02.01.59 Home Sleep Studies - Pediatric

Wellmark Blue Cross and Blue Shield is an Independent Licensee of the Blue Cross and Blue Shield Association.

Original Effective Date: April 2018

Review Date: August 2025

Revised: August 2024

DISCLAIMER/INSTRUCTIONS FOR USE

This policy contains information which is clinical in nature. The policy is not medical advice. The information in this policy is used by Wellmark to make determinations whether medical treatment is covered under the terms of a Wellmark member's health benefit plan. Physicians and other health care providers are responsible for medical advice and treatment. If you have specific health care needs, you should consult an appropriate health care professional. If you would like to request an accessible version of this document, please contact customer service at 800-524-9242.

Benefit determinations are based on the applicable contract language in effect at the time the services were rendered. Exclusions, limitations, or exceptions may apply. Benefits may vary based on contract, and individual member benefits must be verified. Wellmark determines medical necessity only if the benefit exists and no contract exclusions are applicable. This medical policy may not apply to FEP. Benefits are determined by the Federal Employee Program.

This Medical Policy document describes the status of medical technology at the time the document was developed. Since that time, new technology may have emerged, or new medical literature may have been published. This Medical Policy will be reviewed regularly and updated as scientific and medical literature becomes available; therefore, policies are subject to change without notice.

Related Policy
None

Summary

Description
Note: *This evidence review only applies to pediatric individuals 17 years old or less.*

A proposed method of diagnosing a sleep related disorder is a pediatric home sleep study. Home sleep studies are an alternative to facility-based sleep studies (polysomnography (PSG) and are frequently performed in adult individuals. Home based sleep studies in the pediatric population has been purposed for the evaluation in the diagnosis of sleep related disorders.

Summary of Evidence
For individuals who was 17 years old and younger who receive an unattended home-based sleep study the evidence includes a systematic review, randomized controlled trial (RCT), and a nonrandomized

study. Relevant outcomes are test accuracy, symptoms, functional outcomes, and resource utilization. The evidence for limited channel home sleep apnea testing (includes type 4 monitors) in children who have OSA consists of studies on diagnostic accuracy. A number of questions remain about the ability of these home sleep apnea tests to detect clinically significant OSA without sensors for respiratory effort, airflow, and oxygen saturation (or alternatively PAT, actigraphy, and oxygen saturation). The medical literature is limited in children when comparing home sleep studies to facility-based polysomnography, the gold standard in the diagnosis of obstructive sleep apnea in the pediatric population we well as when comparing home sleep studies to polysomnography in children with comorbidities or in children (< 2 years of age). Per the 2016 systematic review, evidence from low-quality studies published between 1995 and 2010 found widely varying diagnostic accuracy results for home sleep testing for pediatric obstructive sleep apnea syndrome (OSAS) compared with PSG. More recent studies of ApneaLink and SleepImage found generally high concordance rates between these devices and PSG in adolescents and children aged 5 to 9.9 years, respectively, but none evaluated clinical utility. Home sleep studies that focused on the feasibility of using home-based sleep studies in children suggest that home sleep studies may be technically feasible in the pediatric population under carefully controlled conditions (e.g., electrodes placed by a trained clinician) however, additional data examining the use of home sleep studies in real-life settings with standardized recording channels and criteria for success is required to accurately determine the feasibility of this testing. In addition to the paucity of literature supporting the use of home sleep studies in children. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

Additional Information

None

OBJECTIVE

The objective of this evidence review is to evaluate the evidence for home-based sleep studies the pediatric population.

PRIOR APPROVAL

Not applicable

POLICY

Unattended home sleep studies are considered **investigational** in pediatric individuals (17 years old and less) because the evidence is insufficient to determine the technology results in an improvement in the net health outcomes.

POLICY GUIDELINES

Obstructive Sleep Apnea in Children

The presentation of OSA in children may differ from that of adults. Children frequently exhibit behavioral problems or hyperactivity rather than daytime sleepiness. Obesity is defined as a BMI greater than the 90th percentile for the weight/height ratio. Although the definition of severe OSA in children is not well established, an AHI or Respiratory Disturbance Index (RDI) greater than 1.5 events per hour is considered abnormal (an AHI or RDI $\geq$10 events per hour may be considered severe).

Coding

See the Codes table for details.

BACKGROUND

Obstructive Sleep Apnea (OSA)

Obstructive sleep apnea (OSA) is characterized by episodes of complete or partial upper airway obstruction during sleep, often resulting in gas exchange abnormalities and disrupted sleep. Untreated OSA in children and may be associated with learning and behavioral problems, cardiovascular complications, and impaired growth (including failure to thrive). OSA occurs in 1% to 5% of children. It can occur at any age and may be most common in those between two and six years of age.

