Clinical Policy Title: Diagnosing obstructive sleep apnea in adults

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Next Review Date: February 2018

Related policies:

CP# 07.01.01 Obstructive sleep apnea in adults

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Coverage policy

AmeriHealth Caritas Pennsylvania considers the use of PSG or portable sleep monitoring to be clinically proven and, therefore, medically necessary when ordered by qualified specialists in pulmonary, neurological, or sleep medicine as part of a comprehensive sleep evaluation to diagnose obstructive sleep apnea (OSA) in adults (age 18 years or older) when all of the following criteria are met:

- One of the following sleep testing devices is used to determine the apnea-hypopnea index (AHI) or respiratory disturbance index (RDI):
  - **Level I**: Full attended PSG (≥7 channels) in a laboratory setting. At a minimum, PSG should record electroencephalography (EEG), electrooculography (EOG), chin electromyography (EMG), airflow, arterial, arterial oxygen saturation, respiratory effort, and electrocardiography (ECG) or heart rate. Identifies sleep and awake states. Measures the AHI.
  - **Level II**: Portable unattended PSG (≥7 channels). Records the same information as Type I; may use fewer channels, but records signals that allow for the reliable identification of arousals from sleep (EEG, EOG, EMG, ECG) and has at least two airflow channels or one airflow and one effort channel. Identifies sleep and awake states. Measures the AHI.
- **Level III (cardiorespiratory):** Portable study that requires a minimum of the following four channels: respiratory effort, airflow, arterial oxygen saturation, and ECG or heart rate. Does not measure asleep or awake states, but has at least two respiratory channels (two airflow channels or one airflow and one effort channel) and estimates episodes of apnea and hypopnea over time as the RDI.

- The following medical necessity criteria for PSG or portable monitoring are met:

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<th>Device</th>
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| Unattended full-channel (Level II), or limited channel portable monitoring (Level III) | Both criteria must be met:  
- Patient has moderate to high suspicion of OSA defined as unexplained daytime sleepiness and at least one of the following (Epstein, 2009):  
  - Body mass index (BMI) >30 kg/m².  
  - Abnormal airway (Mallampati score >2).  
  - Snoring.  
  - Neck circumference >17 inches in men and >16 inches in women.  
- Patient has no contraindications to limited channel monitoring/home sleep testing, including any of the following (Collup, 2007; Epstein, 2009):  
  - Physical or cognitive inability to use device at home.  
  - Comorbid sleep disorder (e.g., narcolepsy, violent or potentially injurious sleep behavior, suspicious rapid eye movement [REM] behavior disorder, central sleep apnea).  
  - Comorbidity that could impact the accuracy of the study, including, but not limited to, any of the following:  
    - Moderate to severe pulmonary disease (e.g., chronic obstructive pulmonary disorder [COPD] or asthma) defined as forced expiratory volume in one second/forced vital capacity (FEV₁/FVC) ≤0.7 and FEV₁ <80 percent of predicted.  
    - Neuromuscular disease (e.g., Parkinson’s disease, spina bifida, amyotrophic lateral sclerosis).  
    - Stroke within the previous 30 days.  
    - Epilepsy.  
    - Significant cardiac disease (e.g., congestive heart failure [NYHA class III or IV], uncontrolled significant persistent cardiac arrhythmia).  
    - Suspected or established obesity hypoventilation syndrome.  
Note: Unattended sleep studies may be medically necessary for patients in whom a full attended Level I PSG cannot be performed due to immobility or critical illness, or when a full attended Level I PSG is unavailable. |
| Attended full-channel nocturnal PSG (Level I) | For any of the following indications:  
- For initial diagnosis of OSA when one or more of the following occurs:  
  - Home sleep monitoring is contraindicated.  
  - Home sleep monitoring results are negative or technically inadequate.  
  - There is a low probability of OSA defined as normal BMI <30 kg/m², normal airway (Mallampati score 1 or 2), no snoring, or normal neck circumference (<17 inches in men and <16 inches in women).  
  - To confirm diagnosis of OSA prior to surgical modifications of the upper airway. |
Device | Criteria for medical necessity
---|---
| • To perform a split-night study (diagnosis and continuous positive airway pressure [CPAP] titration performed in one night) for patients with severe OSA as an alternative to one full night of diagnostic phase followed by a second night of titration if all of the following conditions are met:
  - The decision to proceed to CPAP titration in the same night is based on either:
    - An AHI $\geq 15$ events per hour recorded for at least two hours during the diagnostic phase of the test period.
    - An AHI $\geq$ five events per hour and $<15$ events per hour recorded for at least two hours during the diagnostic phase with clinical judgment.
  - CPAP titration is carried out for more than three hours.
  - PSG documents that CPAP eliminates or nearly eliminates the respiratory events during REM and non-REM sleep for at least two hours.
| • To titrate CPAP in persons with clinically significant OSA for whom attended full channel nocturnal PSG (Level I device) was medically necessary but who were unable to undergo a split-night study because of either:
  - An insufficient AHI ($<15$ events per hour) during the first two hours of testing.
  - Inadequate CPAP titration (i.e., $<$three hours of titration or failure to eliminate the vast majority of obstructive respiratory events).

