GUIDELINES FOR THE PERFORMING OF OVERNIGHT TESTING

FOR SLEEP DISORDERS IN SOUTH AFRICA.

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Please note that these guidelines do not report on treatment options but only diagnostic options. The guidelines are designed for doctors to advise their suspicions of patients with sleep disorders and give guidance to those unsure of the appropriate test to use for a given patient with sleep symptoms. They can also be used by educational institutions for training as well as medical insurers to give guidance particularly when implementing cost saving measures.

The text is designed to give context to the algorithm presented as appendix A.

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Introduction

In South Africa currently there are no standard approaches to the diagnosis of sleep disorders. Doctors and other clinicians generally send their patients to a sleep laboratory which may be run by a doctor or a neurophysiologist where a test is done. The doctor has no control over which test is done or on the quality of the reports that are issued by the laboratory. These guidelines aim to standardize both the referral, testing and initial management decisions for anyone involved in sleep medicine.

Sleep disorders are usually divided broadly into 3 types – those that present with a reduced quantity of sleep leading to daytime dysfunction (insomnia), a reduced quality of sleep (leading to daytime sleepiness or fatigue) or parasomnias. Patient with chronic insomnia may either have a cause (such as restless legs syndrome or circadian rhythm disorder) or be psychophysiological in nature (following the 3P model of Spielman REF). The hypersomnias may be caused by sleep related breathing disorders such as obstructive sleep apnea or periodic limb movements or epilepsy. Specific to daytime sleepiness are the disorders related to narcolepsy or idiopathic hypersomnia. Parasomnias include those associated with Slow wave sleep such as night terrors and sleep walking to those occurring during Rem sleep such as REM behaviour disorder and nightmares.

It is important both to find patients with sleep disorders, diagnose them correctly and manage them appropriately as the symptoms have consequences. Sleep related accidents, reduced productivity at work and the effects of sleep disorders on other medical disorder all produce a significant economic cost. By far the most important consequence of a sleep disorder is the loss of daytime performance leading to a significant overall cost in working performance and accidents and errors. Both insomnia and obstructive sleep apnea have been associated with an increased error rate leading to compromised cognitive function and increased accidents at home at work and while driving leading to a significant economic cost of OSA to any country [7].

These consequences are particularly important in the case of patients with obstructive sleep apnea. Multiple medical consequences of OSA have been described including polycythaemia, hypertension, arrhythmias, metabolic syndrome, secondary pulmonary hypertension and nocturnal polyuria. Recurrence of atrial fibrillation after cardiac ablation for atrial fibrillation is twice as common if the patient has untreated OSA (80% versus 40% recurrence) [2]. A significant increase in future cerebrovascular and cardiovascular events in patients treated for severe OSA has been demonstrated. Treatment of OSA results in a decrease of these medical disorders[3]. Over 50% of patients with type 2 diabetes have OSA which contributes to the metabolic dysregulation. Most patients with resistant hypertension have untreated OSA and treatment leads to management of the hypertension and thus all the future events caused by that hypertension (OSA is the most common cause of secondary hypertension [4].

Importantly in these other medical disorders (often fulfilling the criteria and described as Patient minimum benefit (PMB) disorders) the OSA is not simply a comorbidity but, when present, specifically increases the severity of the primary disorder and increases the risk of treatment failure of that disorder. Conversely treatment of the OSA (usually with nasal CPAP) leads to better outcomes of the other medical disorder.

Other medical disorders which have been strongly linked to organic sleep disorders include depression and anxiety. Untreated OSA is likely to be found in patients who are resistant to anti-depressants and the length of the depressive episode is likely to be longer as well [5]. OSA complicates metabolic disorders such as hepatic disorders with a strong lipid component and all forms of diabetes. There are multiple publications on this topic which is outside the scope of this paper. Increasingly OSA is considered an important disorder to exclude or to treat when dealing with many other medical disorders.

While most guidelines focus mainly on OSA the committee felt it was important to include other sleep disorders given the likelihood of having a negative home study with ongoing symptoms which indicates another type of sleep disorder. We aimed to cover all patients who had symptoms of an organic sleep disorder which could be diagnosed by an overnight study. These alternative disorders are just as important to find and treat as OSA not only for the significant drop in daytime function but also related to the effect on other medical disorders.

PLMD has also been shown to increase the risk of cardiovascular disease and depression [6]. The presence of untreated insomnia is both a prodromal symptom of depression as well as leading to an increased risk of relapse in depression(REF). The loss of circadian rhythms in patients admitted to ICU increases the risk of delirium by 30% which then increases the length of hospital stay and risk of mortality (REF).

Thus normal sleep is essential to maintain good health and reduce negative outcomes. Thus the correct diagnosis and management of sleep disorders is critical. These guidelines are aimed primarily at identifying and diagnosing those disorders which require an overnight recorded test. Thus only disorders which are relevant to that purpose are discussed. The full diagnostic process required in patients who present with other causes of insomnia is not covered.