Adenotonsillar hypertrophy and obesity, defined as a BMI greater than the 90th percentile for the weight/height ratio, are the major risk factors for obstructive sleep apnea (OSA) in otherwise healthy children. The contribution of each of these risk factors varies among individuals and also tends to vary with age. Other risk factors for OSA include medical, neurological, skeletal or dental conditions that reduce upper airway size, affect the neural control of the upper airway, or impact the collapsibility of the upper airway. Examples include the following:

- Achondroplasia
- Cerebral palsy
- Craniofacial anomalies (e.g., retrognathia, micrognathia, midface hypoplasia)
- Down syndrome
- Family history of OSA
- History of low birth weight
- History of prematurity and multiple gestation
- Muscular dystrophy or other neuromuscular disorders
- Mucopolysaccharidoses (e.g., Hunter syndrome or Hurler syndrome)
- Myelomeningocele
- Orthodontic problems (e.g., high narrow hard palate, overlapping incisors, cross bite)
- Prader-Willi syndrome

A physical examination should be completed and is directed towards identification of causes of sleep disorders or conditions associated with sleep pathology. The examination includes a general physical examination, oropharynx/airway examination and neurological examination. Clinicians should incorporate questions about sleep into routine health assessment for children of all ages because parents may not volunteer information about their child's sleep or may not appreciate the potential relationship between sleep problems and daytime behavior. Children with sleep disorders may present with different symptoms than adults. Most children with obstructive sleep apnea may present with daytime attentional or behavioral problems rather than overt sleepiness. Even within the pediatric age group, the clinical manifestations of sleep problems may vary by age and developmental level. A school aged child with excessive sleepiness may exhibit motor over-activity, inattentiveness or irritability and may worsen certain medical or psychiatric problems. In adolescents sleep problems may coexist with anxiety or depression

A thorough sleep and medical history provides the foundation for diagnosis and management of sleep problems. A variety of checklists and questionnaires are available to supplement the history. One of the best validated questionnaires is the Sleep-Related Breathing Disorder (SRBD) scale from the Pediatric Sleep Questionnaire (PSQ). The SRBD generates a score that correlates OSA related impairment of behavior, quality of life and sleepiness. The SRBD scale contains a four-item sleepiness subscale that has been validated against the multiple sleep latency test (MSLT), the total score on the PSQ ranges from 0.0 to 1.0, and a score of $\geq$ 0.33 suggests high probability for presence of OSA. Another questionnaire that may be utilized as an initial screening tool, is the 8- item screening tool I'M SLEEPY which was developed for primary care physicians to screen for pediatric OSA. This type of screening can help

identify individuals who should be evaluated with a more detailed sleep history. The history should include details about the duration and frequency of the problem, temporal profile of onset (abrupt, gradual, intermittent), and degree of variability from night to night. Most chief complaints can be placed into one (or more) of four categories:

- Abnormal movements or behaviors before or during sleep
- Difficulty initiating or maintaining sleep
- Excessive daytime sleepiness
- Snoring or other breathing problems during sleep

Parents are generally asleep during the night, they may struggle to provide a full history, as they may witness only portions of nighttime events. Some parents may generate diaries or logs of sleep problems, and the widespread availability of home video cameras and smartphones have increased the opportunity for physicians to observe episodes of abnormal movement or behavior.

Table 1. Definitions of Terms and Scoring Criteria for OSA

Terms	Definition
Respiratory event	
Apnea	The frequency of apneas and hypopneas is measured from channels assessing oxygen desaturation, respiratory airflow, and respiratory effort. In adults, apnea is defined as a drop in airflow by 90% or more of pre-event baseline for at least 10 seconds. Due to faster respiratory rates in children, pediatric scoring criteria define an apnea as 2 or more missed breaths, regardless of its duration in seconds.
Hypopnea	Hypopnea in adults is scored when the peak airflow drops by at least 30% of pre-event baseline for at least 10 seconds in association with either at least 3% or 4% arterial oxygen desaturation (depending on criteria) or an arousal. Hypopneas in children are scored by a 50% or greater drop in nasal pressure and either a 3% or more decrease in oxygen saturation or associated arousal.
RERA	Respiratory event-related arousal is defined as an event lasting at least 10 seconds associated with flattening of the nasal pressure waveform and/or evidence of increased respiratory effort, terminating in arousal but not otherwise meeting criteria for apnea or hypopnea.
Respiratory event reporting	
AHI	The apnea/hypopnea index is the average number of apneas or hypopneas per hour of sleep.
RDI	The respiratory disturbance index is the number of apneas, hypopneas, or respiratory event-related arousals per hour of sleep time. RDI is often used synonymously with the AHI.
REI	The respiratory event index is the number of events per hour of monitoring time. Used as an alternative to AHI or RDI in-home sleep studies when actual sleep time from EEG is not available.
OSA	Obstructive sleep apnea is repetitive episodes of upper airway obstruction due to the collapse and obstruction of the upper airway during sleep.
Mild OSA	In children: AHI ≥1.0 to <5
Moderate OSA	Children: AHI of ≥5 to <10