Repeat testing | Repeat attended or unattended PSG/portable monitoring may be medically necessary if any of the following conditions is met:
- The first study is technically inadequate due to equipment failure.
- The subject could not sleep or slept for an insufficient amount of time to allow a clinical diagnosis.
- The results of the first study were inconclusive or ambiguous.
- Initiation of therapy or confirmation of the efficacy of prescribed therapy is needed.

Repeat sleep testing for diagnosing sleep apnea requires documentation justifying the medical necessity for the repeated test.

Follow-up testing | Follow-up PSG/portable monitoring (up to two tests per year) is medically necessary for any of the following indications:
- To assess the effectiveness of upper airway surgery or oral appliances for treatment of OSA.
- After substantial weight loss has occurred in patients on PAP treatment of sleep-related breathing disorders to determine whether continued treatment with PAP is still needed at the previously titrated pressure.
- When clinical response is insufficient or when symptoms return despite a good initial response to treatment with CPAP.

Limitations:

All other uses of full- or limited-channel PSG or cardiorespiratory sleep testing in patients with OSA are not medically necessary, including:
• Unattended sleep studies for the diagnosis of any other sleep disorder, including, but not limited to, narcolepsy, central sleep apnea, or insomnia.
• Screening asymptomatic persons.
• Routine follow-up for patients treated with PAP whose symptoms continue to be resolved with PAP treatment.

The use of home testing in patients with chronic opiate narcotic use limits validity of interpretation. Diagnostic sleep testing for patients using opiate narcotics for acute self-limited conditions should ideally be deferred until the medications have been stopped.

A Level IV portable study that typically uses one to three channels but fails to fulfill criteria for Level III monitors is not medically necessary for diagnosing OSA. This includes sleep testing devices measuring three or more channels that involve actigraphy, oximetry, and peripheral arterial tone.

Other tests performed either alone or in combination are not medically necessary to diagnose OSA but may be medically necessary to assess risk of OSA or select patients for more definitive testing. Other tests include but are not limited to:
• Actigraphy testing when used alone.
• Radiographic studies.
• Daytime nap PSG.
• Diagnostic audio recording, with or without pulse oximetry.
• Laryngeal function studies.
• Maintenance of wakefulness test.
• Multiple sleep latency test.
• Peripheral arterial tonometry.
• Phased testing (simple tests followed by more intensive tests in selected patients).
• Serum inflammatory markers.

Clinical prediction models are not medically necessary for the diagnosis of OSA.

The use of auto-CPAP devices during attended titration in patients with congestive heart failure is not medically necessary due to an absence of evidence in this population.

