Actigraphy: A Key Choice

The uses for actigraphy are many in terms of measuring treatment outcomes; it can be implemented over several nights to help physicians determine the effectiveness of medications to treat such disorders as periodic limb movement syndrome and restless legs syndrome.

Polysonrnography has been, and remains, the gold standard by which suspected sleep disturbances are evaluated. The encompassing cost of overnight, monitored sleep studies rules out the possibility of long-term evaluation. There are patients who report a consistent sleep diary, but complain of excessive daytime somnolence and have been evaluated polysomnographically, only to have a report read "within normal limits"; they are left wondering about the fate of their sleepiness. Patients with insomnia who have a tremendous night-to-night variability are not normally seen in the sleep laboratory. These patients may be treated pharmacologically; however, is there a way to monitor the effectiveness of their treatment? In the past, physicians have been left with few options outside the counsel of rigorous sleep hygiene. Actigraphy may be the most viable option, in terms of a cost-effective means by which to monitor long-term circadian rhythms. This technology has granted physicians another tool to assist and assess patient outcomes.

Actigraphy was first introduced in the early 1970s. It was a means to differentiate sleep from wake, based on movement. Kupfer and colleagues introduced self-contained activity counters, in which circuits and memory could be retrieved by an off-line source. Several years later, analog actigraphs were developed. These analog recordings would be hand-scored after the telemetry data had been retrieved. With technological advances, actigraphy moved into the digital era. The first digital actigraphs were approximately half the size of a chalk board eraser. Actigraphs in 2003 are the size of an average man's wristwatch. These newest models collect digital data and some even have the capability to record light exposure and core body temperature, in addition to the movement being recorded. These advances in digital acquisition grant the researcher many avenues for exploring the true nature of the patient's sleep/wake cycle. Patterns are easily recognized once the recordings are downloaded and analyzed. With the advent of light exposure data, a better view of overall body rhythm may be examined. Data may be recorded up to several weeks. It is recommended that data is downloaded weekly to avoid the loss of information. All calibrations and batteries should be checked on a weekly basis to ensure data reliability.

Every subject wearing an actigraph should be keeping a sleep diary to correlate with the data. The diary should include bedtime, wake time, approximate number of nocturnal awakenings, caffeine and alcohol consumption, and number of naps taken. There should be ample room for the subject to record personal information in the diary ("please list any unusual happenings for this day"). This is especially important if the patient's primary diagnosis is psychological insomnia. It may be of clinical significance to correlate the personal information and the actual data recorded. What may have once been the physician's suspicion can now be easily concurred with actigraphy data. Clearly, on the days when higher stress is reported, subjects will have greater activity during the nocturnal recording. The diary is extremely beneficial for patients who report a high incidence of insomnia, but slept well while being recorded polysomnographically. This population with "sleep state misperception" may benefit from actigraphy if for no other reason than the physician can more thoroughly explain the nature of the problem.
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Actigraphy does have a role in modern sleep medicine. The American Academy of Sleep Medicine (AASM) concluded that actigraphy is a useful adjunct to a detailed history and physical examination, when multiple days of sleep-wake activity patterns are necessary to diagnose sleep disorders. Actigraphy may also be useful in determining the efficacy of treatment. Specifically, the AASM stated that actigraphy is not recommended for the routine diagnosis of sleep disorders.

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of insomnia, obstructive sleep apnea, or periodic limb movements in sleep. Those who have worked feverishly in the polysomnographic arena to establish the standards of diagnosis and treatment will never substitute actigraphy for the gold standard. Actigraphy was not designed as a means of substitution, but a tool aiding diagnosis.

This tool seems to be greatly underutilized. The national compliance rate for nasal continuous positive airway pressure (nCPAP) is approximately 50%. Half of the people diagnosed and prescribed therapy are not likely to wear the device. It would be educational to show an actigraph recording of these patients demonstrating nights with and without therapy. It may change some attitudes regarding therapy once it is established that not only is the apnea eliminated with CPAP but so is all the kicking and jerking associated with the arousals. The actigraph may be the means to convince some patients that treatment is effective. It would be great to see the compliance increase knowing that the alternatives for untreated apnea are so bleak. The uses for actigraphy are many in terms of measuring treatment outcomes. How does a physician fully evaluate the efficacy of medications to treat periodic limb movement syndrome (PLMS) or restless legs syndrome (RLS)? Actigraphy could be used over several nights to determine effectiveness. Both PLMS and RLS have an increased night-to-night variability not seen with apnea patients. Monitoring these patients in their home environment over several nights may be the key.

Actigraphy has been used to study adolescents, shift workers, and flight crews (particularly interesting in the military where amphetamines are regularly prescribed to combat fatigue in pilots), the elderly, and those suffering jet lag. It appears actigraphy also has a place in academia in the field of research. The benefits of this research are just beginning to shed light on the disorders that have eluded the field of sleep medicine.