AmeriHealth Caritas Ohio

Actigraphy

Clinical Policy ID: CCP.1275

Recent review date: 12/2025

Next review date: 4/2027

Policy contains: Actigraphy, circadian rhythm sleep disorders, polysomnography.

Coverage policy

Actigraphy is considered experimental/investigational and not clinically proven.

Limitations

No limitations were identified during the writing of this policy.

Alternative covered services

- Facility based polysomnogram.
- Multiple sleep latency test.
- Split-night sleep studies.
- Unattended home polysomnograms.

Background

Actigraphy is a method of continually measuring patterns of human rest and activity cycles (unit movements) through an actimetry sensor. The technique was first used in the 1960s. The three main types of this device are sleep actigraphs, activity actigraphs, and movement actigraphs. Improvements in actigraphy technology include piezoelectric sensors, lithium batteries, and digital data storage (Martin, 2011).

Since the 1990s, the predominant purpose for the device has been to monitor sleep behavior. Sleep actigraphs, which are worn on the non-dominant arm like a wristwatch, often for a week or more, are used for disorders like insomnia, circadian rhythm sleep disorders, sleepiness, and restless leg syndrome. Unlike polysomnography, actigraphs permit movement by the patient while data are recorded. Information can be transmitted to a computer or can be analyzed in real time (Martin, 2011). Actigraphy offers a more convenient, less invasive, waterproof, and lower cost option to polysomnography. Data from actigraphy can cover multiple nights, while polysomnography is performed in a laboratory, usually for only one or two nights (Fekedulegn, 2020).

Actigraphy is also used to measure activity behavior. Activity actigraphs are worn like a pedometer around the waist. They are used for several days and evaluate activities while awake, plus calories burned. Activity actigraphs are preferable for measuring and assessing activities during waking hours rather than sleep.

A third type of actigraphy is used to measure human movement to determine problems with gait and other physical impairments. Movement actigraphs are larger than sleep or activity actigraphs and are worn on the dominant shoulder. These actigraphs are three-dimensional (the others are one-dimensional) and are used only for several hours at a time (John, 2012).

Several devices have received 510(k) regulatory approval as Class II worn activity devices. The devices are intended to monitor the activity associated with movement during sleep and can be used to analyze circadian rhythms and assess activity in any instance where quantifiable analysis of physical motion is desirable (U.S. Food and Drug Administration, 2023).

Findings

The totality of evidence regarding actigraphy demonstrates that while the technology offers a feasible, non-invasive method for estimating sleep parameters in real-world settings, it does not currently possess the diagnostic accuracy to replace polysomnography as the clinical standard. Systematic reviews and meta-analyses consistently indicate that although actigraphy exhibits high sensitivity in detecting sleep, it lacks the specificity required to distinguish motionless wakefulness from true sleep or to accurately classify sleep stages. Research highlights significant heterogeneity in device performance, scoring algorithms, and study protocols, limiting the ability to generalize findings across patient populations. Consequently, professional guidelines offer only conditional recommendations for its use in specific sleep disorders. Recent data regarding its application in pediatric and psychiatric cohorts confirm that confounding factors and a lack of standardization preclude its acceptance as a medically necessary diagnostic alternative.

<u>Guidelines</u>

The primary clinical guidance for this technology comes from the American Academy of Sleep Medicine, which issued recommendations for the use of actigraphy to evaluate sleep disorders and circadian rhythm sleep-wake disorders. The Academy limited these recommendations to clinical-grade devices approved by the U.S. Food and Drug Administration, explicitly excluding consumer wearable devices or nonprescription devices directly marketed to consumers (Smith, 2018a). The guidelines provide one strong recommendation, which advises against using actigraphy in place of electromyography for the diagnosis of periodic limb movement disorder in adult and pediatric patients.

All other recommendations are graded as conditional, reflecting a low degree of certainty regarding outcomes and appropriateness for all patients. These conditional recommendations suggest using actigraphy to estimate sleep parameters in adult and pediatric patients with insomnia disorder or circadian rhythm sleep-wake disorder. Additionally, the Academy conditionally supports using the device to estimate total sleep time in adults with suspected insufficient sleep syndrome or suspected sleep-disordered breathing, provided it is integrated with home sleep apnea tests in the absence of alternative objective measurements. Finally, the guidelines suggest using actigraphy to monitor total sleep time prior to testing with the Multiple Sleep Latency Test in patients with suspected central disorders of hypersomnolence (Smith, 2018a).

<u>Meta-analyses</u>

Quantitative syntheses of the literature generally demonstrate that while actigraphy provides more useful data than sleep logs alone, it consistently differs from the gold standard of polysomnography. A meta-analysis of 81 studies, which served as the basis for the American Academy of Sleep Medicine guidelines, found that actigraphy estimates correlated more closely with polysomnography than sleep logs in patients with insomnia, circadian rhythm disorders, and sleep-disordered breathing, provided validated algorithms and standardized scoring were used (Smith, 2018b). However, a separate meta-analysis of 96 studies involving 4,134 participants found significant discrepancies in measurement. Compared to polysomnography, actigraphy overestimated total sleep time by an average of 22.42 minutes and underestimated sleep onset latency by 7.70 minutes, with larger differences observed in adults with chronic conditions compared to healthy adults (Conley, 2019). Regarding specific pathologies, a meta-analysis of 14 studies on periodic limb movements noted that results were heterogeneous and required improvement before replacing polysomnography (Plante, 2014).