**For Medicare members only:**

In addition to the aforementioned medically necessary indications, AmeriHealth Caritas Pennsylvania considers the use of the following portable monitoring sleep devices to be a covered benefit to aid in the diagnosis of OSA in adults (age 18 years or older):
• Type IV sleep testing devices measuring three or more channels, one of which is airflow, in beneficiaries who have signs and symptoms indicative of OSA if performed unattended in or out of a sleep lab facility or attended in a sleep lab facility.
• Sleep testing devices measuring three or more channels that include actigraphy, oximetry and peripheral arterial tone in beneficiaries who have signs and symptoms indicative of OSA if performed unattended in or out of a sleep lab facility or attended in a sleep lab facility.

Note: The following CPT/HCPCS codes are not listed in the Pennsylvania Medicaid fee schedule:

0244T - Continuous measurement of wheeze rate during treatment assessment or during sleep for documentation of nocturnal wheeze and cough for diagnostic evaluation 3 to 24 hours, with interpretation and support

95800 - Sleep study, unattended, simultaneous recording; heart rate, oxygen saturation, respiratory analysis (e.g., by air flow or peripheral arterial tone) and sleep time

95801 - Sleep study, unattended, simultaneous recording; minimum of heart rate, oxygen saturation, respiratory analysis (e.g., by airflow or peripheral artery tone)

95806 - Sleep study, unattended, simultaneous recording of, heart rate, oxygen saturation, respiratory airflow, and respiratory effort (e.g, thoracoabdominal movement)

G0398 - Home sleep test (HST) with type II portable monitor, unattended; minimum of 7 channels: EEG, EGO, 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

Alternative covered services:

• Clinical evaluation and sleep history.

Background

OSA is a sleep and breathing disorder characterized by recurrent episodes of partial or complete upper airway obstruction during sleep. It may manifest as a reduction in airflow (hypopnea) or complete cessation of airflow (apnea), which impairs sleep continuity, autonomic function, and gas exchange. OSA associated with excessive daytime sleepiness is commonly called obstructive sleep apnea syndrome (OSAS) — also referred to as obstructive sleep apnea-hypopnea syndrome.

Advancing age, excess body weight, and male gender are associated with increased risk of OSA. Race may play a role, as well as craniofacial anatomy, familial and genetic predisposition, smoking and alcohol consumption, medical comorbidity, polycystic ovary syndrome, hypothyroidism, and pregnancy (Punjabi,
2008). Patients may present with clinical symptoms that suggest underlying sleep-disordered breathing such as excessive snoring, episodes of apnea, and daytime hypersomnolence. Untreated OSA can have numerous negative health consequences, decrease the quality of life, and increase the risk of motor vehicle accidents (Punjabi, 2008).

The primary treatment for OSA in adults is CPAP. Improvements in diagnosis and treatment of OSA are at the forefront of efforts to reduce the harmful consequences of this disease. Considerable clinical uncertainty remains regarding the type and level of respiratory abnormality used to define the disorder, as well as uncertainty with available diagnostic methods for its detection.

**Diagnosis:**

PSG detects the presence of OSA and quantifies severity (Epstein, 2009). The frequency of airflow obstructive events is generally reported as the AHI, which, in adults, is a measure of the number of apneas (events of breathing cessation >10 seconds) and hypopneas (>30 percent decline in breathing effort coupled with >4 percent oxygen saturation [SaO₂], desaturation, and/or arousal) per hour during sleep. However, there is no empirically validated threshold level for the AHI that would indicate clinically significant disease (Balk, 2011). By consensus, the American Academy of Sleep Medicine (AASM) sets a diagnostic threshold of 15 events per hour with or without symptoms or five events per hour with symptoms, but other definitions of OSA employing thresholds of AHI ≥ 15 events per hour have been reported (Epstein, 2009).

Attended overnight Level I PSG is a facility-based overnight test that monitors many body functions during sleep, including brain activity (EEG), eye movement (EOG), muscle activity or skeletal muscle activation (EMG), heart rhythm (ECG), respiratory airflow, respiratory effort, and peripheral pulse oximetry. It is typically performed over two nights—first to diagnose and then to titrate CPAP. Alternatively, a split-night sleep study may be performed during which diagnosis and CPAP titration is conducted in one night.