Furthermore, along with international trends there is an urgency to expand patient access to sleep testing and drop the costs of sleep related tests without losing accuracy of diagnosis. The development of technologies to allow self-administered apnea specific testing, home testing and out-of-hospital sleep laboratories with sufficient economies of scale is promising. The development of home-based devices for the specific diagnosis of OSA has advanced and their quality is continuously improving. In the light of a recent Lancet publication estimating the prevalence of moderate to severe OSA in South Africa to be over 20% and the lack of sleep related tests in the public hospital system generally, a focus on lower cost facility based (rather than hospital-

based sleep laboratories and home-based tests is essential[18]. Considering the high prevalence of cardiac and metabolic disease as well as depression in South Africa it is urgent that the diagnosis of sleep disorders is made accessible to as many patients as possible.

The process of diagnosing and managing sleep disorders has been divided into 4 steps:

Step 1: Identifying patients who require an overnight sleep test

Step 2: Identifying the correct test

Step 3: Understanding the results

Step 4: Management of result (most of this will be covered in a separate guideline for treatment of sleep disorders)

Step 1: Identifying patients who require overnight sleep testing

There are many differing sleep disorders but they do not all need overnight testing for diagnosis and treatment such as patients with chronic insomnia. Thus excluding patients who may not need formal overnight testing is important.

- If the patient presents with classic chronic psychophysiological insomnia the recommended treatment is Cognitive Behavioural therapy (CBT) [1]. Failure of CBT, particularly with suspicion of another underlying sleep disorder, may, however, provide a reason to have an overnight polysomnogram. Of importance is that a fair number of patients with OSA present with insomnia and not excessive daytime sleepiness. Thus an extensive history is required to exclude other sleep disorders in these patients before beginning CBT.
- Patients with a clear history of restless legs syndrome interfering with sleep onset without any evidence of periodic limb movement disorder (i.e poor quality sleep) do not require an overnight polysomnogram.
- Patients with a circadian disorder only (i.e. displacement of the sleep period in time) including jet lag and shift work and uncomplicated delayed or advanced sleep phase syndrome do not require an overnight sleep study.

Overnight testing should be restricted to those patients with clear sleep-related symptoms and a suspicion of an organic sleep disorder which:

1. Can be detected on an overnight sleep study,

2. Requires an overnight test for a definitive diagnosis and information to best manage that disorder.

Sleep disorders that always require overnight testing include suspected:

- Obstructive sleep apnea (OSA) and all variations of sleep disordered breathing (SDB)
- Narcolepsy and idiopathic hypersomnia
- Periodic limb movement disorder (PLMD) and other movement disorders such as REM behaviour disorder (RBD).

- Specific sleep-related abnormalities only diagnosed with a EEG recording – epilepsy, cyclic alternating pattern and disorders in which diagnosis depends on EEG arousals.

The first indication of a sleep related disorder comes from a patient complaint. This may be specific, as in witnessed apneas, or a decrease in daytime function due to sleepiness or fatigue.

A. Identifying and measuring specific daytime sleep-related symptoms

The common symptom of any significant sleep disorder is of poor functioning during the day due to sleep debt (whether by lack of appropriate hours of sleep or poor quality sleep). In its most extreme form sleep debt presents with excessive daytime sleepiness (EDS) which can leave the sufferer prone to fall asleep in potentially dangerous situations.

There are many subjective questionnaire-based tests to determine the extent of current daytime sleepiness but the one used most often clinically is the **Epworth Sleepiness scale (ESS)**. The questionnaire is composed of 8 questions that assess the risk of falling asleep in 8 different daytime situations. Each question is scored from 0-3 leading to a maximum potential score of 24 [8]. If a patient scores 10/24 or more they can be considered to be pathologically sleepy.

However, the test has its drawbacks including differing scores between patients and their respective spouses and poor repeatability between days [9]. In patients with OSA, in which there is expected to be excessive sleepiness and where the ESS is most commonly used, up to 40% do not have excessive sleepiness [10]. This is due not to the poor sensitivity of the scale but rather the range of differing phenotypes of OSA where some patient, on any scale, do not present with excessive daytime sleepiness. Thus, while the ESS may indicate significant daytime sleepiness in many patients it cannot be used independently as a diagnostic test for OSA or to exclude any specific sleep disorder.

Another symptom often found in patients with sleep disorders is fatigue which is different to sleepiness and can be measured using various scales. The **fatigue severity scale (FSS)**, for example, is a 9-question scale where items are graded between a score of 1 and 7 (10). The final score can either be expressed as a mean score out of 9 or a total score out of 63. A mean score over 3 or a total score over are considered abnormal. The mean fatigue scores for all organic sleep disorders have been reported to be 4.4 while the ESS scores in the same group varied from 7.6 in insomnia to 9.8 for OSA and 16 for narcolepsy (Hossain 2005 - 11). The FSS is well validated, has high internal consistency and clearly differentiates patients from controls. However, fatigue is a common feature of many medical disorders unrelated to sleep disorders and clinical discretion is required to eliminate other causes of fatigue.