Terms	Definition
Severe OSA	Children: AHI of ≥10
UARS	Upper airway resistance syndrome is characterized by a partial collapse of the airway and results in increased resistance to airflow. The increased respiratory effort is associated with multiple sleep fragmentations, as measured by very short alpha EEG arousals.
Positive airway pressure	
APAP	Auto-adjusting positive airway pressure may be used either to provide treatment or to determine the most effective pressure for CPAP.
PAP	PAP may be CPAP or APAP or bi-PAP. CPAP is a more familiar abbreviation for delivery of positive airway pressure.
PAP failure	Usually defined as an AHI >20 events per hour while using CPAP.
PAP intolerance	CPAP use for <4 hours per night for ≥5 nights per week, or refusal to use CPAP. CPAP intolerance may be observed in patients with mild, moderate, or severe OSA.

AHI: Apnea/Hypopnea Index; APAP: auto-adjusting positive airway pressure; bi-PAP: bi-level positive airway pressure; CPAP: continuous positive airway pressure; EEG: electroencephalogram; OSA: obstructive sleep apnea; PAP: positive airway pressure; RDI: Respiratory Disturbance Index; REI: Respiratory Event Index; RERA: respiratory event-related arousal: UARS: upper airway resistance syndrome.

Signs and Symptoms of OSA in Children and Adolescents

- History
    - Attention deficit/hyperactivity disorder (ADHD)
    - Behavioral problems
    - Cyanosis
    - Daytime sleepiness
    - Frequent snoring (≥ 3 nights/week)
    - Gasps/snorting noises/observed episodes of apnea
    - Headaches on awakening
    - Labored breathing during sleep
    - Learning problems
    - Sleep enuresis (especially secondary enuresis- which is enuresis after at least 6 months of continence)
    - Sleeping in a seated position or with the neck hyperextended

- Physical Examination
    - Adenoidal facies (dentofacial growth anomaly caused by long term adenoid hypertrophy)
    - Failure to thrive
    - High arched palate
    - Hypertension
    - Micrognathia/retrognathia
    - Tonsillar hypertrophy
    - Underweight or overweight

Thorough assessment and treatment of children and adolescents with sleep disorders can require a multidisciplinary approach. For suspected obstructive sleep apnea (OSA) if polysomnography is indicated, this can be arranged by the sleep physician. An overnight supervised polysomnography (PSG) in a sleep laboratory/facility remains the gold standard diagnostic test to diagnose, exclude or assess

obstructive sleep apnea (OSA) severity in children and adolescents. The international Classification of Sleep Disorders, Third Edition (ICSD-3) defines pediatric OSA as an AHI $\geq$ 1 or a pattern of obstructive hypoventilation defined as at least 25% of total sleep time with hypercapnia ($PaCO_2$ > 50 mm Hg) in association with snoring, flattening of the nasal pressure waveform, or paradoxical respiratory efforts. Although snoring and obstructive sleep apnea are generally the most common indications for evaluation, 25% of pediatric individuals referred for evaluation of a sleep disorder may have a suspected non-respiratory condition.

Identifying Arousals and Hypoventilation

The AASM Scoring Manual identifies separate respiratory rules for the scoring of pediatric sleep studies. This includes the option to score a hypopnea if the event is associated with an arousal, rather than just a 3% oxygen desaturation, which requires EEG monitoring. The pediatric respiratory rules also recommend monitoring hypoventilation in children during a diagnostic study, which requires CO2 monitoring. An ideal HSAT would capture all of these parameters:

- Ability to estimate total sleep time (e.g., actigraphy)
- Arousal identification (i.e., EEG)
- Body position
- CO_2 monitoring
- Electrocardiogram
- Nasal airflow pressure
- Oronasal thermistry
- Oxygen saturation
- Respiratory excursion

Home Sleep Studies

Home sleep studies (home sleep apnea test) are performed in the home (unattended), the portable monitoring device measures oxygen saturation (oxygen level), heart rate, airflow and breathing effort and it will also record time spent snoring and the individual's sleep position. The morning after the home sleep study, the monitor is dropped off at the location where the device was received, and a sleep specialist will analyze the information. Home sleep studies are an alternative to facility-based sleep studies (polysomnography) and are frequently performed in adult individuals. Home sleep studies (home sleep apnea test) in pediatric individuals has been evaluated in the diagnosis of obstructive sleep apnea.