The main drawbacks of facility-based Level I PSG with CPAP titration are limited numbers of recording beds, high cost, long waiting lists, labor requirements, and inconvenience to the patient (Pagel, 2007). While surgical outcomes continue to depend heavily on the AHI to validate surgical effectiveness, AHI is known to correlate poorly with both patient perception of their OSA and many other measures of disease burden (Tam, 2014).

Less resource-intensive and more convenient alternatives to PSG have been sought as a means of assessing disease burden and severity, and measuring treatment response. These include, but are not limited to, the use of self-administered sleep questionnaires, biomarkers, clinical prediction models, overnight pulse oximetry, testing for daytime somnolence, craniofacial morphology, phased testing, and portable monitoring performed in-laboratory or at home. The ideal device should be inexpensive, readily accessible, easily used with minimal instructions, have no risk or side effects to the patient, and be both sufficiently sensitive and specific to potentially obviate the need for Level I PSG.
The U.S. Food and Drug Administration regulates polysomnographs as Class II devices (product code OLV “standard polysomnograph with electroencephalograph”) (21CFR882.1400). Several devices with this code have 510(k) marketing clearances; however, not all of these clearances are for devices for split-night sleep studies.

**Searches**

AmeriHealth Caritas Pennsylvania searched PubMed and the databases of:
- UK National Health Services Centre for Reviews and Dissemination.
- Agency for Healthcare Research and Quality (AHRQ) National Guideline Clearinghouse and other evidence-based practice centers.
- The Centers for Medicare & Medicaid Services (CMS).

We conducted searches on December 13, 2016. Search terms were: "sleep apnea, obstructive/diagnosis" (MeSH) and the free text term "sleep testing."

We included:
- **Systematic reviews**, which pool results from multiple studies to achieve larger sample sizes and greater precision of effect estimation than in smaller primary studies. Systematic reviews use predetermined transparent methods to minimize bias, effectively treating the review as a scientific endeavor, and are thus rated highest in evidence-grading hierarchies.
- **Guidelines based on systematic reviews.**
- **Economic analyses**, such as cost-effectiveness, and benefit or utility studies (but not simple cost studies), reporting both costs and outcomes — sometimes referred to as efficiency studies — which also rank near the top of evidence hierarchies.

**Findings**

AmeriHealth Caritas Pennsylvania identified seven systematic reviews/meta-analyses and four evidence-based guidelines for this policy. Studies generally included adult patients who were either referred to specialized sleep centers or hospitals for evaluation of suspected OSA or studied at home. It is unclear if the results of the studies are applicable to a more general population of patients with comorbidities or other sleep-related breathing disorders.

The overall quality of the evidence comparing testing alternatives to Level I PSG is low to moderate due to selection bias, varying study designs, use of varying cutoff values of AHI for defining OSA, patient attrition, and a lack of rigorous evaluation of the impact on outcomes for treatment directed by results of alternative testing. These limitations contribute to the wide ranges of diagnostic test accuracy determined by meta-analysis and the subsequent uncertainty in finding suitable replacements for Level I PSG.
The evidence is sufficient to support the use of dual-night Level I PSG with CPAP titration for diagnosing OSA. The body of evidence supporting Level I PSG is of moderate quality, and evidence-based guidance supports its use as the standard of care (Qaseem, 2014; Epstein, 2009).

The evidence is sufficient to support the use of split-night sleep studies as an alternative to dual-night Level I sleep studies for diagnosing OSA in adults who are suspected of having moderate to severe OSA. Results of randomized controlled trials (RCTs) suggest that attended split-night studies perform comparably to portable home monitoring with auto CPAP titration in this population (Hayes, 2012). The AASM recommends split-night PSG when an AHI \( \geq 40 \) events per hour is recorded for at least two hours during the diagnostic phase of the test period, or for an AHI of 20–40 per hour based on clinical judgment (Epstein, 2009). There is a role for split-night testing when carried out by a trained and experienced sleep technologist and when there is recognition that further testing may be required to rule in or out a diagnosis of OSA (Hayes, 2012; Epstein, 2009). There is an absence of evidence supporting the use of auto-CPAP devices during attended titration in patients with congestive heart failure (Hayes, 2012).