Thus both fatigue and sleepiness should be considered as significant symptoms of sleep disorders. While such questionnaires may assist the medical practitioner in measuring the severity of key symptoms of sleep disorders more information regarding the potential sleep disorder is required.

Objectively the only validated test to check for daytime sleepiness is the Multiple Sleep latency test (MSLT) which is PSG related and only used for the diagnosis of narcolepsy due to its expense. The Maintenance of Wakefulness test (MWT), which is similar in construct to the MSLT can also be used to check for ability to stay awake during the day.

B. Identifying suspected sleep disorders

As the guidelines specifically mention a difference in diagnostic process for patietns suspected of having moderate to severe obstructive sleep apnea some guidance on finding these patients may be pertinent. A history of snoring with witnessed apneas is obviously key to alerting clinicians to the presence of OSA, even though that history may be missing in some patients. There are a number of validated questionnaires which have been developed to increase the level of suspicion which are also predictive. These include the STOP-BANG questionnaire and the Berlin questionnaire. [11] Use of one of these questionnaires is recommended.

As the prevalence of OSA is high in the cardiovascular and metabolic disease basic questions regarding snoring and witnessed apneas plus daytime sleepiness or poor-quality sleep should be routine. Any positive history should trigger the use of one of the validated questionnaires for OSA to identity those with a high risk. Resistance to treatment in any of the associated disorders should trigger an enquiry as to a sleep disorder.

Despite the high predictive value of specific questionnaire for OSA these questionnaires do not predict severity of OSA very well. Thus the suspicion of moderate to severe OSA requires a degree of clinical expertise and a patient with negative answers to these questionnaires may still require an overnight test for exclusion of OSA. A routine apnea specific test even if negative for the diagnosis of OSA may be crucial in deciding on treatment for atrial fibrillation.

The severity of the symptoms of insomnia can also be assessed using several validated scales including the insomnia severity scale (ISS). Questions for restless legs syndrome / periodic limb movement disorder and narcolepsy when answered in the affirmative give a high clinical suspicion of the disorder. However, within each disorder the questionnaires do not give an absolute clarity of diagnosis and in some cases a great deal of clinical suspicion is still required. While the presence of cataplexy is unique to narcolepsy an overnight polysomnogram is still required not only to create a baseline but also to exclude any other sleep disorder which is more common in patients with narcolepsy. Knowledge of the symptoms of other sleep disorders is important for the clinician as this information may influence the test requested.

Recommendation:

1. Doctors should be aware of sleep disorders and the tools to identify the pertinent disorders

2. Patients with recognised co-morbidities for obstructive sleep apnea should have routine screening for sleep disordered breathing

Step 2: Choose the correct test

Types of overnight sleep studies

A decision then needs to be made by the clinician on the appropriate testing for these sleep disorders. The sleep test needs to be performed and reported on as well as, and as soon as, possible because the implications of a missing or inadequate sleep test can be significant.

Overnight studies for sleep can be split into two main groups – those that measure EEGs and a full suite of diagnostic measures and those that are focussed on respiratory (and hence only for the diagnosis of OSA) parameters alone (See appendix B for details).

Each report should contain (at least) the patients name, ID number and date of testing as well as the equipment used for the test. There should also be the name and signature of the person reporting on the test.

For both types of sleep test the reports should contain all information required by the referring clinician to assist in choosing the correct treatment for that patient. Thus the report requirements have been selected for that purpose.

Full overnight polysomnogram report requirements.
Classified as Type 1 (attended) and Type 2 (unattended) studies.

Attended studies are those in which a technician / technologist / nurse stays and monitors the patient overnight. Unattended studies are those in which all the electrodes are placed on the patient and they sleep either in their own home or another facility without constant monitoring. Generally, the person who attached all the electrodes the night before comes back the following morning to remove all the equipment.

Full overnight polysomnogram should record the following channels: electroencephalographs (EEGs), electroculographs (EOGs), electromyographs (EMGs), bilateral tibial EMGs, respiratory measures including airflow and respiratory effort as well as oxygen saturation, pulse rate and body position. Optional channels can include monitoring of continuous positive airway pressure (CPAP) and oesophageal pressure. The report should represent all the information gathered from these recording channels. Lack of any of the following information would be considered an inadequate PSG and if only respiratory channels are reported it should be considered to be an apnea diagnostic test only – see below.

The report of a full overnight PSG should include the following:

<u>Sleep related channels</u>

- Total valid recording time, total sleep time and sleep efficiency
- Sleep onset latency and REM onset latency
- Minutes and percentage for all sleep stages and wake after sleep onset (WASO)
- Arousal index – respiratory events, leg movements and spontaneous arousals

<u>Respiratory channels</u>

- AHI (apnea-hypopnea index)– central and obstructive
- ODI (oxygen desaturation index)
- RDI (respiratory disturbance index)
- Minimum and mean oxygen saturation
- Changes in AHI with body position
- Snoring presence and severity

<u>Other</u>

- Periodic limb movement index – with and without arousals
- Trend lines for all channels on one page

Other reporting may include Percentage cyclic alternating pattern

Apnea diagnostic tests report requirements

Apnea diagnostic tests are distinguished by the reduced number of channels to supply sufficient information both for a complete diagnosis of moderate to severe obstructive sleep apnea and provide sufficient information to allow the correct treatment decision.