In general, the devices used to perform an HSAT do not include EEG or end-tidal or transcutaneous CO2 monitoring and, therefore, are unable to score arousals or monitor hypoventilation. The lack of EEG and CO2 monitoring may result in significantly underestimating the presence and severity of disease in children, which may result in differing diagnoses and clinical management strategies in children using an HSAT, as compared to decisions based on PSG.

Technical Feasibility of Home Sleep Apnea Tests (HSATs) in Children

There are unique challenges associated with conducting home sleep studies in the pediatric population; the body sizes of children can vary significantly; and the cognitive and emotional maturity of children is less predictable than that of adult individuals, this makes it difficult to identify individuals who will be able to tolerate the numerous sensors that must be worn throughout the night to obtain a valid and accurate test. Further studies are needed in the pediatric population to compare home sleep studies to facility-based polysomnography (PSG), to define optimal physiologic parameters to be measured in individuals, develop additional tools to assess sleep/wake status, create a diagnostic algorithm to identify ideal candidates from home sleep study testing and establish appropriate alternatives to PSG.

Data suggest that an HSAT may be technically feasible in the pediatric population under carefully controlled conditions (e.g., electrodes placed by a trained clinician). However, the likelihood of success may be significantly reduced if sensors are placed by caregivers instead of trained professionals or when more stringent criteria are used to define acceptable studies. Home sleep studies are difficult in children as they tend to move frequently during sleep resulting in artifact, and young children or those with limited comprehension may remove sensors during the night.

The consequences of misdiagnosing or underdiagnosing are potentially more severe because home sleep apnea devices calculate less physiologic variables than PSG such as no carbon dioxide measurement and arousals identification. The clinical use of home sleep studies in the pediatric population is not typically recommended. Additional data examining the use of an HSAT in real-life settings with standardized recording channels and criteria for success is required to accurately determine feasibility of HSATs in the pediatric population.

A variety of devices have been developed specifically to evaluate OSA at home. They range from portable full PSG systems to single-channel oximeters. Available devices evaluate different parameters, which may include oximetry, respiratory and cardiac monitoring, and sleep/wake activity, but most portable monitors do not record EEG activity.

Regulatory Status

The SleepImage System for diagnosis of OSA is described in Table 2.

Table 2. Other Devices for OSA Diagnosis

Device	Manufacturer	Indications for Use	FDA Marketing Clearance	FDA Product Code	Year
Diagnosis					
SleepImage System	MyCardio	The SleepImage System is Software as a Medical Device (SaMD) that establishes sleep quality. The SleepImage System analyzes, displays and summarizes Electrocardiogram (ECG) or Plethysmogram (PLETH) data, typically collected during sleep, that is intended for use by or on the order of a Healthcare Professional to aid in the evaluation of sleep disorders, where it may inform or drive clinical management for children, adolescents and	K182618	MNR	2019

Device	Manufacturer	Indications for Use	FDA Marketing Clearance	FDA Product Code	Year
		adults. The SleepImage Apnea Hypopnea Index (sAHI), presented when oximeter data is available, is intended to aid healthcare professionals in diagnosis and management of sleep disordered breathing. The SleepImage System output is not intended to be interpreted or clinical action taken without consultation of a qualified healthcare professional.			

FDA: Food and Drug Administration; OSA: obstructive sleep apnea

Note: The regulatory status section is not intended to be all inclusive.

RATIONALE

This evidence review was created in April 2018 and has been updated regularly with searches of the PubMed database. The most recent literature update was performed through August 2025.

Evidence reviews assess the clinical evidence to determine whether the use of technology improves the net health outcome. Broadly defined, health outcomes are the length of life, quality of life, and ability to function including benefits and harms. Every clinical condition has specific outcomes that are important to individuals and managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of technology, 2 domains are examined: the relevance, and quality and credibility. To be relevant, studies must represent 1 or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The randomized controlled trial (RCT) is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. Randomized controlled trials are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

Home Sleep Studies in the Pediatric Population

Clinical Context and Test Purpose
The purpose of home sleep apnea tests in the pediatric population with sleep related disorders is to diagnose the condition and to inform a decision on appropriate treatment.