The evidence is sufficient to support the use of Level III portable monitors as an alternative to dual-night Level I sleep studies for diagnosing OSA in adults who have a high clinical suspicion of OSA and no major comorbidities. A portable monitor must be able to report the number of respiratory events during sleep as either the AHI or RDI. However, substantial differences in the measurement of AHI/RDI between portable monitors and Level I PSG may exist, leading to judgments on the trade-off between poorer diagnostic performance than Level I PSG and appropriate use of limited resources. Studies to date have been performed predominantly in populations at high risk for moderate to severe OSA. Insufficient research has been conducted to directly compare the relative diagnostic performance of different portable monitors, to determine the discriminatory capacity of various portable monitors to detect low levels of OSA versus high levels of OSA, or in pediatric or older (>age 65) populations (El Shayeb, 2014; Balk, 2011; Collup, 2011).

According to the AASM, a portable monitor should, at a minimum, record airflow, respiratory effort, and blood oxygenation values sufficient to estimate the number of respiratory events during sleep (Epstein, 2009; Collup, 2007). Low- to moderate-quality evidence suggests unattended Level III portable devices that record at least airflow, respiratory effort, and blood oxygenation are sufficiently accurate to predict an AHI suggestive of OSA with high positive likelihood ratios and low negative likelihood ratios (high false negative rate) for various AHI cutoffs in PSG (Balk, 2011; El Shayeb, 2014; Qaseem, 2014).

With the high false negative rates associated with Level III devices, unattended home sleep tests are not appropriate for patients with major medical or sleep comorbidities that may degrade test accuracy or with other sleep disorders, or for screening asymptomatic individuals. A Level I sleep study should be performed in cases where portable monitoring is technically inadequate or fails to establish the diagnosis of OSA in patients with a high suspicion of disease (Epstein, 2009). The AASM supports using portable monitoring for patients in whom a full attended Level I study cannot be performed due to immobility or critical illness (Epstein, 2009; Collup, 2007). The American College of Physicians (ACP) also recommends portable monitoring in patients without serious comorbidities as an alternative to PSG when PSG is unavailable for diagnostic testing (Qaseem, 2014).
The evidence is insufficient to support the use of Level IV portable monitors as an alternative to dual-night Level I sleep studies for diagnosing OSA in adults. Level IV devices cannot differentiate between obstructive and central apneas. Because CPAP may be contraindicated in patients with central sleep apnea, an accurate differential diagnosis using Level I, II, or III testing is indicated for appropriate treatment management (Qaseem, 2014).

The evidence is insufficient to support using other testing either alone or in combination, or clinical prediction models as surrogates for PSG to diagnose OSA. However, if these tests are found to be sufficiently predictive of the results of full sleep testing, they may have value as a screening tool to identify patients who should be worked up further, treated for OSA, or considered not to have OSA.

Studies comparing questionnaires to PSG for screening OSA were of low quality and limited by high likelihood of selection bias, or they were supported by only single studies. Whether the various questionnaires can accurately predict the clinical severity of sleep apnea and the likelihood of clinically important sequelae is unknown. Questionnaires may help rule out OSA but generally are not helpful in identifying patients affected by sleep apnea (Abrishami, 2010; Balk, 2011; Myers, 2013). Other tests such as peripheral arterial tonometry, tests for excessive daytime sleepiness, and serum biomarkers may aid in identifying high-risk patients for OSA, but are not routinely recommended (Yalamanchali, 2013; Nadeem, 2013; Balk, 2011; Littner, 2005). There is insufficient evidence to support using phased testing (simple tests followed by more intensive tests in selected patients) as predictors of OSA (Balk, 2011).