In order to improve the accuracy of the apnea diagnostic tests, particularly using those devices that have no measure of sleep time, patients who are likely to spend large amounts of the night awake (insomnia) may be excluded. Patients should be advised to activate the recording as close to actual sleep time as possible.

There are multiple types of these devices with varying capabilities. At all times the device which can supply the most information would be recommended and therefore would be considered technically adequate. The following information should be present on the report after an apnea diagnostic test.

- Total recording time
- Total estimated sleep time (if possible)
- AHI (apnea-hypopnea index) – central and obstructive
- ODI (oxygen desaturation index)
- Minimum and mean oxygen saturation
- Changes in AHI with changes in body position
- Snoring presence and severity
- Trend lines for all channels on one page

Screening device - Type 4 devices
The information obtained from a type 4 device is inadequate for diagnostic purposes even for moderate or severe OSA. Type 4 devices should be used for screening of populations possibly without easy access to more comprehensive sleep tests to indicate which patients should go for further consultation and testing.

Guidelines for the type of test required in patients with sleep disorders

The underlying South African Guidelines for diagnostic tests for sleep disorders have been based on accepted international guidelines such as those from the American Association for Sleep Medicine[12] and the Australasian Sleep Association guidelines[13]. The proposed South African guidelines do not differ substantially from either of these international guidelines.

Apnea screening tests: It is recommended that patients with a high index of suspicion of moderate to severe OSA either by high ESS scores, many symptoms (snoring, witnessed apneas) and /or relevant co-morbidities (arrhythmia, hypertension) should initially have an apnea screening test (Type 3 only).
The patient should be able to attach the equipment and the environment should be safe for both equipment and staff (if required). The expectation of a good quality recording should be assessed.

With a positive diagnosis of moderate to severe OSA the patient can move onto a CPAP titration test to investigate whether CPAP therapy would be appropriate to treat the apneas or to manage the patient with alternative treatments.

Type 3 tests are specifically not suitable for patients with the circumstances outlined below and in these patients a **full overnight polysomnogram is required;**

1. Severe respiratory or cardiovascular disease, particularly those patients on supplemental oxygen
2. Neurological disease such as motor neuron disease or post stroke where the patient may be unable to fit the home device, or the home device may give inadequate information
3. Any other condition where the patients may require nursing assistance during the night
4. Suspicion of any other non-respiratory sleep disorder other than OSA, including milder forms of sleep-disordered breathing, narcolepsy, movements disorders or parasomnias. Other disorders may be relevant in future and this list should not be considered complete.
5. Failed screening process (various factors including patient and security for device)
6. Negative apnea screening test – where there are significant symptoms without evidence of moderate to severe apnea.
7. Failed CPAP titration where symptoms continue after adequate treatment with CPAP
8. Children (no apnea screening device is recommended below the age of 12 years)
9. Suspicion of multiple sleep disorders
10. For exclusion of other sleep disorders in the diagnosis of narcolepsy
11. Conditions that place the patient at increased risk of non-obstructive sleep-disordered breathing (e.g., central sleep apnea, hypoventilation and sleep related hypoxemia). Examples of these conditions include significant cardiopulmonary disease, potential respiratory muscle weakness due to neuromuscular conditions, history of stroke and chronic opiate medication use.
12. Patients located in environments that may put sleep equipment, personnel and quality of home-based recording at risk

In cases not covered by the existing guidelines above a clinical opinion by a medical doctor skilled in managing patients with sleep disorders should be considered a valid reason for a full overnight polysomnogram.

Other sleep-related tests

Multiple sleep latency test. This test should be performed according to international criteria which have been clearly set out [14]. Each nap should be reported on and should include data on time starting nap, sleep onset latency (SOL), REM onset latency and time of wake up. The report should also indicate mean SOL and number of SOREMs (Sleep onset REM periods).

The Maintenance of wakefulness test (MWT) should also follow international criteria for performance of the tests and the report should include the same details as for the MSLT [15].

CPAP titration test. To determine whether a patient with OSA would benefit from long term treatment with nasal CPAP therapy a CPAP titration test should be performed. This would entail adjusting the CPAP pressure (either manually or automatically by machine) to manage apneas during one or multiple nights of sleep. Mask fitting and are essential before attempting a CPAP titration.

During the CPAP titration patients should show compliance indicated by the ability to sleep for sufficient hours per night on the CPAP machine. Efficacy of CPAP to cause a drop in AHI to near normal levels (<10 apneas per hour) is also essential. These 2 factors as well as a positive result for relief of symptoms would indicate a high likelihood for long term compliance on CPAP.