The following PICO was used to select literature to inform this review.

Populations
The relevant population of interest is individuals 17 and younger with a sleep related disorder.

Interventions
The test being considered is home sleep apnea testing.

Comparators
The established test for pediatric individuals is in-laboratory polysomnography (PSG). Laboratory PSG is a more complex procedure than home testing and is more limited in its availability.

Outcomes
The general outcomes of interest are the number of apneas or hypopneas during sleep, measured by the Apnea/Hypopnea Index (AHI), and subjective symptoms of sleepiness, typically measured with the Epworth Sleepiness Scale (ESS) or the Functional Outcomes of Sleep Questionnaire (FOSQ).

Study Selection Criteria
For the evaluation of clinical validity of home sleep apnea testing, studies that meet the following eligibility criteria were considered:

- Reported on the accuracy of the marketed version of the technology (including any algorithms used to calculate scores)
- Included a suitable reference standard
- Patient/sample clinical characteristics were described
- Patient/sample selection criteria were described.

Systematic Reviews
In October of 2012 Hayes completed a Health Technology Assessment which was last reviewed in September 2016 on “home sleep studies for diagnosis of obstructive sleep apnea syndrome in patients younger than 18 years of age”. For home sleep studies in patients younger than 18 years of age Hayes assigned a D^2 rating. According to Hayes, “this rating reflects the lack of evidence regarding the impact on health outcomes or patient management, and the sparse and inconsistent evidence regarding the diagnostic accuracy of home sleep studies in the pediatric population, which does not allow for any predictions of impact on health outcomes.” This review included 4 cohort studies, 3 cross-sectional, and 1 longitudinal study published between 1995 and 2010 that compared the diagnostic performance of portable devices used either at home unattended or within a laboratory or sleep clinic, with simultaneous measurements obtained from PSG performed in a laboratory on measurements of the apnea-hypopnea index (AHI), apnea index, respiratory disturbance index (RDI), oxygen desaturation index (ODI), or similar indices. It found that studies were low in quality and that the diagnostic accuracy varied widely and that Ot It did not identify any studies that evaluated clinical utility. Ultimately Hayes concluded, “insufficient evidence. There is insufficient published evidence to assess the safety and/or impact on health outcomes or patient management.”

Limited Channel Home Sleep Apnea Testing

SleepImage System

Randomized Controlled Trials

Hilmisson et al (2020) compared results calculated by the SleepImage System with manually scored PSG in 805 children 5 to 9.9 yrs of age who participated in the Childhood Adenotonsillectomy Trial (CHAT). The CHAT study included 1244 habitually snoring children who were referred for PSG. A total of 805 children had successfully collected data from the sensor, while 439 did not. Of the 805 children with data, 47% were male, 61% were African American, and 29% were White. Concordance between the SleepImage-derived AHI and PSG-derived AHI in the successful recordings is shown in Table 3. Kappa was 0.81, 0.89, and 0.91 for mild, moderate, and severe sleep apnea, respectively. A proposed benefit is that this would be easier for children compared to a test requiring multiple sensors in a sleep laboratory and improve access. Further study in a wider population is needed to evaluate whether this system might be a suitable method for evaluating sleep parameters in the home.

Table 3: Clinical Validity of the SleepImage System

Study	Initial N	Final N	Excluded Samples	Prevalence of Condition	Clinical Validity: Agreement (95% CI)		
					Mild Sleep Apnea AHI > 1.0	Moderate Sleep Apnea AHI > 5.0	High Risk AHI > 10.0
Hilmission et al (2020)	1244	805	439	64%	0.914 (0.895 to 0.934)	0.967 (0.954 to 0.979)	0.986 (0.978 to 0.994)

AHI: Apnea/Hypopnea Index; CI: confidence interval.