The ACP suggests targeting the assessment of OSA to individuals with unexplained daytime sleepiness (Qaseem, 2014). This assessment should include evaluation of the risk factors and common presenting symptoms for OSA. The best-documented risk factor for OSA is obesity. Clinical symptoms for OSA include unintentional sleep episodes during wakefulness, daytime sleepiness, unrefreshing sleep, fatigue, insomnia, and snoring. Sleepiness questionnaires, such as the Eppworth Sleepiness Scale, may help in assessing the symptom severity of OSA, but cannot assess the AHI, and lack sufficient sensitivity and specificity to replace a sleep study in diagnosing OSA. The ACP makes no recommendation for or against the use of other questionnaires in assessing risk of OSA (Qaseem, 2014).

Many of the large referral-based studies that developed clinical prediction rules for sleep apnea are heterogeneous and impractical for use in primary care. All models in the included meta-analyses had been internally validated, but not externally validated in independent populations (Balk, 2011; Myers, 2013). Some clinical prediction models have been developed or tested specifically for the prediction of severe OSA (defined as AHI ≥20 or 30 events per hour) to prioritize patients for a split-night protocol. Their clinical value as defined by their impact on clinical outcomes, beyond simple studies of diagnostic test accuracy, has not been determined. The AASM does not recommend using clinical predictions models to assess severity of OSA (Epstein, 2009).

There is insufficient evidence to support routine preoperative testing using PSG for OSA. The rationale for using PSG for routine preoperative assessment is to identify surgical candidates with undiagnosed sleep apnea, who would be at an increased risk of perioperative pulmonary and cardiovascular complications.
Routinely screening all (or selected) patients undergoing anesthesia or surgery may allow for improved perioperative care to minimize problems with intubation, extubation, and other respiratory events. At present, the value of screening all or selected surgical patients and the most effective and efficient method of screening have not been determined (Balk, 2011).

**There is insufficient evidence to support the routine use of full PSG or attended cardiorespiratory (Level III) devices to monitor treatment effectiveness.** AASM consensus-based recommendations suggest unattended Level III portable devices may be indicated to monitor patients after a good response to oral appliance treatment, surgical or dental treatment, substantial weight loss (e.g., 10 percent of body weight), substantial weight gain with return of symptoms, when clinical response is insufficient, or when symptoms return despite a good initial response to CPAP (Epstein, 2009). Follow-up PSG or portable monitoring is not routinely indicated in patients treated with CPAP whose symptoms continue to be resolved with CPAP treatment. The type of surgery and clinical judgment will dictate the frequency of post-surgical follow-up and OSA-related evaluation (Epstein, 2009).

The U.S. Preventive Services Task Force (USPSTF) (2014) posted a final research plan on screening for OSA in asymptomatic adults and persons with unrecognized symptoms of OSA. The goal is to identify persons at high risk of OSA and determine if screening improves health outcomes in this population. The research plan will help guide a comprehensive systematic review to support evidence-based recommendations for the use of screening in persons at high risk of OSA.

**Policy updates:**

The USPSTF published an evidence review of screening for OSA in adults (Jonas, 2017). They identified no RCTs or prospective studies of screening questionnaires or clinical prediction tools that reported on calibration or clinical utility for improving health outcomes. Two studies assessed the screening accuracy of the Multivariable Apnea Prediction (MVAP) score followed by home portable monitoring to predict severe OSAS. Both studies oversampled high-risk patients, which may substantially overestimate the accuracy that would be achieved in the general population of asymptomatic adults (or those with unrecognized symptoms). They concluded that the current evidence was insufficient to assess the balance of benefits and harms of screening for OSA in asymptomatic adults. The new information does not change previous findings. Therefore, no policy changes are warranted.