The CPAP titration test is essential before providing long term treatment with CPAP and can be performed in a sleep laboratory or home environment. Evidence would suggest that a home-based CPAP titration is as

effective as a lab-based CPAP titration in uncomplicated patients with OSA [16]. When titration is performed in a home environment, mask fittings and education on CPAP use are necessary either at a sleep center / doctors rooms and there should be availability of trained staff by telephone. An attended CPAP titration performed in a facility is recommended for all cases where a full polysomnogram was recommended for the diagnostic study (see list above).

An automatic CPAP device (APAP) or manual adjustment of CPAP pressure in an attended study are usually used for a home-based and facility- based CPAP titration respectively . The benefits of using an automated device include: lower staff costs, more frequent and possibly more accurate pressure changes, option for 2 or 3 more nights of titration with no increased costs and accurate information regarding CPAP titration. The cons of using an auto-titration device include lack of minute-by-minute ability to change pressure and a slow rise in pressure in severe patients.

A repeat sleep study is not required in most patients undergoing a CPAP titration.

A second sleep study while on CPAP is recommended in the following patients:

1. Patients who had significant oxygen desaturation during the diagnostic study (such as severe apnea (AHI >30 per hour) with a baseline below 90% and / or a minimum oxygen saturation below 70%). In this case the repeat study should ideally involve the same equipment used for the diagnostic study while the patient is on CPAP.
2. Patients who had a failed home-based CPAP titration where CPAP is the best option for treatment of the patient.
3. A negative CPAP titration defined by continuation of sleep related symptoms after a successful CPAP titration as this indicates a second sleep disorder (see below). If that second sleep disorder is suspected to be narcolepsy a multiple sleep latency test (MSLT) should be performed the day after the overnight polysomnogram. The polysomnogram should be performed with the patient on CPAP.
4. Any patient where a download from the CPAP machine does not give sufficient information regarding adequacy of treatment.

In all cases of CPAP titration a download from the auto-titration machine should be obtained and a report written by the clinician before proceeding to long-term therapy. If manual titration is performed a comprehensive report of pressure changes and patient response must be created.
Apart from patient name, ID number and date of titration, the minimum criteria for the CPAP titration report are as follows:

- Machine and mask used for titration
- Total connected time (or the average)
- AHI
- Mean CPAP pressure and 90% required pressure
- Central apnea index and percentage Cheyne-Stokes breathing if required
- Percentage leak

Report should be dated and signed

Whether the CPAP titration is performed in a facility or at home depends on various patient and equipment factors:

In-Laboratory CPAP titration

Pros	Cons
1. providing immediate education and help while using the CPAP for the first time, 2. real-time visual identification of efficacy of therapy (if together with a polysomnogram) and 3. the ability to provide immediate interventions to make CPAP treatment more comfortable for the patient particularly in mask selection	1. the need for an overnight stay away from home at the testing facility with the associated costs and patient time and 2. the potential delay in initiation of therapy.

CPAP titration done in the home setting:

Pros	Cons
1. lower cost, 2. reduced time away from home, 3. faster initiation of treatment, and 4. greater access to care	1. Possible inadequate patient education and 2. The inability to identify and rectify problems related to mask fit, leak, or other CPAP-related issues on the night of Auto-CPAP use.

Split-night studies

A split-night sleep study can be done either to initiate CPAP therapy on the diagnostic night or to confirm treatment efficacy either with an oral appliance or other treatment. The level of evidence for split-night studies as a diagnostic tool is weak mainly due to lack of randomised controlled trials[12].

a. In the diagnostic study type: a routine attended PSG is started with confirmation of moderate to severe OSA within the first few hours. Halfway through the study the clinician is advised of the results and asks the attending technologist to initiate CPAP. Evidence indicates that there is good consistency of AHI compared to a full-night study and that there is no difference in the success rate of CPAP titration or adherence to CPAP over the short term [17].

Pros: rapid treatment initiation – which may be important for patients traveling a long distance.

Cons: may not get the full extent of the severity if patient does not have a period of REM sleep or does not lie supine during first arm of the split study.

b. Clinician treating the patient needs to be on call and able to visualize the results of the first half before giving approval to commence CPAP therapy.
c. A split night study can only be done with full attended polysomnography.
d. Patient and funder need to approve and give consent for CPAP titration prior to commencement of study

2. When assessing efficacy of treatment, the split schedule is pre-planned – one half of the night without treatment and the other half with treatment. The treatment modalities could be either CPAP or an oral appliance. The referring clinician does not need to be on call and there are no further cost implications for funders. Patients give consent upfront as this is intended function of test.

The reports written on a split-night test should comprise 2 separate reports one for each section.

Once again the decision between a home-based, lab based CPAP titration or split-night study should be at the treating clinicians discretion and should not be influenced entirely by funding limitations. The choice of PAP initiation in the home or lab should be based on access, cost-effectiveness, patient preference, sleep clinician judgement, and other factors. In cases which do not conform to the guidelines as indicated above the doctors motivation should be recognised. These guidelines cannot cover all possible situations.

Recommendations:

1. Patients who have a high suspicion for moderate to severe obstructive sleep apnea should have an apnea specific diagnostic test.