Nonrandomized Comparative Studies

Bhattacharjee et al (2021) evaluated the accuracy of the ApneaLink Air portable sleep monitor to diagnose obstructive sleep apnea in adolescent patients (NCT03748771).. Twenty adolescents (age 12-18 years) with suspected obstructive sleep apnea using a PM device were evaluated. In addition to in-laboratory polysomnography (PSG), all participants had PM testing performed twice, once in their home and once concurrent to in-laboratory PSG. PM was compared to PSG using 2 primary outcomes: the apnea-hypopnea index and oxygen desaturation index. All participants were approached for interview to evaluate their experience with PM sleep testing. Bland-Altman analysis comparing the apnea-hypopnea index and oxygen desaturation index determined by home or in-laboratory PM to in-laboratory PSG revealed mostly agreement; however, some deviations were observed when either parameter was markedly increased. While PM testing tended to underestimate the apnea-hypopnea index, the diagnostic agreement between home PM and PSG was 80% (by the White-Westbrook method). Most preferred PM to PSG and found PM easy to very easy to set up. The authors concluded in a small cohort of adolescents; the study supports the application of home PM in the diagnosis of suspected obstructive sleep apnea. Until studies implementing PM using larger cohorts become readily available, the findings from this preliminary study could contribute to adolescents receiving sleep apnea therapy more promptly.

Section Summary: Limited Channel Home Sleep Apnea Testing

The evidence for limited channel home sleep apnea testing (includes type 4 monitors) in patients who have OSA consists of studies on diagnostic accuracy. A number of questions remain about the ability of these

home sleep apnea tests to detect clinically significant OSA without sensors for respiratory effort, airflow, and oxygen saturation (or alternatively PAT, actigraphy, and oxygen saturation).

None of the available studies evaluating the feasibility or validity of HSATs included children with comorbid medical conditions. HSATs have been used in a few other small studies of children with comorbid conditions, but the validity and feasibility of the tests were not the focus of those reports. Finally, the review of the literature identified no validation studies for the use of HSATs in infants and young children (< 2 years old). These populations present unique challenges to diagnostic testing, and the consequences of misdiagnosing or underdiagnosing are potentially more severe. The lack of validation and feasibility testing in these populations contributed to the recommendation against using HSATs for the diagnosis of OSA in children.

SUPPLEMENTAL INFORMATION

The purpose of the following information is to provide reference material. Inclusion does not imply endorsement or alignment with the evidence review conclusions.

Clinical Input from Physician Specialty Societies and Academic Medical Centers

While the various physician specialty societies and academic medical centers may collaborate with and make recommendations during this process, through the provision of appropriate reviewers, input received does not represent an endorsement or position statement by the physician specialty societies or academic medical centers, unless otherwise noted.

2010 Input

In response to requests, input was received from 1 physician specialty society and 6 academic medical centers (8 reviewers) while this policy was under review in 2010. Input focused on the sensors required for unattended home sleep studies and on diagnosis and treatment of OSA in children. In general, reviewers supported the requirement that home monitors measure 4 parameters, including respiratory effort, airflow, and oxygen saturation, and their use is restricted to adults. Some exceptions were noted for specific situations. The 2010 update included recommendations from reviewers on indications specific to pediatric patients.

Practice Guidelines and Position Statements

Guidelines or position statements will be considered for inclusion in ‘Supplemental Information' if they were issued by, or jointly by, a US professional society, an international society with US representation, or National Institute for Health and Care Excellence (NICE). Priority will be given to guidelines that are informed by a systematic review, include strength of evidence ratings, and include a description of management of conflict of interest.

American Academy of Pediatrics (AAP)

The American Academy of Pediatrics (2012) published guidelines on the diagnosis and management of uncomplicated childhood OSA associated with adenotonsillar hypertrophy and/or obesity in an otherwise healthy child treated in the primary care setting, which updated the AAP's 2002 guidelines. The AAP recommended that all children or adolescents be screened for snoring, and PSG is performed in children or adolescents with snoring and symptoms or signs of OSA as listed in the guideline. If PSG is not available, an alternative diagnostic test or referral to a specialist may be considered (option). The estimated prevalence rates of OSA in children or adolescents ranged from 1.2% to 5.7%.

American Academy of Sleep Medicine (AASM)

In 2017, the American Academy of Sleep Medicine (AASM) issued a position paper for the use of home sleep apnea test (HSAT) for the diagnosis of OSA in children, which states, "the use of a home sleep apnea test is not recommended for the diagnosis of obstructive sleep apnea in children. Remarks: For the purpose of this position statement, children are defined as individuals < 18 years of age."

- The clinical use of HSATs in pediatric populations is not recommended due to insufficient evidence. Specifically, there is limited literature comparing HSATs to PSG, the gold standard, in children. The task force was unable to identify literature on the use of HSAT devices that monitor CO_2 or have the ability to identify arousals, measurements that have been viewed as critical in pediatric populations. Additionally, the task force identified limited literature comparing HSATs to PSG in children with comorbidities or in young children.