**Summary of clinical evidence:**

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<tr>
<th>Citation</th>
<th>Content, Methods, Recommendations</th>
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<tr>
<td>Jonas (2017) for the USPSTF</td>
<td>Key points:</td>
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<tr>
<td>Screening for OSA in asymptomatic adults</td>
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<tr>
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<td>• Systematic review and meta-analysis of three retrospective studies; one evaluated the Berlin Questionnaire and two from the same investigators evaluated the MVAP score, alone and followed by in-home portable monitoring. No RCTs found.</td>
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<td>• Overall quality: fair with high risk of spectrum bias from oversampling of high-risk participants and those with OSA and OSAS, which may substantially overestimate the accuracy that would</td>
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| El Shayeb (2014)  | **Key points:**  
| Level III portable vs. Level I PSG | - Meta-analysis of 19 studies of a referral population with stable comorbidities or without comorbidities.  
|                           | - Level III portable devices showed good diagnostic performance compared with Level I sleep tests in adult patients with a high pretest probability of moderate to severe OSA and no unstable comorbidities. For patients suspected of having other types of sleep-disordered breathing or sleep disorders not related to breathing, Level I testing remains the reference standard.                                                                                                                                                                                                                                                                 |
| Hayes (2014)      | **Key points:**  
| Split-night PSG    | - Systematic review of three RCTs (n = 102 to 373), three retrospective comparative studies (n = 200 to 608), and two retrospective cohort studies (n = 198 to 418).  
|                           | - Overall quality: low. Variable methods, OSA definitions, high drop-out rates, short follow-up.  
|                           | - Split-night PSG with CPAP titration is a safe and reasonable alternative to dual-night PSG and CPAP titration when limited to patients with a high clinical suspicion of having moderate to severe OSA.  
|                           | - Split-night PSG is less efficacious for patients with milder OSA due to insufficient time to capture meaningful AHI data and other sleep disturbances.  
|                           | - Split-night PSG is similar to portable monitoring at home.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Myers (2013)      | **Key points:**  
| Clinical exam for identifying OSA | - Systematic review of 42 studies.  
|                           | - The most useful observation for identifying patients with OSA was nocturnal choking or gasping (summary likelihood ratio [LR], 3.3; 95%CI, 2.1–4.6) when the diagnosis was established by AHI ≥10/h).  
|                           | - Snoring is not useful for establishing diagnosis (summary LR, 1.1; 95%CI, 1.0–1.1). Patients with mild snoring and BMI <26 are unlikely to have moderate or severe OSA (LR, 0.07; 95%CI, 0.03–0.19 at threshold of AHI ≥15/h).  
|                           | - Oropharyngeal examinations and craniofacial structure, multi-itemed questionnaires, and prediction rules provided limited information for reliably diagnosing OSA.  
|                           | - The clinical examination of patients with suspected OSA is useful for selecting patients for more definitive testing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Nadeem (2013)     | **Key points:**  
| Serum inflammatory markers | - Systematic review and meta-analysis of 51 studies of persons with AHI ≥5/h (30 studies for CRP, 19 studies for TNF-alpha, eight studies for ICAM, 18 studies for IL-6, six studies for VCAM, and five studies for Selectins).  
|                           | - Overall quality: not reported.  
|                           | - Future studies needed to validate the role of these markers regarding progression or prognosis of disease, disease severity, or treatment effectiveness.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Yalamanchali (2013)| **Key points:**  
| Peripheral arterial  | - Systematic review and meta-analysis of 14 trials (909 total patients).  
|                           | - Overall quality: low to moderate. High risk of selection bias, low risk of publication bias, results
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| Ionometry (PAT), primarily Watch-PAT 100 (Itamar Medical; Franklin, MA) | confounded by inclusion of patients with hypertension.  
- Moderate to high correlation between the RDI and AHI in one nonblinded study.  
- Moderate to high correlation between PAT and PSG with respect to RDI, AHI, and oxygen desaturation index.  
- PAT-based portable devices respiratory indices positively correlated with those calculated from the scoring of PSG either in lab or at home.  
- PAT is less sensitive than PSG; negative results require laboratory-based PSG.  
- Results are insufficient to evaluate its appropriate diagnostic use. |
| Balk (2011) for AHRQ update of 2007 review Various diagnostic methods | Key points:  
- Systematic review of 46 studies of diagnostic tests, using PSG as the reference.  
- Overall quality: low to moderate. High risk of bias.  
- Low-quality evidence suggests Level II monitors used at home are accurate to diagnose OSA, but substantial differences in AHI between them and Level I PSG may exist.  
- Moderate-quality evidence suggests Level III and Level IV monitors can accurately predict an elevated AHI.  
- Low-quality evidence suggests the Berlin questionnaire can prescreen patients with OSA with moderate accuracy.  
- Insufficient evidence to evaluate:  
  - Other questionnaires: STOP (Snoring, Tiredness during daytime, Observed apnea, and high blood Pressure), the STOP-Bang (STOP with BMI, age, neck circumference, and sex variables), the American Society of Anesthesiologists (ASA) screening checklist for OSA in surgical patients, Hawaii Sleep Questionnaire, and the Epworth Sleepiness Scale.  
  - Clinical prediction rules.  
  - Level III monitors versus Level IV monitors.  
  - The predictive ability of portable monitors for clinical outcomes, response to treatment, or impact of patient triage.  
  - Phased testing for OSA.  
  - Routine preoperative testing for OSA. |
| Abrishami (2010) Questionnaires for screening OSA | Key points:  
- Systematic review of 10 studies (1,484 total patients).  
- Overall quality: Low or unclear. Unclear risk of bias, poor reporting, heterogeneous design (population, questionnaire type, validity).  
- Berlin questionnaire most commonly studied (four studies) followed by the Wisconsin sleep questionnaire (two studies).  
- Promising but inconsistent results. Suggest STOP and STOP-Bang questionnaires for screening of OSA in the surgical population due to their higher methodological quality and easy-to-use features. |