Recent meta-analyses have focused on specific clinical indications and pediatric feasibility. In the realm of mental health, a 2025 meta-analysis of 19 observational studies (N = 1,368) assessed sleep abnormalities in individuals at clinical high risk for psychosis and those with schizophrenia spectrum disorders. The study found that while actigraphy could detect increased total sleep time in schizophrenia spectrum disorders compared to healthy controls, the results were heavily confounded by medication effects, age, and gender, limiting clinical interpretability (Aronica, 2025). Regarding pediatric use, a 2025 meta-analysis of 135 studies covering 64,541 children demonstrated a high pooled adherence rate of 81.6%. Notably, this analysis found that adherence was significantly higher in children with neurodevelopmental or mental health diagnoses compared to undiagnosed peers, though variability across study contexts remained high (Morris, 2025).

<u>Systematic reviews</u>

Systematic reviews of the broader evidence base highlight that actigraphy possesses high sensitivity for detecting sleep but limited specificity for identifying wakefulness. A large review noted that specificity levels were consistently low, ranging from 26% to 77% in healthy subjects and 32% to 80% in patient groups, because the devices often fail to identify motionless wakefulness (de Zambotti, 2019). This limitation was reinforced by a 2024 review of eight studies (N = 1,139), which found that while actigraphy showed moderate accuracy in distinguishing wake from sleep, its ability to classify specific sleep stages such as light, deep, or rapid eye movement sleep was limited (Yuan, 2024).

In comparative studies of home-based measures, a review of 71 articles found that results for diagnosing insomnia were mixed, though findings were generally consistent for measuring sleep patterns in mental health disorders (Scott, 2020). Regarding prognosis in heart failure, a review of 17 studies (N = 2,759) found that while real-world measurement is feasible, the prognostic value of actigraphy varies depending on the specific physical activity parameter considered (Tan, 2019). Similarly, a review of 38 studies (N = 3,758) on depressive and bipolar disorders found discernible measurement patterns but concluded that further research linking results to disease severity is needed to establish clinical utility (Tazawa, 2019). Consensus from the International Biomarkers Workshop in Sleep and Circadian Science further indicates that wearable devices still lack validation against gold standard measurements (Depner, 2020).

Evidence regarding the use of actigraphy in pediatric populations reveals variable accuracy depending on the clinical condition and the specific device used. In newborns (N = 40) admitted to neonatal intensive care, actigraphy showed accurate sleep-wake detection compared to polysomnography (Unno, 2021). Children with autism spectrum disorder (N = 26) also showed similar results between the two methods for most parameters (Yavuz-Kodat, 2019). However, significant discrepancies were noted in other pediatric groups. In children referred for snoring or enlarged tonsils (N = 56), actigraphy underestimated total sleep time by 31.5 minutes and sleep efficiency by 12.9% while overestimating wake after sleep onset by 56.1 minutes (Burkart, 2021).

Similarly, in children with attention deficit hyperactivity disorder (N = 48), the device underestimated sleep duration and efficiency compared to healthy controls (Waldon, 2016). Comparisons of specific devices found that while both the Actiwatch 2 [Manufacturer, City, State] and a fitness tracker showed high sensitivity in children (N = 17) and adolescents (N = 17), specificity was poor, particularly in adolescents (Pesonen, 2018). Additionally, in children treated for craniopharyngioma (N = 50), actigraphy differed from polysomnography by an average of 15 minutes for total sleep time (Niel, 2019).

In adult populations, the diagnostic utility of actigraphy is frequently compromised by disease-specific factors and demographic variables. Studies in sleep laboratory settings (N = 281) indicated that actigraphy overestimated sleep time in obstructive sleep apnea but underestimated it in narcolepsy (Alakuijala, 2021). Among adults with insomnia (N = 53), the device showed better detection rates for those with normal sleep duration compared to those with short sleep duration (Galbiati, 2021). Accuracy appears particularly low in older adults; one study of elderly males (N = 1,141) found actigraphy did not accurately predict sleep quality compared to polysomnography (Faerman, 2020).

Another study of older adults in a home setting (N = 46) reported a specificity of only 40% (Regalia, 2021). Agreement with polysomnography was also poor in patients with traumatic brain injuries (N = 227), where actigraphy underestimated sleep disruption (Zeitzer, 2020). In pregnant women (N = 78), differences in sleep measures were significant, with authors suggesting that specific scoring settings are required to improve accuracy in this population (Zhu, 2018). Finally, comparative results were similar for participants with chronic insomnia disorder (N = 35) but discordant for those with sleep-disordered breathing (N = 31), limiting generalizability (Choi, 2017).

In 2025, we reviewed a systematic review and meta-analysis, which found that actigraphy detected sleep abnormalities in schizophrenia spectrum disorders but was significantly confounded by medication effects (Aronica, 2025), and a systematic review and meta-analysis demonstrating generally high device adherence in school-aged children, particularly those with health diagnoses (Morris, 2025); no policy changes were warranted.

References

On November 18, 2025, we searched PubMed and the databases of the Cochrane Library, the U.K. National Health Services Centre for Reviews and Dissemination, the Agency for Healthcare Research and Quality, and the Centers for Medicare & Medicaid Services. Search terms were “actigraphy,” “sleep studies,” “obstructive sleep apnea,” and “polysomnography.” We included the best available evidence according to established evidence hierarchies (typically systematic reviews, meta-analyses, and full economic analyses, where available) and professional guidelines based on such evidence and clinical expertise.

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Policy updates

11/2016: initial review date and clinical policy effective date: 4/2017

11/2017: Policy references updated.

11/2018: Policy references updated. Policy changed from medically necessary to investigational.

11/2019: Policy references updated. Policy ID changed to CCP.1275.

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