2. Tests can be done at home or in hospital with equal validity

3. In an era where cost reduction is important home-based testing should be promoted.

4. All data pertinent to the diagnosis of a sleep disorder and possibly required for management should be given in the report.

5. CPAP titration tests are required to confirm compliance and efficacy of CPAP.

5. Split night studies should only be done in exceptional circumstances.

Step 3: Understanding the results of the tests

The South African group also agree with other sleep bodies that only medical practitioners should refer and treat patients with sleep disorders. However, most doctors in South Africa have had no training on sleep disorders. While the results of the apnea screening tests are fairly simple to interpret those of the full overnight polysomnogram are not.

The committee recognises the lack of sufficient education on sleep related disorders at an undergraduate and postgraduate level in all the Medical schools in South Africa and commits to running a training program through the Sleep Society starting in 2021. We hope to get the standard of training in sleep medicine in line with international trends. Ultimately a speciality in sleep medicine is required, which will facilitate greater development of sleep clinics and sleep qualified doctors to coordinate better sleep testing and treatment.

Two levels of training will be offered:

1. A Basic course on diagnosing and managing obstructive sleep apnea open to all doctors and dentists allowing them to refer patients in for home-based testing to exclude moderate to severe OSA. The course should include a discussion of these guidelines, how to interpret the results of their chosen device as well as how to manage patients with OSA.

2. An advanced course to upgrade those skills to know when to refer for a full polysomnography and a detailed knowledge of the interpretation and management of those results. This course should include all of topics in the basic course but also the other sleep disorders in sufficient detail as to allow competent interpretation of the results from such a study.

Both courses will have an assessment component allowing doctors to be certified.

Doctors who wish to run and report on either apnea specific tests or full polysomnograms should complete a further training process including mentoring to competence in the areas of interpretation of results and report writing.

Negative or failed apnea specific diagnostic test or CPAP titration

Definitions:

- a failed test is one where data was not able to be obtained for various reasons
- a negative test is where the performance of the test was successful but:
  a. in the case of a diagnostic tests the patient did not have moderate to severe OSA.
  b. In the case of a CPAP titration the titration was successful but did not treat the patient symptoms adequately

If the home-based apnea diagnostic test is negative for moderate to severe OSA the referring doctor may wish to treat the resulting snoring or mild OSA with treatment options other than CPAP. These may include a referral to an ENT surgeon, a dietician, or a dentist to fit an oral appliance. Discussion of these management options should be included in the basic course.

In other circumstances patients should be referred to doctors who have completed the advanced course for further management or assessment. In a significant number of these cases the patients will require a full polysomnogram either to improve compliance on CPAP or to diagnose a secondary sleep disorder. Thus having a previous Type 3 apnea screening test does not preclude the patient from a full overnight polysomnogram.

In these circumstances the need for a full polysomnogram is at the discretion of the doctor to whom the patient is referred.

Recommendations:

1. Any doctor can send patients for an apnea screening test but only doctors with some training on sleep tests should motivate for full overnight sleep studies to manage the results appropriately.

2. All doctors should have some exposure to a course on obstructive sleep apnea as well as other sleep disorders

3. Those doctors who wish to directly perform and report on overnight sleep studies of any sort, from Type 1 to Type 3, should have the appropriate training on the performance and analysis of these tests.

4. A repeat test, usually a full polysomnogram, is recommended in the case of a failed or negative test for both apnea diagnostic tests and CPAP titrations.

Some final points:

1. The South African guidelines presented are fully compatible with international guidelines including those from the American Academy for Sleep Medicine (AASM)[12] and the Australasian Sleep Association [13].

2. Neurophysiologists can also perform and report on sleep studies but they should not consut with patients prior to the test, refer patients for testing or recommend treatment. They may give results to patients but should send patient back to the referring doctor for treatment. No CPAP titration should be performed without written approval from that referring doctor. Neurophysiologists should be held to the same reporting standards as indicated above for the various tests.

3. Remuneration for sleep studies, should be the same no matter who performs the test (i.e. neurophysiologist or medical practitioner) as long as the recommended criteria are upheld. The renumeration for an apnea screening test should be lower than that for overnight polysomnogram as less staff costs and cheaper equipment costs are involved. There should be no difference in the renumeration for a particular sleep tests based on whether it is done at home or in hospital (i.e. full PSGs done at home should receive the same renumeration as in hospital) as long as the reporting criteria are upheld.

4. A repeat full polysomnogram in a patient who has had an apnea specific tests may be required for various reasons and indicated previously.

Conclusion

As one of the few truly multidisciplinary fields sleep medicine is practised by many different specialties as well as general practitioners. It is this multidisciplinary nature of the field which has led to a lack of clear academic courses at either an undergraduate or postgraduate level. A sleep society which has brought these doctors together to agree on standardised testing and training has been set up and is responsible for this guidelines document.

These guidelines lay out an approach to sleep testing which is based on medical evidence as well as trying to reduce the costs of testing for sleep disorders to be applicable to the South African situation. This approach allows more widespread access to sleep testing as well as deliberate education of doctors to manage larger group of patients with various sleep disorders. A standardised approach to report writing and testing will allow consistency across all sleep facilities.