In addition to the paucity of literature supporting the use of HSATs in children, there are unique challenges associated with conducting HSATs in children that contributed to the position against its use. The body sizes of children can vary significantly, even within a narrow age range, and the cognitive and emotional maturity of children is less predictable than that of adult patients. This makes it difficult to identify patients who will be able to tolerate the numerous sensors that must be worn through the night.

National Institute for Health and Care Excellence (NICE)

In 2021, NICE published a guideline for Obstructive Sleep Apnea/ Hypopnea Syndrome and Obesity Hypoventilation Syndrome in Over 16s with the following recommendations noted for a home sleep test:

- Offer home respiratory polygraphy to people with suspected OSAHS.
- If access to home respiratory polygraphy is limited, consider home oximetry for people with suspected OSAHS. Take into account that oximetry alone may be inaccurate for differentiating between OSAHS and other causes of hypoxemia in people with heart failure or chronic lung diseases.
- Consider respiratory polygraphy or polysomnography if oximetry results are negative but the person has significant symptoms. Consider hospital respiratory polygraphy for people with suspected OSAHS if home respiratory polygraphy and home oximetry are impractical or additional monitoring is needed.

Ongoing and Unpublished Clinical Trials

Some currently ongoing and unpublished trials that might influence this review can be located at clinicaltrials.gov.

REFERENCES

1. Kirk V, Baughn J, Andrea L, et. al. American Academy of Sleep Medicine Position Paper for the Use of a Home Sleep Apnea Test for the Diagnosis of OSA in Children. Journal of Clinical Sleep Medicine Vol. 13, No. 10 2017
2. Marcus CL, Brooks LJ, Draper KA, et. al. Diagnosis and management of childhood obstructive sleep apnea syndrome. Pediatrics 2013;130(3):e714-e755
3. Goodwin JL, Enright PL, Kaemingk KL, et. al. Feasibility of using unattended polysomnography in children for research – report of the Tucson Children's Assessment of Sleep Apnea Study (TuCASA). Sleep 2001;24(8):937-944. PMID 11766164
4. Marcus CL, Traylor J, Biggs SN, et. al. Feasibility of comprehensive unattended ambulatory polysomnography in school-aged children J Clin Sleep Med 2014;10(8):913-918. PMID 25126039
5. Brockman PE, Perez JL, Moya A. Feasibility of unattended home polysomnography in children with sleep disordered breathing. Int J Pediatr Otohinolaryhgol 2013;77912):9160-1964. PMID 24120158

