sleep testing method, and more sleep centers are able to use it because it now pays for itself.

Studies have shown that for patients with OSA, actigraphy has been indicated to estimate total sleep time when polysomnography isn't available. There also is some evidence to support the use of actigraphy for characterizing circadian rhythms and sleep patterns in patients with insomnia or hypersomnia.

At press time, PubMed had already cited at least 15 studies published in 2009 that utilized actigraphy to measure sleep disturbances and other factors affecting sleep. Let's take a look at a few of these studies, as well as the most recent technological advances in actigraphs.

Actigraphy in action

Researchers in the department of psychiatry and behavioral sciences at the Stanford University School of Medicine, wanted to determine whether bright light can improve sleep in older insomnia patients. The study participants were men and women ranging in age from 57 to 71 who met primary criteria for insomnia. Each individual received an at-home light therapy and sleep hygiene program for 12 weeks, as well as eight office therapy sessions.

One study group received bright light therapy, while the other group received therapy with a dim light. The researchers used actigraphy alongside polysomnography to observe objective sleep measures after morning or evening bright light therapy sessions. Actigraphy helped show that objective sleep treatments were not significantly different between the bright and dim light groups. Although the light exposure shifted the circadian rhythm in test subjects, it was unrelated to changes in objective and subjective sleep measures. Stanford researchers determined that there is not strong enough support for bright light treatment in older insomnia patients.

Clinicians at the Baylor College of Medicine studied sleepiness in ICU residents because sleep deficiency in medical residents can have safety repercussions for the residents and their patients. The study aimed to provide an objective assessment of daytime sleepiness in residents. Researchers used actigraphy and sleep diaries to assess sleep times for two days and two nights prior to when a resident was on call, as well as on the day and night when residents were on call.

The assessments were measured objectively using a modified multiple sleep latency test and subjectively using the Sanford Sleepiness Scale. The data indicated that 70 percent of the residents studied had severe sleepiness on days after being on call. They concluded that despite reductions in work hours, residents working in the ICU had a severe degree of sleepiness post-call.

Finally, in a third study out of the MIND Institute (Sacramento, Calif.), researchers investigated the association between preschool children's sleep patterns measured by actigraphy and parent-reported hyperactivity symptoms. The study looked at 186 pre-school children ages 2 to 5 years old who had autism, autism with developmental delay, and typically developing children.

For one week, parents reported the presence or absence of sleep problems while actigraphy was performed. Sleep behaviors were compared for children with and without clinical levels of attention deficit/hyperactivity disorder (ADHD) symptoms. The researchers found that children with a clinical ADHD profile were more likely to be described as having a sleep problem by their parents. However, actigraphy showed no significant difference in sleep patterns or sleep-wake variability for children with ADHD profiles in the clinical range.

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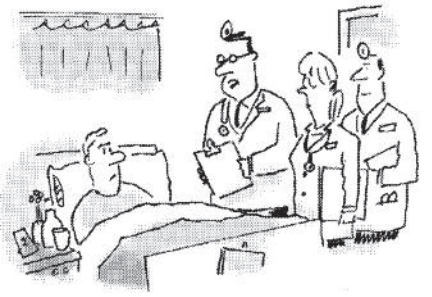

"We're concerned. Your credit score is below normal."

State-of-the-art actigraphy

Most, if not all, actigraphy devices today are designed in a wristwatch style for the most unobtrusive patient experience possible. And if the device isn't primarily worn on the wrist, many manufacturers are offering this as an option. These small, rugged dataloggers offer applications ranging from basic sleep estimation, high-resolution analog data collection, environmental data collection, wearer input features, and comprehensive sleep scoring and sleep distribution data.

One manufacturer has developed a family of actigraphy devices that records a digital measure of gross motor activity and comes equipped with a high-sensitivity accelerometer and the ability to record extra data channels. These wristwatch style devices use actigraphy principles to determine sleep schedule variability, sleep quantity/quality statistics and daytime activity patterns. Ultimately, this data helps clinicians identify the best therapeutic options for each patient, as well as understand each patient's response to treatment.

Another new feature of actigraphy devices is the ability to record information about the amount and duration of ambient white light illuminance. Such a device could be useful in research such as the Stanford study already mentioned in this article.

Some of the more advanced actigraphy devices combine an accelerometer with heart rate monitoring, and they can measure other parameters such as caloric expenditure, steps taken, and intensity level. A particular model can transmit heart rate data wirelessly to the accelerometer where it can be viewed in real time and stored for further analysis.

For actigraphy devices that are worn on chest bands, sensors are no available in smaller sizes to enhance patient comfort. These sensors, many of which are wireless, provide multi-parameter data collection within a common interface.

As actigraphy gains momentum, manufacturers are developing ways to improve upon current technology. Some of these advances are:

- greater opportunities for wireless communication between the actigraph and actigraphy provider
- smaller, more powerful batteries, which will allow devices to smaller
- compliance monitoring, or "off-wrist detection," that alerts clinicians if a device isn't working or is removed by a patient
- clothing that incorporates actigraphy sensors for more comfortable patient testing.
- under-mattress bed sensors, which provide a lower-cost alternative to the watch-type actigraphy sensor.

A final word

Even though actigraphy is not as accurate as PSG for determining some sleep measurements, studies generally agree that actigraphy is more reliable than sleep logs that rely on a patient's recall of how many times he or she woke up or how long they slept during the night. In addition, because it allows for continuous recording, actigraphy is more reliable than some other observations which only capture short time periods.

The latest research suggests that, in the clinical setting, actigraphy is reliable for evaluating sleep patterns in patients with insomnia, studying the effect of treatments designed to improve sleep, diagnosing circadian rhythm disorders, and evaluating sleep in individuals who are less likely to tolerate PSG.

Stephanie Richardson is a freelance medical writer in Philadelphia.