These are not intended to be final guidelines and will need to be adjusted as more information becomes available on all sleep disorders. The guidelines should remain focussed on the best approach, both from an information and cost perspective, to diagnose sleep disorders in order that they can be managed properly.

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References

Only selected references are given as a comprehensive report on all issue covered in these guidelines is beyond the scope of this document

1. Edinger JD, Arnedt JT, Bertisch SM, Carney CE et al. Behavioural and psychological treatment for chronic insomnia disorder in adults: an American Academy of Sleep Medicine clinical practice guideline. J Clin Sleep Med 2021 doi:10.5664/jcsm.8986

2. Geovanini G, Lorenzi-Filho G. Cardiac rhythm disorders in obstructive sleep apnea. J Thorac Dis 2018;10 (Suppl 34): S4221-S4230.]

3. Mehra R. Sleep apnea and the heart. Cleveland Clin J Med 2019; 86: suppl 1

4. Pedrosa R, Drager L, Gonzaga C, Sousa M, de Paula L, Amaro A, Amodeo C, Bortolotto L, Krieger E, Bradley D, Lorenzi-Filho G. Obstructive Sleep Apnea: The Most Common Secondary Cause of Hypertension Associated With Resistant Hypertension. Hypertension. 2011;58:811-817.)

5. Waterman L, Stahl S, Buysse D et al. Selfreported obstructive sleep apnea is associated with nonresponse to antidepressant pharmacotherapy in late-life depression. Depress Anxiety 2016; 33:1107-1113.

6. Giannaki C, Karatzaferi C, Hadjigeorgiou G et al Periodic limb movements in sleep and cardiovascular disease: time to act. Front Neur 2013 10.3389/fneur.2013.00097

7. Leger D, Stepnowsky C. The economic and societal burden of excessive daytime sleepiness in patients with obstructive sleep apnea. Sleep Med Rev 51 (2020) 101275

8. Johns MW. A new method for measuring daytime sleepiness: the Epworth sleepiness scale. Sleep. 1991 Dec;14(6):540-5.

9. Hunsasiketti M. Low repeatability of the Epworth Sleepiness Scale and the need to redefine the minimally clinically important difference. J Clin Sleep Med 2020; 16(10): 1827.

10. Zinchuk A, Gentry M, Concato J, Yaggi K. Phenotypes in obstructive sleep apnea: a definition, examples and evolution of approaches. Sleep Med Rev. 2017 Oct; 35: 113–123.

11. Nagappa M, Liao P, Wong J, Auckley D, Ramachandran S, Memtsoudis S, Mokhlesi B, Chung F. Validation of the STOP-Bang Questionnaire as a Screening Tool for Obstructive Sleep Apnea among Different Populations: A Systematic Review and Meta-Analysis. PLOS ONE 2015; DOI:10.1371/journal.pone.0143697

12. Kapur V, Auckley D, Chowdhuri S, Kuhlmann D, Mehra R, Ramar K, Harrod CG. Clinical Practice Guideline for Diagnostic Testing for Adult Obstructive Sleep Apnea: An American Academy of Sleep Medicine Clinical Practice Guideline. J Clin Sleep Med. 2017;13(3):479–504

13. Douglas JA, Chai-Coetzer CL, McEvoy D, Naughton MT, Neill AM, Rochford P, Wheatley J, Worsnop C. Guidelines for sleep studies in adults - a position statement of the Australasian Sleep Association. Sleep Medicine 36 (2017) S2eS22

14. Carskadon MA et al. Guidelines for the multiple sleep latency test (MSLT): a standard measure of sleepiness. Sleep. 1986 ;9(4):519-24

15. Mitler et al. Maintenance of wakefulness test: A polysomnographic technique for evaluating treatment efficacy in patients with excessive somnolence. 1982 Electro Enceph Neurophys 53:658-661.