6. Alonso-Alvarez ML, Teran-Santos J, Ordax Carbajo E, et. al. Reliability of home respiratory polygraphy for the diagnosis of sleep apnea in children. Chest 2015;147(4):1020-1028. PMID 25539419
7. Lesser DJ, Haddad GG, Bush RA, Pian MS. The utility of portable recording device for screening of obstructive sleep apnea in obese adolescents. J Clin Sleep Med 2012;8(3):271-277. PMID 22701384
8. Zucconi M, Claroi G, Castronovo V, Ferini-Strambi L. Respiratory monitoring by means of an unattended device in children with suspected uncomplicated obstructive sleep apnea: a validation study. Chest 2003;124(2):602-607. PMID 12907549
9. Villa MP, Pietropaoli N, Supino MC, et. al. Diagnosis of pediatric obstructive sleep apnea syndrome in settings with limited resources. JAMA Otolaryngol Head Neck Surg 2015;141(11):990-996. PMID 26540025
10. Bannink N, Mathijssen IM, Joosten KF. Use of ambulatory polysomnography in children with syndromic craniosynostosis. J Cariofac Surg 2010;21(5):1365-1368. PMID 20856022
11. American Academy of Sleep Medicine (AASM) Practice Parameters for the Respiratory Indications for Polysomnography in Children, Sleep, Vol. 34, No.3, 2011.
12. American Thoracic Society, Patient Information Series, Obstructive Sleep Apnea in Children.
13. American Sleep Apnea Association, Children's Sleep Apnea.
14. Medscape. Childhood Sleep Apnea Treatment and Management. Mary E. Cataletto M.D.. Updated April 1, 2014.
15. Clinical Practice Guideline: Diagnosis and Management of Childhood Obstructive Sleep Apnea Syndrome. Pediatric Pulmonology Subcommittee on Obstructive Sleep Apean Syndrome. Pediatrics Apr 2002 109 (4) 704-712
16. Tan JL, Kheirandish-Gozal L, Gozal D. Pediatric Home Sleep Apnea Testing. Chest, Volume 148, Issue 6 1382-1395
17. American Academy of Sleep Medicine Position statement on Home Sleep Apnea Testing. 2020 available at https://aasm.org Accessed August 14, 2025
18. Hilmisson H, Berman S, Magnusdottir S. Sleep apnea diagnosis in children using software-generated apnea-hypopnea index (AHI) derived from data recorded with a single photoplethysmogram sensor (PPG): Results from the Childhood Adenotonsillectomy Study (CHAT) based on cardiopulmonary coupling analysis. Sleep Breath. Dec 2020; 24(4): 1739-1749. PMID 32222900
19. Section on Pediatric Pulmonology, Subcommittee on Obstructive Sleep Apnea Syndrome. American Academy of Pediatrics. Clinical practice guideline: diagnosis and management of childhood obstructive sleep apnea syndrome. Pediatrics. Apr 2002; 109(4): 704-12. PMID 11927718
20. Marcus CL, Brooks LJ, Draper KA, et al. Diagnosis and management of childhood obstructive sleep apnea syndrome. Pediatrics. Sep 2012; 130(3): 576-84. PMID 22926173
21. Jacob SV, Morielli A, Mograss MA, et al. Home testing for pediatric obstructive sleep apnea syndrome secondary to adenotonsillar hypertrophy. Pediatr Pulmonol. 1995;20(4):241-252.
22. Bhattacharjee, R., Benjafield, A., Blase, A., et al. 2021. The accuracy of a portable sleep monitor to diagnose obstructive sleep apnea in adolescent patients. Journal of clinical sleep medicine: JCSM : official publication of the American Academy of Sleep Medicine, 17(7), 1379–1387. https://doi.org/10.5664/jcsm.9202 Accessed August 14, 2025
23. UpToDate. Grigg-Damberger M. Chervin R.D., Eichler A.F, Overview of Polysomnography in Infants and Children. Review Current through February 2023. Topic last updated March 28, 2025 Available at: www.uptodate.com Accessed August 14, 2025
24. UpToDate. Paruthi S., Chervin R.D., Wilkie L. Evaluation of Suspected Obstructive Sleep Apnea in Children. Review current through: July 2025. Last updated: Apr 25, 2024. Available at: www.uptodate.com Accessed August 14, 2025

25. Hayes, a symplr company. Health Technology Assessment. Home Sleep Studies for Diagnosis of Obstructive Sleep Apnea Syndrome in Patients Younger than 18 Years of Age. Hayes, Inc. October 5, 2012. Annual Review: September 12, 2016. Available at: www.hayesinc.com. Accessed August 14, 2025

CODES

To report provider services, use appropriate CPT codes, HCPCS codes, Revenue codes, and/or ICD diagnosis codes.

Codes	Number	Description
CPT		
	95800	Sleep study, unattended, simultaneous recording; heart rate, oxygen saturation, respiratory analysis (e.g., by airflow or peripheral arterial tone), and sleep time
	95801	Sleep study, unattended, simultaneous recording; minimum of heart rate, oxygen saturation, and respiratory analysis (e.g., by airflow or peripheral arterial tone)
	95806	Sleep study, unattended, simultaneous recording of, heart rate, oxygen saturation, respiratory airflow, and respiratory effort (e.g., thoracoabdominal movement)
HCPCS		
	G0398	Home sleep study test (HST) with type II portable monitor, unattended; minimum of 7 channels: EEG, EOG, EMG, ECG/heart rate, airflow, respiratory effort and oxygen saturation
	G0399	Home sleep test (HST) with type III portable monitor, unattended; minimum of 4 channels: 2 respiratory movement/airflow, 1 ECG/heart rate and 1 oxygen saturation
	G0400	Home sleep test (HST) with type IV portable monitor, unattended; minimum of 3 channels
Type of Service	Medical	
Place of Service	Outpatient/Home	

POLICY HISTORY

Date	Reason	Action
August 2025	Annual Review	Policy Renewed
August 2024	Annual Review	Policy Revised
August 2023	Annual Review	Policy Renewed
April 2023	Annual Review	Policy Revised
April 2022	Annual Review	Policy Renewed
April 2021	Annual Review	Policy Revised
April 2020	Annual Review	Policy Renewed
April 2019	Annual Review	Policy Renewed
April 2018		New Medical Policy Created

New information or technology that would be relevant for Wellmark to consider when this policy is next reviewed may be submitted to:

Wellmark Blue Cross and Blue Shield
Medical Policy Analyst
PO Box 9232
Des Moines, IA 50306-9232

*CPT® is a registered trademark of the American Medical Association.