

RCPCH Working Party on Sleep Physiology and Respiratory Control Disorders in Childhood

Lay Summary 1 – Sleep Services and Sleep Studies – General Information

Children may suffer from a number of disorders affecting sleep. In many cases these may be problems with settling to sleep, or repeated waking in the night which can be managed by simple behavioural treatment. In other children there may be an important underlying disturbance of sleep regulation, or breathing during sleep, which needs specialised assessment and management.

This report sets out to describe the sort of problems of sleep which may require specialised assessment and management, reviews the evidence for investigation and management of each condition, and makes recommendations on the services which should be available.

Separate information leaflets have been provided for specific sleep disorders, and for a number of common conditions where sleep and breathing may be a particular problem. This leaflet provides an overview of different sorts of sleep studies and services.

Why do a sleep study?

In many cases a sleep study is done to assess whether a child has a problem with breathing during sleep. In the first instance a simple assessment of the effectiveness of breathing might be done. If there are more concerns, then a more detailed test of sleep and breathing would assess whether a child is having to work too hard to breathe while asleep, causing unwanted effects on general health, growth and mental function. In other cases we need to look at a child's quality of sleep, which requires a complete night-time sleep study.

Where should a sleep study be done?

Simpler sleep studies can often be done at home, which is the most natural environment for a child. More detailed sleep studies may need to be done in hospital. It is important that any study done in hospital is done in a quiet environment where a child has a reasonable chance of sleeping normally; they should never be done on an open ward. There should always be facilities for a parent to stay with the child in or next door to the sleep cubicle. Studies should only be done by staff who are experienced in the performance and interpretation of the tests.

What do the tests involve?

Simple studies of the effectiveness of breathing during sleep – Oximetry and Capnography

The most important thing to establish is whether breathing is adequate during sleep, and the simplest way to assess this is to record the level of oxygen, which the body breathes in, in the bloodstream, using a soft probe which wraps around a finger or toe. This is called oximetry. It is often helpful to record the level of carbon dioxide (CO₂), which the body breathes out, in the bloodstream at the same time. This can be done by using a sensor which is stuck to the skin or ear lobe, or by using soft plastic tubes which fit a little way inside the nostrils and gather exhaled breath. The assessment of CO₂ is called capnography.

Any assessment of breathing during sleep using oximetry must be a continuous electronic recording of the oxygen levels; observation of the monitor by a nurse at intervals during the night is not an adequate test.

More detailed tests of sleep and breathing – Cardiopulmonary (heart and lung) sleep studies

If there are concerns about a child struggling to breathe during sleep, then a simple screening test such as oximetry may not be enough to rule out a problem. In this case a more detailed study will need to be carried out. This needs to assess the breathing pattern in more detail. In addition to oximetry and capnography the test will usually involve:

- Three or four soft pads to be stuck to chest and tummy to record the heart rhythm (ECG)
- Two stretchy bands around the chest and tummy to measure breathing effort
- Soft plastic tubes to fit a little way inside the nostrils to measure airflow during breathing
- A video and sound recording of the child during sleep

Other sensors used may include a small microphone taped near the neck, a device which detects movement of an arm or leg, and a sensor which detects whether the child is lying on their front or back.

Full sleep studies – Polysomnography

Although many children with sleep problems can be assessed adequately using cardiopulmonary sleep studies, there are some situations where an assessment of sleep quality and sleep patterns is needed. This requires measurements of brain waves, muscle activity, and eye movements as well as the cardiopulmonary measurements described previously.

The additional sensors which would be used in a full polysomnography study include:

- At least five small metal electrodes which are glued to the scalp or behind the ears to record brain waves (EEG)
- Two electrodes which are stuck on to the cheek or temple near the eyes to detect eye movements
- Two or three electrodes stuck under the chin to measure muscle activity

- Sometimes electrodes may be attached to one or both legs as well, to look for regular muscle activity in the legs during sleep

Multiple Sleep Latency Testing

If narcolepsy is suspected it may be necessary to measure a child's tendency to fall asleep in the daytime. This is done by Multiple Sleep Latency Testing (MSLT). MSLT is a test done in the daytime, usually following an overnight polysomnography. The additional sensors used in polysomnography to measure sleep patterns are left on the child after they wake up in the morning. Every two hours during the day the child is asked to lie down in a darkened room and try to fall asleep. Each test lasts for no more than 20 minutes, and there are usually four or five tests during the day.

Where should these tests be available?

Any hospital which looks after children overnight should have the facility to carry out an oximetry recording.

Cardiopulmonary sleep studies should be available in every hospital which accepts referrals of children from other hospitals, or any paediatric centre serving 2 or more Strategic Health Authorities.

Polysomnography should be available in most regions, and we would recommend that such a facility should be available for any area with a population of 5-6 million people. Multiple Sleep Latency Testing should be available at a centre which can carry out polysomnography. It is essential that staff carrying out and interpreting sleep studies are appropriately trained and competent to do so. This becomes increasingly important with the more complex studies. We have proposed a system of peer review and quality control of centres, as there is currently no way of verifying the competence of centres carrying out sleep studies in this country.