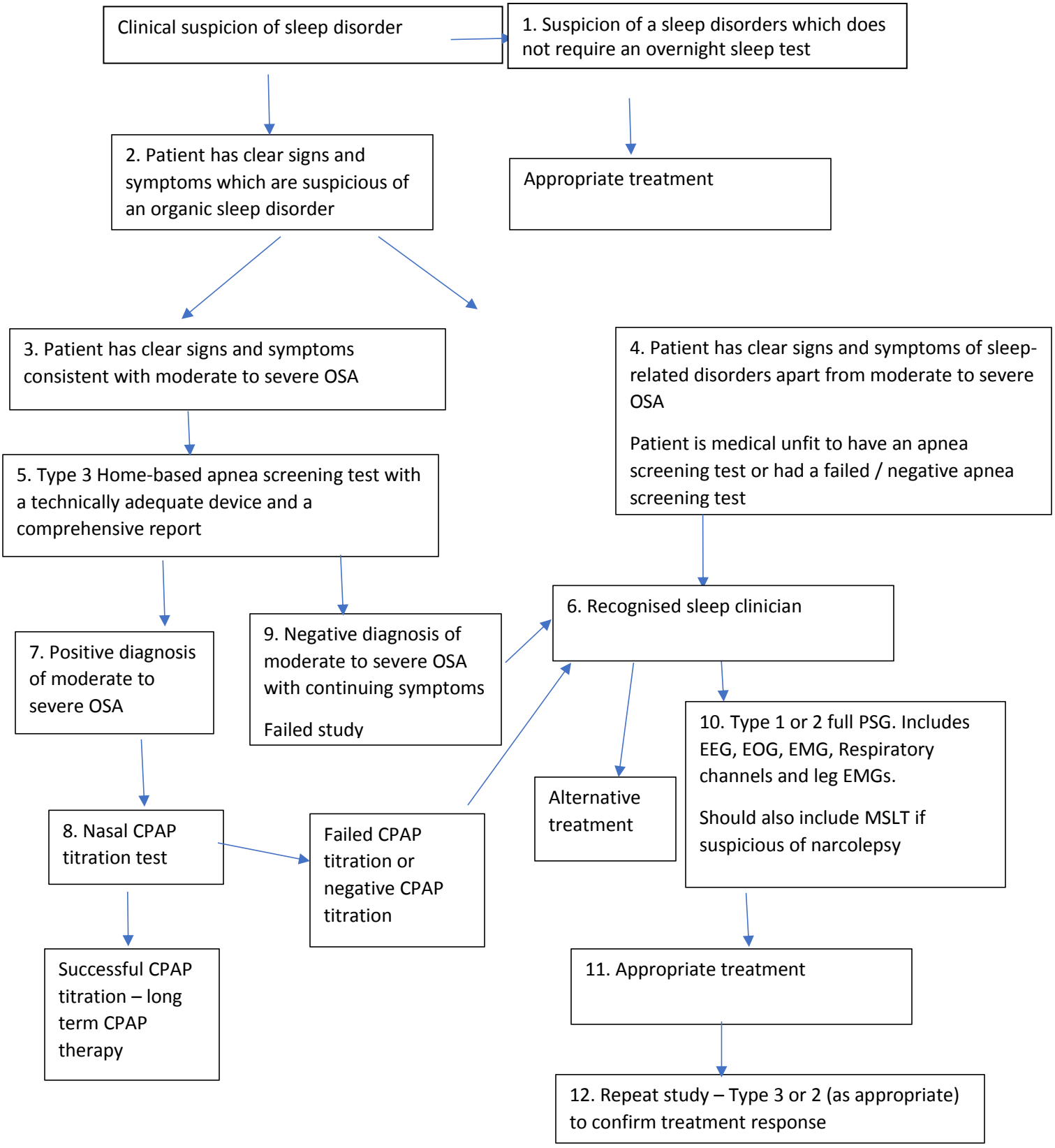
16. Rosen C, Auckley D, Benca R, Foldvary-Schaefer N, Iber C, Kapur V, Rueschman M, Zee P, Redline S. A Multisite Randomized Trial of Portable Sleep Studies and Positive Airway Pressure Autotitration Versus Laboratory-Based Polysomnography for the Diagnosis and Treatment of Obstructive Sleep Apnea: The HomePAP Study. Sleep 2012;35(6):757-767

17. Collen J, Holley A, Lettieri C, Shah A, Roop S. The impact of split-night versus traditional sleep studies on CPAP compliance. Sleep Breath. 2010;14(2):93–99.

18. Benjafield A, Ayas N, Eastwood, Heinzer R, Ip MSM et al. Estimation of the global prevalence and burden of obstructive sleep apnea: a literature-based analysis. Lancet Respir Med. 2019; 7(8): 687–698.

Appendix A

Guidelines for sleep testing in South Africa



Appendix B

Channels that should be included for each type of overnight sleep recording.

Generally type 1 and type 2 recordings should include the same channels and should provide the same results on the report. Type 4 studies which only use 1 or 2 channels are not included in this table as they are not appropriate for diagnostic tests but can be used for screening of populations in order to alert practitioners to the need for a more comprehensive test.

Required Channels for Test Type		
Type 1 - Minimum	**Type 2 - Minimum**	**Type 3 - Minimum**
EEG	EEG	ECG/heart rate
EOG	EOG	Airflow
ECG/Heart rate	ECG/heart rate	Respiratory effort
Chin EMG	EMG	Oxygen saturation
Limb EMG	Airflow	
Respiratory effort at thorax and abdomen	Respiratory effort	
Air Flow from nasal canula thermistor and/or X-Flow	Oxygen saturation	
Pulse Oximetry		

Appendix C

Approved medical aid codes to use when running sleep studies:

Full polysomnogram:	
• Hire of equipment	2719
• Reporting fee:	2720
Multiple sleep latency tests	2723
CPAP titration	2724
Apnea screening tests: (Discovery only):	
• Hire of equipment	6015
• Reporting fee	6016
Facility fee: for sleep studies done in doctor's rooms	0004 modifier