Sleep Services During Endemic COVID-19

Introduction

Sleep services comprise a series of diagnostic and treatment functions for a wide spectrum of sleep disorders and are run by physiologists/scientists together with a range of specialties including respiratory, neurology, anaesthesia and others. They consist of testing and treating patients with either (i) sleep breathing disorders or (ii) purely sleep disorders.

The sleep breathing disordered services are high volume services with some 12,000 diagnostic sleep tests per month, many to exclude or confirm the diagnosis of obstructive sleep apnoea. As for general respiratory physiology, such services closed early and several treatments are associated with infection control issues caused by aerosol generating procedures (AGPs) such as administration of CPAP and NIV.

As a consequence, there are three issues to consider:

1. The need for physiologists/scientists to continue supporting the acute use of CPAP / NIV on wards as the endemic COVID-19 will now be looked after mainly by respiratory teams and ITU.
2. The huge backlog that has arisen as a consequence of respiratory/sleep physiology services being closed early, coupled with the huge turnover that normally occurs, leading to difficulties in restoration of services.
3. Difficulties in the initiation of CPAP and NIV given their AGP nature. This will lead to reduced turnaround times with subsequent inefficiencies due to reduced throughput and exacerbate the significant backlog that already exists in many sleep departments.

Most services in the past have had a variety of pathways, but the reduction of face to face services has forced changes in pathways that may be better for patients, although this requires formal evaluation. In the interim 18-24 months, these new ways of working now need to now be established as part of normal business, taking local circumstances into account. However, there needs to be recognition of any financial implications of such changes with tariffs and commissioning adjusted appropriately.

These matters need to be considered in the setting of workforce capacity. On top of the long-standing staff shortages in respiratory physiology, there are those who are currently absent from work with COVID-19 or shielding. Additionally, a significant proportion of the workforce is from a B.A.M.E. background, and more senior staff tend to be older with possible associated co-morbidities.

Simple precautions

For patient attendances, if they do occur, similar precautions to respiratory physiology services need to be considered, as listed:

1. Ensure patients and staff are at the lowest risk by:
   - Undertaking a pre attendance questionnaire, including validating the contact app.
   - Check the patient's temperature on arrival at the sleep department. If elevated above 37.3°C, organise swabbing and rebook the patient at a later date.
   - Some organisations may pre-swab ahead of any appointments, recognising that there is a significant false negative rate.
   - "Hot" and "cold" COVID-19 sites may be considered, recognising there is still a risk of false negative results.
   - Social distancing in waiting rooms or ask patients to wait in their car, recognising there is a need for administration time for this.
   - Attempt to maintain a unidirectional flow of patients through the department to minimise face to face contact.
   - Ensure the environment allows sufficient air exchanges.

2. ***Full PPE (including FFP3 mask or equivalent) needs to be worn if there is a plan to directly initiate NIV or CPAP***, though alternative methods of initiating these need to be considered. PHE have decreed that both these procedures are AGPs, so full PPE is required.

3. Following the attendance, the equipment and surfaces need to be cleaned and PPE removed, with time allowed for room air to change delaying turnaround times. ("Second" rooms, where available, can be used alternately).

4. The time between the next patient attending for the next test will be a function of the number of room air changes. PHE recommends 6 Air Changes per Hour (ACH) for rooms where NIV and CPAP are initiated. Departments need to check the airflow/changes in rooms are adequate to determine how long the room needs to be left empty before re-use by a new patient. Where the testing room does not meet the PHE recommended air change requirement, or there are significant doubts, the room should be left empty before cleaning for a period of at least three hours [1].

Specific process

A. Performing limited sleep studies

This involves patients using a piece of equipment overnight in their own environment to record a variety of different parameters, depending upon the condition being investigated. As such the equipment needs to be available for the patient, they need to be instructed how to use it, ensuring the kit is returned in a timely fashion with subsequent cleaning/disposal so it can be reissued.

Departments may wish to consider using pulse oximetry to be posted out as a screening test. Interpretation by skilled individuals is key, recognising that some patients may have significant sleep problems but do not show overnight desaturation, though, when abnormal with the characteristic pattern, it can reduce the need for other diagnostic tests with the problems below.

If a limited multi-channel sleep study is deemed necessary, it could be:

- Performed using disposable equipment, organised through a third party.
- By sending the department's equipment out by courier.
- Patients attending the sleep laboratory (or a collection point) as they did previously.

If the department's equipment is used, then, on return, some parts will need to be disposed of as high risk; e.g. nasal cannula, whilst other parts will need cleaning if not single patient use; e.g. effort bands. The recording device will need to be rigorously cleaned according to manufacturer's instructions.

All this will delay the normally rapid turnaround. So, to maintain efficiency during the endemic COVID-19 period, several more items of diagnostic equipment will need to be available to departments, at significant additional cost. Tariff and commissioning will need to reflect this new inherent inefficiency.

The use of a range of limited sleep study devices is available and, to date, none has any clear infection protection and control advantage over the other.

B. Reviewing the patients with results

Given the widespread use of telephone and video consultations that have occurred in the current COVID-19 pandemic arrangements, this should be the main way wherever possible of undertaking the clinical history, communicating the results of the sleep study and determining a management plan. Whether this "first appointment" will be performed by medical staff or physiologists/scientists will depend upon local arrangements, but this will significantly reduce footfall of patients in sleep departments. To enable such innovation providers need to invest in appropriate technology.