**References**

**Professional society guidelines/other:**


**Peer-reviewed references:**


**CMS National Coverage Determinations (NCDs):**


Local Coverage Determinations (LCDs):


**Commonly submitted codes**

Below are the most commonly submitted codes for the service(s)/item(s) subject to this policy. This is not an exhaustive list of codes. Providers are expected to consult the appropriate coding manuals and bill accordingly.

<table>
<thead>
<tr>
<th>CPT Code</th>
<th>Description</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>95800</td>
<td>Sleep study, unattended, simultaneous recording; heart rate, oxygen saturation, respiratory analysis (e.g., by airflow or peripheral arterial tone) and sleep time.</td>
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<tr>
<td>95801</td>
<td>Sleep study, unattended, simultaneous recording; minimum of heart rate, oxygen saturation, respiratory analysis (e.g., by airflow or peripheral artery tone)</td>
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<tr>
<td>95806</td>
<td>Sleep study, unattended, simultaneous recording of heart rate, oxygen saturation, respiratory airflow, and respiratory effort (e.g., thoracoabdominal movement)</td>
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<tr>
<td>95807</td>
<td>Sleep study, simultaneously recording of ventilation, respiratory effort, ECG or heart rate, and oxygen saturation, attended by a technologist.</td>
<td></td>
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<table>
<thead>
<tr>
<th>ICD-10 Code</th>
<th>Description</th>
<th>Comments</th>
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<tbody>
<tr>
<td>G47.33</td>
<td>Obstructive sleep apnea (adult) (pediatric)</td>
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<tr>
<th>HCPCS Level II Code</th>
<th>Description</th>
<th>Comments</th>
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<tbody>
<tr>
<td>G0398</td>
<td>Home sleep test (HST) with type II portable monitor, unattended; minimum of 7 channels: EEG, EGO, EMG, ECG/heart rate, airflow, respiratory effort and oxygen saturation.</td>
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<tr>
<td>G0399</td>
<td>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.</td>
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<tr>
<td>G0400</td>
<td>Home sleep test (HST) with type IV portable monitor, unattended; minimum of 3 channels.</td>
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