

Polysomnography (Sleep Studies)

What Is A Sleep Study?

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A sleep study or polysomnogram (PSG) is a multiple-component test that electronically transmits and records specific physical activities while you sleep. The recordings become data that are analyzed by a qualified physician to determine whether or not you have a sleep disorder.

The four kinds of PSG studies are:

1. **Diagnostic overnight PSG** – This is the most common type of sleep study, usually performed when sleep apnoea is suspected, or when there are abnormal movements in sleep or other causes of unexplained arousals. The sleep study consists of general monitoring of sleep architecture (ie. the amount of the different stages of sleep, number of arousals etc) and a variety of body functions during sleep, including breathing patterns, heart rhythms and limb movements.
2. **Diagnostic daytime multiple sleep latency test (MSLT)** – This test is used to diagnose narcolepsy and to measure the severity of daytime sleepiness. It is ideally performed on the morning following a diagnostic overnight PSG. The MSLT consists of 4 to 5 twenty minute naps, separated by 2 hour intervals. The average time taken to fall asleep in each of these 4 to 5 naps is calculated to give the mean sleep latency, or the average time it takes to fall asleep. This is a measure of the degree of sleepiness. The sleep stages reached are also recorded. The presence of REM sleep (sometimes called dream sleep) is abnormal within twenty minutes of falling asleep, and is a characteristic feature of narcolepsy.
3. **Two-night evaluation PSG and CPAP titration** - CPAP (continuous positive airway pressure) is a sleep apnea treatment that involves the delivery of air into airways through a specially designed nasal mask. On the first night of the two-night protocol, general monitoring and diagnostic evaluation is conducted ie. the diagnostic overnight PSG as described above. If the diagnostic overnight PSG shows significant sleep apnoea, the patient returns for a second night to determine the necessary CPAP pressure required to abolish the apnoea.
4. **Split-night PSG with CPAP titration** - Split night PSG is conducted when moderate or severe sleep apnoea has been discovered or strongly suspected during the first part of the night's study. The second half of the night is used for CPAP titration. This type of study is essentially similar to the two-night evaluation, except that both studies are condensed into a single night, usually

as a time and cost saving measure. It is less ideal because there is less time to record the respiratory events in the diagnostic portion of the study, and also less time for CPAP titration in the latter half of the study.

What to expect when you come for a sleep study:

Patients are encouraged to visit the sleep laboratory to familiarize themselves with the environment prior to testing and to bring any personal items (eg. pillows, blankets, toys, books) which may facilitate relaxation and sleep. Brochures containing information related to the PSG are usually given in advance and any questions addressed prior to the appointment so that you will better understand the procedures and be able to follow instructions. You will be asked to fill out a bedtime questionnaire detailing medical history including height, weight, sleep habits and the use of drugs which may affect normal sleep.

You may be asked to discontinue medication which can affect sleep patterns if there are no contraindications to doing this. Your sleep physician and your primary care physician will decide if this is necessary or appropriate. Do not make any medication adjustments without first checking with your physician.

The sleep laboratory is ideally a quiet place conducive to sleep, simulating the bedroom environment at home, situated away from the main hospital. Bathroom facilities, light and temperature control, television, a nightstand and other amenities are made available to enhance patient comfort. Recording equipment is stored in a separate room to minimize disturbance and audiovisual communication maintained at all times via closed circuit television and 2-way intercom. Emergency medical coverage is available throughout the study, provided by physicians on call within the hospital.

On the night of your sleep study, you will be assigned to a private bedroom in a Sleep Disorders Centre or hospital. Near the bedroom will be a central monitoring area, where the technicians monitor sleeping patients. You will be hooked up to equipment that may look uncomfortable. However, most patients fall asleep with little difficulty.

The equipment used in a sleep test:

- Surface electrodes on your face and scalp that will send recorded electrical signals to the measuring equipment. These signals, which are generated by your brain and muscle activity, are then recorded digitally.
- Belts placed around your chest and abdomen to measure your breathing.
- An EEG (electroencephalogram) to measure and record brain wave activity during sleep.
- An EMG (electromyogram) to record muscle activity such as face twitches, teeth grinding, and leg movements. It also helps in determining the presence of REM stage sleep.

- An EOG (electro-oculogram) to record eye movements. These movements are important in determining the different sleep stages, particularly REM stage sleep.
- An ECG (electrocardiogram) to record heart rate and rhythm.
- A nasal airflow sensor to record airflow.
- A bandage-like oximeter probe on your finger to measure the amount of oxygen in your blood.
- A snore microphone to record snoring activity.

Recording these parameters will allow your physician to assess the quality and quantity of your sleep, how you breathe and any abnormal movements during sleep. The sleep study will be analyzed by qualified sleep technologists and your sleep physician.

At the end of the recording period, usually at least 6 hours, you will be allowed to spontaneously awaken, and you will be unhooked from the recording equipment. There will be facilities for a shower and a change of clothing, and you will then be discharged to go about your usual day, unless you have been scheduled for an MSLT.

If an MSLT or daytime nap study has been ordered by your sleep physician, you will be unhooked from the belts around your chest and abdomen, as well as the EMG electrodes on your legs. The remainder of the EEG, EMG and EOG electrodes will be retained to record your sleep patterns. You will have to stay for at least 4 twenty minute naps, 2 hours apart. You should plan to spend the day in the sleep laboratory and will need to take a day off work typically.

A detailed report will be prepared by the sleep physician. The sleep study provides useful diagnostic information about sleep related breathing disorders, movement disorders in sleep and other less common conditions like seizures in sleep and other abnormal behaviours during sleep. If you undergo a CPAP titration study, the optimum pressure setting will be determined and included in the sleep study report.