It needs to be recognised that, in some instances, review of the patient face to face may be required (e.g. to examine the upper airway with regards to consideration of any obstructing lesions and the possibility of an advancement device). Appropriate precautions need to be in place as documented above and FFP3 mask and visor worn given the risk of coughing during inspecting the mouth/throat/airway.

For patients with other "pure" sleep diagnoses (e.g. narcolepsy, parasomnias, etc.), management advice and follow up should be by virtual means where possible.

C. Initiation of CPAP

While, in a small number of organisations, this may be arranged through third parties, many patients are initiated onto CPAP through either group or individual appointments within sleep departments. This will be an explanation with the patient of the underlying

problem, finding the correct interface, advice on cleaning the equipment and then patients starting CPAP in the presence of sleep staff.

If this process is to continue, it has to be recognised that this is a high risk AGP scenario and full PPE needs to be in place, with appropriate cleaning of the environment and sufficient air changes before other patients can use the room.

An alternative process is to educate the patient and mask fit but not to apply the mask with the unit turned on. CPAP should be started in the patient's home with, access to on-line or written/interactive media and supported by phone or virtual advice. ***Under such circumstances, given the close proximity to the patient during assessing the correct interface, a FFP3 or equivalent mask together with visor and gloves should be used. A standard apron will be sufficient.***

If patients try the "sensation" of CPAP at pressure on a non-vented mask and circuit staff should wear full PPE including FFP3 mask even if for a brief period.

D. Follow up of CPAP patients

Previously, patients would attend clinic regularly for a variable number of times to check CPAP adherence; a pre-requirement for DVLA at 1 -3 years depending upon their class of driving licence. Over recent times, technology has enabled both monitoring and the ability to change the device settings remotely. There should be a concerted move to technology-enabling follow-up by reviewing CPAP (e.g. usage, amount of leak, etc.) by interrogating the equipment and a phone call with the patient. This will allow adherence issues to be addressed, explanations to patient questions, and a clear plan for withdrawing CPAP if not used. This has proved very successful to many sleep services in the pandemic phases of COVID-19.

Where patients have older machines without this facility, posting in the smart cards and subsequent phone review may be necessary, until we move to smart technology in all newly issued machines. Switching machines to enable remote monitoring may be more cost-effective in the long term.

There needs to be recognition within organisations that while this may reduce footfall in departments, clinics should be pre-booked, and time is established in physiologists/scientists job plans for this occur. Given this equipment is more expensive, the commissioning of the service and the tariff needs to reflect this change in practice that minimises staff and patient risk by limiting patient attendance.

E. Full polysomnography (PSG)

Full polysomnography and the associated daytime studies of MSLT and MWT are key to managing a wide spectrum of sleep problems, though are used proportionately less than limited studies. It is estimated that they make up about 5-10% of NHS sleep services in the UK.

In all these studies, electrodes are applied to the skin of the scalp, around the eyes, and chin to enable the staging of sleep. While MSLT and MWT are daytime studies, they are invariably proceeded by full polysomnography the previous night. The operational

standards for overnight studies are applicable to the daytime ones. For PSG, the study is performed overnight and records a variety of measurements to fully stage sleep, record breathing patterns, cardiac status, limb movements, video, etc.

Given the close proximity of the physiologist/scientist to the patient in applying the electrodes to the scalp, eyes and chin for staging sleep, and remaining in the department through the night to adjust electrodes, etc., and then to remove them the following morning, the issues below need to be considered in addition to standard infection control procedures:

i) The Patient

The precautions listed above in [1] need to be in place and should include swabbing, isolation after swabbing, administration of a questionnaire on the afternoon of the study and checking the individual's temperature on arrival.

ii) The Physiologist/Scientist

During set up, PPE should include a visor/goggles, water-repellent mask or equivalent, gloves and apron. Such equipment should be used if the patient needs to be reviewed in the night and when taking the equipment off the following morning.

iii) The Environment

There should be sufficient air changes as listed above (see latest PHE guidance) though this may be difficult for many sleep laboratories as they are part of the organisations structure and "hard wired". After the study, the room needs to be thoroughly cleaned and not used for a period recommended by infection control.

iv) The Equipment

Following the test(s), the nasal cannula and disposable effort bands should be disposed of as high risk waste as should other equipment where possible. Any equipment that cannot be disposed of should be cleaned as per local infection control/PHE guidance recommendations, recognising there are a variety of different sorts of equipment, so specific rules cannot be stated.

Future work needed

Uncertainty about the financial aspects of the service

Agreement on funding for remote monitoring, video-consultations/appointments, peripatetic services and testing/treating in the patient's home. All to include PPE expenses.

Audit of non F2F and remote monitoring in CPAP adherence

- Retrospective audit of services should be simple but needs coordinating nationally via professional bodies (ARTP, BTS).
- Patient satisfaction audit on non F2F contact for management of sleep patients.

Acknowledgment

This document has been developed with expert colleagues from the British Sleep Society and British Thoracic Society and reflects a broad range of opinion. As new evidence becomes available, the document will be revised to reflect this.

References

1. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1.
   van Doremalen N, Bushmaker T, Morris DH, et al. N Engl J Med 2020; 382:1564-1567